ENVIRONMENT AGENCY AUSTRIA umweltbundesamt

State of the Art in the Food, Drink and Milk Industries

Description of Austrian plants

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CONTENT

LIST OF ABBREVIATIONS

AEL .... Associated Emission Level

AOX .... Adsorbable organic halogen compounds (reported as Cl)

BAT .... Best Available Techniques

BATC .... Best Available Techniques Conclusions

BOD_5 .... Biological Oxygen Demand (5 day)

COD .... Chemical Oxygen Demand

ELV .... Emission Limit Value

EMREG .... Emission Register Surface Water

EMS .... Energy Management System

ESL .... Extended Shelf Life (milk)

EW_{60} .... Population equivalent (60 g BOD_5 per inhabitant)

EW_{100} .... Population equivalent (100 g COD load per inhabitant)

FDM .... Food, Drink and Milk

fpdcs .... Flow Proportional unsettled homogenised Daily Composite Sample

IED .... Industrial Emissions Directive

IPPC .... Integrated Pollution Prevention and Control

ÖWAV .... Österreichischer Wasser- und Abfallwirtschaftsverband (Austrian Water and Waste Management Association)

Q .... Volumetric flow rate (Quantity of water or wastewater per time unit)

SBR .... Sequencing Batch Reactor

TN .... Total Nitrogen

TP .... Total Phosphorus

TOC .... Total Organic Carbon

VOC .... Volatile Organic Compounds

WW .... Wastewater

WWTP .... Wastewater treatment plant

1 INTRODUCTION

1.1 Summary

This study was carried out on behalf of the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management to describe the processes and techniques which are applied in installations of the Austrian Food Industry. Consumption and emission figures are presented for selected processes and for industrial installations as a whole.

The Austrian Food industry is a heterogeneous industrial sector both regarding products, applied processes and the size of installations. It is not possible to provide an in-depth description of the whole sector. Thus, this report focuses on those techniques and processes which are relevant from the environmental point of view – this could be either because of their consumption of energy or raw materials or because of their emissions of pollutants. Another criterion was the relevance of the subsector in terms of the number of installations and total production capacity.

Relevant environmental parameter and/or emissions are:

- water consumption
- wastewater emissions (especially COD, TOC, BOD, total N, NH_4, AOX, total P, settleable substances/total suspended solids, lipophilic substances)
- energy consumption (cooling, heating, compressed air)
- emissions into air (energy installations, VOC)
- odour emissions
- waste generation and waste disposal

The aim of the study is to give a clear picture of the level of environmental protection in the Austrian Food Industry. Based on an assessment of the techniques applied and the associated consumption and emission figures, best available techniques (= state of the art) for certain processes are described.

It is intended to use this report as a background document for a revision of the BREF document on “Food, drink and milk”, first published in August 2006. This BREF describes almost every process applied in the food manufacturing industry. However, it lacks detailed consumption and emission figures.

The review of the BAT reference document (BREF), which started in the second half of 2014, shall be done in accordance with IED Art 13, which means that it has to be technology based data driven and transparent. BAT conclusions will contain BAT associated emission levels (BAT-AELs), which shall be used as a reference for the determination of emission limit values. Accordingly, the quality of the data must be high – they have to be based on measurements, they have to be representative of the operation of the plant or unit in question and additional information is needed (such as the applicability of the process, cross-media effects, driving force for implementation, costs).

1.2 Zusammenfassung

Die vorliegende Studie wurde im Auftrag des Bundesministeriums für Land- und Forstwirtschaft, Umwelt und Wasserwirtschaft erstellt um die in Anlagen der Österreichischen Lebensmittelindustrie angewandten Prozesse und Verfahren zu beschreiben. Hierfür werden Verbrauchs- und Emissionsdaten für einzelne Prozesse als auch ganze Standorte dargestellt.

Die Österreichische Lebensmittelindustrie zeichnet sich durch ihre Vielfalt in der Produktpalette als auch in den angewandten Prozessen aus. Eine detaillierte Darstellung des gesamten Sektors ist daher nicht möglich, weshalb diese Studie einen Fokus auf jene Techniken und Verfahren legt, welche umweltrelevante Auswirkungen zeigen. Hierfür können sowohl der Verbrauch an Ausgangsmaterialien oder Energie, als auch die Emission von Schadstoffen entscheidend sein. Ein weiteres Kriterium war die Verbreitung der jeweiligen Branche sowohl anhand der Anzahl an Standorten als auch anhand der Produktionskapazität.

Relevante Umweltparameter bzw. Emissionen sind:

- Wasserverbrauch
- Abwasseremissionen (insbesondere CSB, TOC, BSB_5, Stickstoff gesamt, Ammonium, AOX, Phosphor gesamt, abfiltrierbare bzw. absetzbare Stoffe und lipophile Stoffe)
- Energieverbrauch (Kühlen, Heizen, Druckluft)
- Emissionen in die Luft (Energieanlagen, VOC)
- Geruchsemissionen
- Abfallaufkommen und Abfallbeseitigung

Das Ziel der Studie ist die Darstellung der Umweltschutzstandards der Österreichischen Lebensmittelindustrie. Auf Basis der angewandten Techniken und den zugehörigen Verbrauchs- und Emissionszahlen wurden die besten verfügbaren Techniken (=Stand der Technik) für eine Reihe von Prozessen abgeleitet.

Es ist vorgesehen diese Studie als Hintergrundinformation für die Revision des BREF Dokuments „Food, drink and milk" von August 2006 heranzuziehen. Das BREF Dokument beschreibt nahezu alle Prozesse der in Europa vorkommenden Lebensmittelindustrie, es fehlen jedoch detaillierte Verbrauchs- und Emissionswerte.

Die Revision des BVT Referenzdokuments begann Ende 2014 und wird in Übereinstimmung mit den Vorgaben des Artikels 13 der IED durchgeführt. Die Überarbeitung muss somit technologie- und datenbasiert, sowie transparent stattfinden. Die BVT-Schlussfolgerungen werden die mit den besten verfügbaren Techniken assoziierten Emissionswerte (BVT-AEW) enthalten, welche als Basis für die Festlegung von Emissionsgrenzwerten heranzuziehen sind. Entsprechend hohe Anforderungen werden an die verwendeten Daten gestellt – diese müssen auf Messungen basieren, repräsentativ für den Betrieb der Anlage sein und mit Zusatzinformationen hinterlegt sein (zu berücksichtigen sind hierbei die Anwendbarkeit des Verfahrens, medienübergreifende Effekte, der Anlass für die Umsetzung und die damit verbundenen Kosten).

1.3 Legal background

In Austria a variety of media specific regulations define the environmental legal framework for the food industry. Most relevant are the following:

Water and wastewater: "Water Act" (Federal Legal Gazette No. 215/1959 as amended by BGBl. I 2012/24) and specific Ordinances for wastewater emissions

Air: "Ordinance on firing installations" (Federal Legal Gazette II No. 331/1997 as amended by BGBl. II Nr. 312/2011) and the "Emission Protection Act for Steam Boilers" (Federal Legal Gazette I No. 127/2013) as well as the "Ordinance for Steam Boilers" (Federal Legal Gazette No. 19/1989, expiring on 11 July 2013 due to BGBl. I Nr. 127/2013)

Waste: "Waste Management Act" (Federal Legal Gazette I No. 102/2002 as amended by BGBl. I Nr. 193/2013)

Horizontal: "Industrial Code" (Federal Legal Gazette No. 194/1994 as amended by BGBl. I Nr. 212/2013)

1.3.1 Ordinance on firing installations

Scope

The Ordinance on Firing Installations (Feuerungsanlagen-Verordnung – FAV, Federal Legal Gazette II No. 331/1997 as amended on 26 March 2014) applies to combustion plants with a rated thermal input of 50 kW to 50 MW which produce usable heat (which means that this Ordinance does not apply to steam boilers).

This Ordinance does not apply to plants which

- use combustion gases for direct treatment of goods or materials,
- incinerate or co-incinerate waste
- operate less than 250 hours a year,
- are combustion engines and gas turbines,
- are used for thermal afterburning to clean exhaust gases.

Regulated parameters

Emission parameters depend on the used fuel and the rated thermal input. A qualitative overview is shown in Table 1.

Table 1: Regulated parameters sorted by fuel (Source: FAV)

Used fuel	Regulated parameters
Coal and coke	dust, SO_2, CO, NO_X
Wood	dust, CO, HC, NO_X
Straw or similar plant products (e.g. cereals, grasses, miscanthus)	dust, CO, HC, NO_X, SO_2, HCl
Oil	soot, dust, SO_2[1)], CO, NO_X
Gas (natural and liquid gas)	CO, NO_X

1) regulated by the S content of the fuel

NH_3 is also regulated if NH_3 or ammonium compounds are used to reduce NO_x.

Limit values are based on a content of oxygen in the exhaust gas of 3% (oil and gas), 6% (coal and coke) and 11% (wood, straw, etc) and refer to standard conditions (273 K, 101.3 kPa, dry gas).

Provisions for existing installations

Existing combustion plants have to fulfil the requirements of the Ordinance on Firing Installations not later than 1 January, 2018.

Existing wood fired combustion plants up to 2 MW have to comply with the emission limit values for dust not later than 1 January 2020.

Existing wood fired combustion plants between 2 and 5 MW have to be in line with an emission limit value for dust of 50 mg/m^3 at 11% O_2 (instead of 20 mg/m^3) following an extension of the plant's capacity or the renewal of the combustion chamber but at the latest by 1 January 2018. This rule does not apply if the installation already complies with the legal limit of 50 mg/m^3 (related to 13% O_2 content in the exhaust gas) or if the emissions are below 20 mg/m^3 (at 11% O_2) dust without additional technical adjustments.

Self-monitoring

If the capacity of a plant reaches certain threshold levels continuous measurement is required for dust, CO, SO_2 and NO_x (see Table 2). Registered data have to be automatically converted into half-hour mean values, the minimum data availability has to be at least 90% over a period of one month.

Table 2: Threshold values (in MW) for continuous measurement (Source: FAV)

Fuel	Dust	CO	SO_2	NO_x	Unit
Solid	> 10	> 10	> 30	> 30	MW
Liquid	> 10	> 10	-	> 30	MW
Gas	-	> 10	-	> 30	MW

The Ordinance also requires periodic calibration of the measurement system (at least every three years) and a yearly technical inspection by accredited bodies, institutions run by the federal government or a federal state, government-authorised institutions and civil engineers or engineering companies.

The functioning of devices for the removal of dust has to be monitored unless continuous dust monitoring is in place already. This can be done by checking the filter voltage and current or triboelectric dust sensors. If the filter unit uses a bypass during start-up, continuous recording of the damper position is also mandatory.

Records of self-monitored have to be kept for a minimum period of three years.

External monitoring

Where continuous measurement is not required, individual measurements shall be carried out at least every 5 (1-2 MW) or 3 years (> 2 MW). If secondary techniques to remove SO_2 or HCl are in use, these parameters (SO_2 and/or HCl) also have to be measured at plants less than 1 MW (every 5 years).

Periodic measurements have to be carried out under normal operating conditions (including the use of permitted fuels) at a representative sampling point by accredited bodies, institutions run by the federal government or a federal state, government-authorised institutions and civil engineers or engineering companies. If the rated thermal input is less than 10 MW, these measurements can also be carried out by private companies within the framework of their competences.

As a rule, three consecutive half-hourly average values shall be measured independantly within a period of three hours.

Firing installations and their emission control systems shall be checked visually once a year. In the course of these yearly checks the parameters CO, exhaust gas losses and soot (oil firing systems only) shall be measured if emission limit values are prescribed and no continuous monitoring system is installed. It also has to be verified that only the specified fuels has been used. If applicable, the results of continuous measurements have to be verified.

Assessment of compliance

Emission limit values are considered exceeded if a validated daily mean value exceeds the limit value or if 3% of the validated half-hour mean values exceed the emission limit value by more than 20%, or if one half-hourly mean value exceeds the emission limit value by a factor of two. Periods of start-up and shutdown shall be disregarded.

In the case of periodic measurement – as a minimum requirement – compliance is achieved if the half-hourly mean value does not exceed the emission limit value, taking into account the measurement uncertainty.

The CO measurements during the periodic inspections (generally 15 min mean value) shall not exceed the limit, taking into account the measurement uncertainty.

All external inspection documents shall be retained at the installation for at least five years so that this information can be provided to the authorities.

1.3.2 Emission protection Act for Steam Boilers

Scope

The Emission Protection Act for Steam Boilers (Emissionsschutzgesetz für Kesselanlagen – EG-K, BGBl. I Nr. 150/2004(idgF)) applies to stationary combustion plants consisting of

- one or several steam boilers,
- heat recovery boiler,
- gas turbines and

- gas engines
- as well as other directly connected units if they have an effect on emissions and pollution.

Installations which do not release any emissions to the environment are excluded from the scope of the law if the emissions are solely related to a production process. Gas engines and gas turbines are excluded if they are part of an installation with a rated thermal input of less than 50 MW. Detailed rules on methods of measurements, calibration, documentation, location of sampling sites and compliance assessment are given in the Ordinance regarding the monitoring of air pollutants (Emissionsmessverordnung Luft – EMV-L, BGBl. II Nr. 153/2011).

Regulated parameters

Emission parameters depend on used fuel and rated thermal input. Further distinctions are made between new, existing and old plants. Existing plants are those which were put into operation before 7 January 2014 and old plants before 27 November 2003.

The parameters in Table 3 apply to plants with a rated thermal input of 50 MW or more.

Table 3: Regulated parameters sorted by fuel (Source: EG-K)

Used fuel	Regulated parameters
Coal and other solid fuels	dust, SO_2, NO_x, CO
Biomass	dust, SO_2, NO_x
Liquid fuels	dust, SO_2[1], NO_x, CO
Gaseous fuels	dust[1], SO_2[1], NO_x, CO

[1] except gas turbines and gas engines

NH_3 is also regulated if NH_3 or ammonium compounds are used to reduce NO_X. Emission limit values are based on a volume content of oxygen in the exhaust gas of

- 6% for solid fuel,
- 3% for liquid and gaseous fuels (except gas turbines and gas engines),
- 15% for turbines and gas engines

and refer to standard conditions (273 K, 101.3 kPa, dry gas).

General monitoring rules

The selection of sampling points has to be in line with the standard ÖNORM EN 15259. In general, monitoring has to be performed according to state-of-the-art specifications. In the absence of specific permit conditions half-hourly average values have to be recorded.

Systems for continuous monitoring have to fulfil the criteria of ÖNORM EN 15267-3. Existing systems have to be in line with the Austrian standard ÖNORM M 9411. There are less stringent requirements regarding measurements at combustion plants with less than 10 MW rated thermal input.

Periodic calibration of the system for continuous measurement (at least every three years) and a yearly technical inspection by accredited bodies, institutions run by the federal government or a federal state, government-authorised institutions and civil engineers or engineering companies is required. The operator shall perform weekly checks of the monitoring systems.

Self-monitoring

Monitoring shall be performed by the operator. Registered data have to be automatically converted into half-hour mean values. The minimum data availability shall be at least 90% over a period of one month. Periods of start-up and shut-down of the plant have to be included in the recordings.

As a general rule, oxygen content, humidity and exhaust gas temperature as well as pressure have to be measured continuously. In addition, the thermal input and the waste gas volume have to be measured or calculated in combustion plants with more than 30 MW rated thermal input. Fuel ratios have to be recorded, if applicable.

If the capacity of single steam boilers or gas turbines reaches certain threshold levels continuous measurement is required for dust, CO, SO_2 and NO_x (see Table 4).

Table 4: Threshold values (in MW) for the installation of systems for continuous measurement (Source: EG-K)

	Dust	CO	SO_2	NO_x	Unit
Rated thermal input	> 15	> 15	> 30	> 30	MW

If the total rated thermal input of a combustion plant exceeds 100 MW, continuous measurement is compulsory. There are certain exemptions from continuous measurements, such as for combustion plants fired with natural gas or biomass or combustion plants < 100 MW.

External monitoring

Periodic measurements have to be carried out at least every 5 (1-2 MW) or 3 years (> 2 MW) by accredited bodies, institutions run by the federal government or a federal state, government-authorised institutions and civil engineers or engineering companies.

Monitoring has to be done in order to obtain representative results. In case of combustion plants with a rated thermal input of more than 30 MW, measurement plans and the sampling strategy shall be designed in accordance with ÖNORM 15259. If the rated thermal input of the combustion plant is less than 10 MW and the plant is fired with certain standardised fuels (e.g. liquid or natural gas, heating oil with very low or no sulphur content), the sampling time may be reduced to 15 minutes.

If the competent authority stipulates Emission Limit Values for additional parameters (in addition to CO, SO_2, NO_X and dust) these have to be measured in accordance with the requirements given by the Waste Incineration Ordinance (Abfallverbrennungsverordnung – AVV, Federal Legal Gazette II No. 389/2002 as amended on 11 July 2013).

As a rule three consecutive half-hourly average values shall be measured independently within a period of three-hours.

Assessment of compliance

Compliance is assessed after subtracting a given measurement uncertainty from the measured value (validated value). In case of periodic measurements, no validated value should exceed the emission limit value. In case of continuous monitoring, emission limit values are complied with if

- no validated daily mean value exceeds the emission limit value
- 97% of all validated values do not exceed the emission limit value by a factor of 1.2
- no validated value exceeds the emission limit value by a factor of 2.

All documents, reports and measuring data have to be stored at the installation for at least five years.

1.3.3 Wastewater

1.3.3.1 General

The Austrian Water Act (Wasserrechtsgesetz 1959 – WRG 1959, BGBl. Nr. 215/1959 idF BGBl I Nr 54/2014) constitutes the legal basis for the following:

- the use of water
- water quality and water protection
- protection against natural hazards

The Austrian Water Act includes a general Ordinance on wastewater discharges, but also specific Ordinances for the discharge of wastewater from different industrial activities. These specific Ordinances lay down general provisions and Emission Limit Values for a variety of parameters, as well as requirements regarding monitoring. More specific provisions are prescribed in the individual permits for the plants.

Relevant for the food sector are the Ordinances on:

- meat industry (FLG. II Nr. 12/1999)
- dairies (FLG. II Nr. 11/1999)
- fish production (FLG. Nr. 1075/1994)
- production of yeast, bio-ethanol and citric acid (FLG. Nr. 1080/1994)
- production of sugar and starch (FLG. Nr. 1073/1994)
- breweries and malting houses (FLG 1994/1074)
- alcohol for human consumption (FLG. Nr. 1076/1994)
- pickles production (FLG. Nr. 1081/1994)
- animal and plant oils and fats (FLG. Nr. 1079/1994)
- fruit and vegetable sector (FLG. Nr. 1078/1994)
- production of soft drinks (FLG. Nr. 1077/1994)
- potato processing (FLG. Nr. 890/1995)

The following tables provide a brief overview about the primary wastewater emission limit values for each relevant food sector addressed in this study (direct wastewater discharges in Table 5 and indirect discharges in Table 6). The standards and directives to be followed for sample-taking, sample treatment and the measurement of emission limit values can be found in Appendix 5.1 (according to Article 7, Section 4 of the AAEV). The competent authority has the possibility to restrict the number of parameters for self- and external monitoring after examining each individual case (e.g. if a parameter can be excluded from a process-related point of view). Parameters shall not exceed the limits given in the AAEV or AEVs (Article 4, Section 1 of the AAEV).

Table 5: Primary wastewater emission limit values for direct discharged wastewater (*according to the respective Austrian Ordinance)*

Parameter **(direct discharge into the receiving water)**	**Unit**	**Breweries and malting houses**	**Production of yeast, bio-ethanol and citric acid**	**Dairies**	**Production of soft drinks**	**Meat industry**	**Production of starch**	**Production of sugar**	**Animal and plant oils and fats**
T	°C	30	30	30	30	30	30	30	30
pH		6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5	6.5-8.5
COD	mg/l	90	110 34 kg/t[1]	75	90	90	100 (or 90% removal if the inlet is >1,000mg/l)	0.35 kg/t[2] 0.5 kg/t[3] 75 mg/l[4]	150
BOD	mg/l	20	25	20	20	20	20-40[5]	0.04 kg/t 20 mg/l[4]	25
total N[6]	min. removal	75%	75%	75%	75%	75%	75%	75%	75%
total P	mg/l	2	1.0	2.0	1	1.0	2	1	2
Lipophilic substances[7]	mg/l			10		20			20
Total suspended solids	mg/l					30			
Settleable substances	ml/l		0.3	0.3			0.3	0.3	0.3
NH_4-N	mg/l	5	5.0	5.0	5	5.0	5	5	5
Free Cl	mg/l		0						0
Total Cl	mg/l		0.4	0.4		0.4			0.4
AOX (reported as Cl)	mg/l	0.5	0.5	0.1	0.5	0.1	0.03 kg/t[8] 0.1 kg/t[9]		0.5
Sulfide (reported as S)	mg/l		0.1		0.1				0.1
Sulfite (reported as SO_4)	mg/l		1.0						
Nitrite (reported as N)	mg/l		2.0						
Total cyanide (reported as CN)	mg/l		1.5						

Parameter **(direct discharge into the receiving water)**	**Unit**	**Breweries and malting houses**	**Production of yeast, bio-ethanol and citric acid**	**Dairies**	**Production of soft drinks**	**Meat industry**	**Production of starch**	**Production of sugar**	**Animal and plant oils and fats**
Chromium (as Cr)	mg/l								0.5
Iron	mg/l				2				
Copper (reported as Cu)	mg/l	0.5	0.5		0.5				
Nickel (reported as Ni)	mg/l								0.5
Zinc (reported as Zn)	mg/l	2.0	2.0						
Mercury (reported as Hg)	mg/l								0.005
TOC (reported as C)	mg/l	30		25	30	30	35 (or 90% removal if the inlet is >350 mg/l)		50
Anionic and non-ionic surfactants	mg/l				1.0				
Sum of hydrocarbons	mg/l								10
Toxicity for fish					< 2		< 2	< 2	< 2

[1] *if beet molasses or other sugar sources are used to produce citric acid (refers to one ton of processed sugar)*

[2] *if the Quentin process is applied (refers to one ton of incoming sugar beet)*

[3] *without application of the Quentin process (refers to one ton of incoming sugar beet)*

[4] *outside of the sugar campaign*

[5] *40 mg/l for corn starch if the minimum removal is at least 97% and the BOD_5 inlet > 850 mg/l*

[6] *if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day*

[7] *dairies: separable lipophilic substances (direkt abscheidbare lipophile Leichtstoffe)*
Meat industry / animal and plant oils and fats: low volatile lipophilic substances (schwerflüchtige lipophile Stoffe)

[8] *per ton of potato starch produced*

[9] *per ton of corn starch produced*

Table 6: Primary wastewater emission limit values for indirect discharged wastewater (*according to the respective Austrian Ordinance)*

Parameter (indirect discharge to an external WWTP)	**Unit**	**Breweries and malting houses**	**Production of yeast, bio-ethanol and citric acid**	**Dairies**	**Production of soft drinks**	**Meat industry**	**Production of starch**	**Production of sugar**	**Animal and plant oils and fats**
T	°C	35	35	35	35	35			35
pH		6.0-9.5	6.0-9.5	6.5-10.5	6.5-9.5	6.0-9.5			6.5-10
Lipophilic substances[1)]	mg/l			100		150			100
Total suspended solids[2)]	mg/l	1000			750	150			
Settleable substances[2)]	ml/l	20	10	10	10				10
NH_4-N	mg/l								
Free Cl	mg/l		0.2	0.4					0.2
Total Cl	mg/l	0.3	0.4		0.3	0.4			0.4
AOX (reported as Cl)	mg/l	1.0	0.5	1.0	1.0	1.0			0.5
Suphfide (reported as S)	mg/l		1.0		1.0				2.0
Sulphite (reported as SO_3)	mg/l		20						
Nitrite (reported as N)	mg/l		10						
Total cyanide (as CN)	mg/l		1.5						
Chromium (as Cr)	mg/l								0.5
Copper (reported as Cu)	mg/l	0.5	0.5		0.5				
Nickel (reported as Ni)	mg/l								0.5
Zinc (reported as Zn)	mg/l	2.0	2.0						
Mercury (reported as Hg)	mg/l								0.005
Sum of hydrocarbons	mg/l								20

[1)] *dairies: separable lipophilic substances (direkt abscheidbare lipophile Leichtstoffe);*
meat industry / animal and plant oils and fats: low volatile lipophilic substances (schwerflüchtige lipophile Stoffe)

[2)] *target value to minimise the risk of blockage in the public sewer system*

Self-monitoring

The pH value as well as the parameters for total suspended or settleable substances shall be measured by means of frequent spot samples. All other parameters have to be based on an unsettled, homogenised daily composite sample.

According to Article 7, Section 8 of the AAEV the frequency for self- and external monitoring shall be specified by the competent authority in the permit for the relevant plant.

Operators may choose – in order to optimise the production process and to control the functioning of the wastewater treatment plant – to monitor additional parameters, to introduce shorter monitoring intervals or to monitor the same parameter upstream and downstream in the process (e.g. online monitoring of N and P dosage).

External monitoring

External monitoring has to be carried out by authorised experts, institutions or companies (Article 134, Section 1 of the WRG 1959 and Article 1, Section 3 of the AAEV).

Asessment of compliance

Self-monitoring: The legal limit is not deemed to have been exceeded if 4 out of 5 consecutive individual measurements are below the prescribed emission limit value and the 5^{th} value does not exceed the emission limit value by a given percentage. In case of continuous sampling, emission levels have to be below the emission limit value at least during 80% of the observed time ("4 out of 5 rule") under all operational conditions.

The limit value for the elimination of total nitrogen is reached if the annual arithmetic average is higher than the limit value of the minimum removal (e.g. 75%).

Methods for sampling, sample treatment, and analysis are described in Appendix C to the AAEV.

External Monitoring: If the frequency of external monitoring is below 4 measurements per year, sampling has to be repeated if one measured value exceeds the emission limit value by a given percentage (usually 50% or, in case of ammonia, 100%). The result of the repeated measurement has to be below the emission limit value. In case of more frequent measurements (and for temperature and the pH value) the "4 out of 5 rule" applies (see above).

1.3.3.2 Meat industry (FLG. II Nr. 12/1999)

Scope

The Ordinance applies to plants for the slaughtering of animals, for the processing, manufacturing and packaging of meat and poultry as well as for the cleaning of such facilities.

Parameters

Direct discharge: temperature, total suspended solids, pH, total chlorine, ammonium, total nitrogen, total phosphorus, TOC, COD, BOD_5, AOX, low volatile lipophilic substances

Indirect discharge: temperature, total suspended solids, pH, total chlorine, ammonium (only because of possible odour nuisance or the risk of corrosion of the public sewer system), AOX, low volatile lipophilic substances

Furthermore, it is prohibited to discharge slaughtering blood, muck and animal slurry in Austria (direct or indirect).

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 12 January 1999 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.3 Dairies (FLG. II Nr. 11/1999)

Scope

The Ordinance applies to plants which perform the following processes: collection, storage, treatment, and filling into containers or transfer from one container to another of milk or milk products as well as by-products of the dairy industry, and the cleaning of such facilities.

Parameters

Direct discharge: temperature, pH, settleable substances, total chlorine, ammonium, total nitrogen, total phosphorus, TOC, COD, BOD_5, AOX, separable lipophilic substances

Indirect discharge: temperature, pH, settleable substances, total chlorine, ammonium (only because of possible odour nuisance or the risk of corrosion of the public sewer system), AOX, separable lipophilic substances

Furthermore, it is prohibited to discharge whey in Austria (direct or indirect).

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 12 January 1999 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.4 Production of sugar (FLG. Nr. 1073/1994)

Scope

The Ordinance applies to plants for manufacturing liquid or solid sugar products as well as syrups (in Austria sugar is industrially manufactured using exclusively sugar beet) and starch which is described in chapter 1.3.3.5.

Parameters

Direct discharge: temperature, fish toxicity, settleable substances, pH value, ammonium, total nitrogen, total phosphorus, COD, BOD_5

In Austria only wastewater from the sugar and starch industry is is discharged directly. A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

The Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.5 Production of starch (FLG. Nr. 1073/1994)

Scope

The Ordinance applies (in addition to sugar) to plants where starch is manufactured, as well as starch syrup, starch sugar or dry starch, and starch derivatives from potatoes, corn or cereals.

Parameters

Direct discharge: temperature, fish toxicity, settleable substances, pH, ammonium, chlorine, total nitrogen, total phosphorus, TOC, COD, BOD_5, AOX

In Austria only wastewater from the sugar and starch industry is discharged directly. A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.6 Production of soft drinks (FLG. Nr. 1077/1994)

Scope

The Ordinance applies to plants for the production of soft drinks (less than 0.5% alcohol) including all kind of water and bottling of all types of beverages.

Parameters

Direct discharge: temperature, fish toxicity, pH, iron, copper, total chlorine, ammonium, chloride, total nitrogen, total phosphorus, sulphide, TOC, COD, BOD_5, AOX, anionic and non-ionic surfactants

Indirect discharge: temperature, settleable substances, filtratable substances, pH, copper, total chlorine, ammonium (only because of possible odour nuisance or the risk of corrosion of the public sewer system), sulphide, AOX

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Regulation.

Recommended techniques to achieve compliance with the emission limit values

According to the Ordinance the following techniques – implemented either individually or in combination – should be taken into consideration in order to achieve compliance with ELVs:

1.3.3.7 Breweries and malting houses (FLG. Nr. 1994/1074)

Scope

The Ordinance applies to plants which produce malt for breweries and distilleries and the filling of beer or non-alcoholic drinks based on hops and malt in containers.

Parameters

Direct discharge: temperature, pH, copper, zinc, total chlorine, ammonium, total nitrogen, total phosphorus, TOC, COD, BOD_5, AOX

Indirect discharge: temperature, settleable substances, filtratable substances, pH, copper, zinc, total chlorine, ammonium (only because of possible odour nuisance or the risk of corrosion of the public sewer system), AOX

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.8 Production of yeast, bio-ethanol and citric acid (FLG. Nr. 1080/1994)

Scope

The Ordinance applies to plants for the production and packaging of citric acid as well as yeast and bioethanol.

Parameters

Direct discharge: temperature, fish toxicity, settleable substances, pH, copper, zinc, free chlorine, total chlorine, ammonium, chloride, total cyanide, total nitrogen, nitrite, total phosphorus, sulphide, sulphite, COD, BOD_5, AOX

Indirect discharge: temperature, settleable substances, pH, copper, zinc, free chlorine, total chlorine, ammonium, total cyanide, nitrite, total phosphorus, sulphate, sulphide, sulphite, AOX

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.9 Animal and plant oils and fats (FLG. Nr. 1079/1994)

Scope

The Ordinance applies to plants for the production of vegetable oil or intermediate products from oilseeds, for the refining and packaging of vegetable oils and fats, the production of margarine and the production and packaging of animal fat.

Parameters

Direct discharge: temperature, fish toxicity, settleable substances, pH, chromium, nickel, mercury, free chlorine, total chlorine, ammonium, total nitrogen, total phosphorus, sulphate, sulphide, TOC, COD, BOD_5, AOX, low volatile lipophilic substances, total hydrocarbons

Indirect discharge: temperature, fish toxicity (only if relevant), settleable substances, pH, chromium, nickel, mercury, free chlorine, total chlorine, sulphide, AOX, low volatile lipophilic substances, total hydrocarbons

A table showing prescribed emission limit values can be found in the Appendix to this document.

Transition period

This Ordinance was published on 30 December 1994 and entered into force one year later. The transitional period ended 5 years after the date of entry into force of this Ordinance.

1.3.3.10 Mixed industrial wastewaters

The possibility of mixed wastewater makes things more complicated. It is common practice to mix e.g. process wastewater with rain or faecal sewage water. So Article 4, Section 5 and 6 of the AAEV (general wastewater discharge ordinance) have also to be taken into account in the light of the decision.

For example many plants have their own steam generator and steam turbine unit producing significant amounts of wastewater so that another AEV, namely "AEV Kühlsysteme und Dampferzeuger" (WasteWater Ordinance on steam generators and cooling systems) has to be considered. In this case e.g. a higher wastewater temperature is allowed for direct discharges into open waters (35 °C compared to for example 30 °C for dairies). The COD limit is of course lower (45 compared to 75 mg/l) and other (additional) parameters have to be measured (e.g. metals like Cu, Mo, Zn and also Cl).

The legal limits for mixed wastewaters are specified at the discretion of the competent authority for each particular case. The specified limit shall not exceed the individual wastewater regulations and has to be weighted according to the approximate amount of water of the respective streams (Article 4, Section 5 of the AAEV).

2 APPLIED PROCESSES AND TECHNIQUES

2.1 Overview of the Austrian Food Industry

According to the Food Industries Association of Austria the Austrian food industry is a very inhomogeneous sector comprising 30 sub-sectors with a total of 222 production plants. Approximately 90 of these plants are dairies and cheese factories, employing more than 4,400 people. The annual production value was 7.8 billion Euros with a workforce of 26,414 people in the year 2012. Austria's food and drink industry has managed to increase the export quota from 16.6% to 58.9% from 1995 to 2008. Foreign trade continued to grow over the last few years which can be seen in Table 7. (Source: FV LEBENSMITTELINDUSTRIE 2013)

Table 7: Austrian foreign trade with food products in billion Euros (Source: WKO 2014)

Year	Exports	Imports	Balance of trade
2010	4.53	3.94	+0.6
2011	4.98	4.28	+0.7
2012	5.18	4.68	+0.5

In order to provide an overview, this chapter contains general information as well as descriptions of plants serving as typical examples of individual production groups (e.g. general descriptions, energy generation and use, waste, noise, odour and wastewater). A list of all the Austrian plants covered in the study is shown in Table 8. At the time when the study was conducted 22 of these 29 plants were IPPC installations.

Table 8: Overview of the installations covered in the present study

Operator	Adress	Sector
Spar Österreichische Warenhandels-AG Betriebsstätte Tann	Landesstraße 45, 9241 Föderlach	meat products
Hochreiter Fleischwaren GmbH	Kommunestraße 1, 4190 Bad Leonfelden	meat products
Landhof GmbH & Co. KG	Lederergasse 59, 4020 Linz	meat products
SalzburgMilch GmbH	Milchstraße 1, 5020 Salzburg	dairy
Berglandmilch reg.Gen.m.b.H	Molkereistraße 5, 3361 Aschbach	dairy
Gmundner Molkerei reg.Gen.m.b.H.	Theresienthalstraße 16, 4810 Gmunden	dairy
NÖM AG	Vöslauerstraße 109, 2500 Baden	dairy
Kärntnermilch reg.Gen.m.b.H.	Villacher Straße 92, 9800 Spittal an der Drau	dairy
Berglandmilch reg.Gen.m.b.H.	Lattellaplatz 1, 6300 Wörgl	dairy

Operator	Adress	Sector
Berglandmilch reg.Gen.m.b.H.	Ottenhausen 34, 5134 Feldkirchen b.M.	dairy
Berglandmilch reg.Gen.m.b.H.	Schubertstraße 30, 4600 Wels	dairy
SalzburgMilch GmbH	Käsereistraße 1, 5112 Lamprechtshausen	dairy
Obersteirische Molkerei eGen	Hautzenbichlstrasse 1, 8720 Knittelfeld	dairy
Agrana Zucker GmbH	Bahnstraße 104, 2285 Leopoldsdorf i.M.	sugar
Agrana Zucker GmbH	Josef-Reither-Straße 21-23, 3430 Tulln	sugar
Agrana Stärke GmbH	Raiffeisenweg 2-6, 4082 Aschach a.d.D.	starch
Agrana Stärke GmbH	Conrathstrasse 7, 3950 Gmünd	starch
Agrana Stärke GmbH	Industriegelände, 3435 Pischelsdorf	starch
Rauch Fruchtsäfte GmbH & Co OG	Langgasse 1, 6830 Rankweil	soft drinks
Rauch Fruchtsäfte GmbH & Co OG	Kuhbrückweg 2, 6714 Nüziders	soft drinks
S.Spitz GmbH	Gmundner Straße 27, 4800 Attnang-Puchheim	soft drinks
Hermann Pfanner Getränke GmbH	Fabrikstraße 11, 4470 Enns	soft drinks
Stieglbrauerei zu Salzburg GmbH	Kendlerstraße 1, 5020 Salzburg	brewery
Brau Union Österreich AG (Brauerei Göss)	Brauhausgasse 1, 8700 Göss/Leoben	brewery
Brau Union Österreich AG (Brauerei Wieselburg)	Doktor-Beurle-Straße 1, 3250 Wieselburg a. d. Erlauf	brewery
Jungbunzlauer Austria AG & Co.KG	Pernhofen 1, 2064 Wulzeshofen	citric acid
Austria Pet Food GmbH	Mach Allee 2, 7023 Pöttelsdorf	animal feed (pet-food)
Mars Austria OG	Industriestraße 20, 2460 Bruck an der Leitha	animal feed (pet-food)
Bunge Austria GmbH	Industriegelände West 3, 2460 Bruck an der Leitha	Vegetable oil

2.2 Meat industry

The meat processing industry includes three main areas: slaughtering (which is described in the BREF "Slaughterhouses and Animal By-products Industries" EC, 2005 and not dealt with here), and the cutting and processing of meat (mainly beef, pork and poultry) which is described briefly below:

First bones, rind, fat and skin are removed from the carcases (if these parts are not needed in the final product). Size reduction is achieved by cutting up the carcases with electrically operated knives, blades, cleavers and circular or straight saws. Particle size is further reduced by grinding and chopping and salt soluble protein is extracted, which improves the taste of the final product. Processing is mainly carried out for preservation purposes but also to adjust the taste as in the case of e.g. ham, bacon, sausage and dry meat. Other applied processes are cooking, frying, fermentation, smoking and brining/curing/picking which provide for a limited extension of shelf-life time as well as for huge food diversity.

The multi needle injection of brine solution under high pressure (NaCl with KNO_2 and $NaNO_2$) is the standard technique to treat large products like ham, shoulder, bresaola and turkey. A multitude of additives containing polyphosphates, ascorbate, caseinate, nitrate, glutamate and different spices may be added to the brine solution. Some products, however, still require the use of solid salt. These are, for example, uncooked ham, bacon and coppa.

Wet and dry melting is used to recover fat from meat residues. If steam injection is used the result is a two-phase mixture of fat and water which is separated by decantation and centrifugation. Another technique is indirect dry heating of the residues in a kettle which results in molten fat and solid fat-free meat residue which is separated by decantation.

As in many foodstuff industries wastewater causes the main environmental impact in the meat and poultry sector. Large amounts of water are used mainly for washing and thawing meat (3-5 m^3/t are reported). The cutting and chilling of carcases is performed under stringent hygiene measures which leads to a need for large quantities of wastewater which have to be used for the thorough cleaning of the equipment and the installations. Although some processes can be run in closed-circuits water consumption is still high in e.g. pasteurising, sterilising and cooling.

Air pollution may be caused by smokers and boilers. Furthermore, some processes require sound insulation. Solid residues are by-products such as bones, fat and skin, of which some may be further used for producing glue, detergents or gelatine. Large quantities of energy are needed for heating (e.g. boiling, cooking, pasteurising, sterilising, drying, thawing, smoking) and cooling purposes (e.g. chilling, freezing) as well as for cleaning and disinfection. (Source: EUROPEAN COMMISSION 2006, ULLMANN 2007)

2.2.1 Spar TANN, 9241 Wernberg

2.2.1.1 General description

Name of the installation	**SPAR Österreichische Warenhandels-AG** **Betriebsstätte TANN,** **9241 Wernberg, Landesstrasse 45**
IPPC activity	Below threshold value of 75 t/d
Capacity	56-65 t/d
Products	Processing and packaging of fresh meat. Production of sausages, smoked meat, ham, bacon and meat paste.
Operating hours	2,405 hours of production per year
Raw materials	About 14,160 t meat (pork, beef and veal) per year
Auxiliary materials	Natural and artificial casings, spice mixtures, cleaning and disinfecting agents

Table 9: General description (Source: Spar TANN, email 13-8-2014)

2.2.1.2 Energy generation and use

Energy data 2013	
Electrical power (external source)	9.68 GWh
Thereof energy consumption for Cooling	3.51 GWh
Fuel oil extra light (low sulphur)	808 TJ

Table 10: General Energy generation and use (Source: Spar TANN, email 13-8-2014)

Year 2011		
	Steam boiler 1	**Steam boiler 2 (reserve plant)**
Type of combustion plant	**Steam boiler**	**Steam boiler**
Rated thermal Input (MW)	3.59	3.64
Start of operation	2003	1996
Fuel	Heating oil extra light	Heating oil extra light
Steam production	5 t/h	5 t/h
Operating hours (h/y)	5,840	371 (only in the event of Steam boiler 1 maintenance or malfunction)
Energy recovery	2 ECO gas heat exchangers (one for feedwater and sanitary water)	-
Flue gas cleaning	none	none
Steam parameter (p,T)	Reduced to 7.5 bar (max 10 bar)	Reduced to 7.5 bar (max 10 bar)

Table 11: Combustion plants operated on site (Source: Spar TANN, email 13-8-2014)

Both steam boilers have to be externally monitored every 3 years.

Table 12: Results of external monitoring from 30-10-2012, short term measurement (average of 3 measurements 30 min each) (Source: Spar TANN, email 13-8-2014)

Combustion plants – External monitoring 30-10-2012			
Pollutant	**Short term emission level – Steam boiler 1**	**Short time emission level – Steam Boiler 2**	**Emission limit value**
Dust (mg/Nm^3; 3% O_2)	< 3	≤ 4	30
NO_2 (mg/Nm^3; 3% O_2)	119	162	150
CO (mg/Nm^3; 3% O_2)	5	6	80

Note: Both oil firing combustion plants have already been replaced by new gas fired steam boilers (each 3.25 MW). Both show concentrations of CO between 0 and 1 mg/Nm^3 and NO_x below 100 mg/Nm^3. *(Source: Spar TANN, email 10-11-2014)*

The 5 largest energy consumers are:

- Hot smoking plant (steam, 10 bar)
- Cold smoke and maturing plants (steam, 10 bar)
- Refrigeration systems
- Meat-cutting machinery
- Energy demand (heat and electricity) for buildings

2.2.1.3 Waste management

Table 13: Process-specific types and amounts of waste 2013 (Source: Spar TANN, email 13-8-2014)

Waste management		
Type	**Amount**	**Treatment/Disposal**
Activated sludge	2,031 t	Wastewater treatment plant Villach
Flotation slurries	595 t	Wastewater treatment plant Villach
Meat wastes (Cat III)	400 t	External rendering plant
Coal ash	5.4 t	Certified waste disposal company
Commercial waste	348 t	authorised waste disposal company

2.2.1.4 Noise and Odour emissions

Table 14: Sources of noise and countermeasures (Source: Spar TANN, email 13-8-2014)

Noise	
Sources	Production process, cooling, ventilation systems
Measures to reduce noise pullution	Housings for all producten processes and machinery

Odour	
Sources	Wastewater treatment plant (flotation)
Measures to reduce odour emission	Housing, exhaust air is purified by the use of a biofilter

Table 15: Sources and measures against odour (Source: Spar TANN, email 13-8-2014)

2.2.1.5 Water and wastewater

Process wastewater is treated in a WWTP and directly discharged into the river Drau. The total volume of wastewater was 115,000 m^3 (2013).

The internal WWTP consists of: 2 rotary sieves (each max. 50 m^3/h), a flotation unit (max 100 m^3/h), an aerated reservoir, an activated sludge basin (675 m^3 and a rotary blower with 580 m^3 air per hour) and a final sludge flotation system (instead of a clarification basin).

Table 16: Emission limit values and monitoring frequency for the direct discharge of process wastewater (Source: Spar TANN, email 13-8-2014 and 29-8-2014)

Process wastewater						
Parameter	**Unit**	**ELV Permit**	**Self-monitoring – type of sample**	**External monitoring – type of sample**	**Self-monitoring – frequency**	**External monitoring – frequency**
Q (discharge)	m^3	600	stationary counter	stationary counter	continuous	2 days per year
T	°C	30	continuous	spot sample	-	2 days per year
pH		6.5-8.5	fpdcs	fpdcs	-	2 days per year
COD	mg/l	90	fpdcs	fpdcs	5 days a week	2 days per year
BOD_5	mg/l	20	fpdcs	fpdcs	min.1 per week	2 days per year
total N	mg/l	10	fpdcs	fpdcs	-	2 days per year
total P	mg/l	1	fpdcs	fpdcs	5 days a week	2 days per year
Low volatile lipophilic substances	mg/l	20	fpdcs	fpdcs	-	2 days per year
NH_4-N	mg/l	5	fpdcs	fpdcs	5 days a week	2 days per year
NO_3-N	mg/l	-	fpdcs	-	5 days a week	-
AOX	mg/l	0.1	fpdcs	fpdcs	-	2 days per year
Total suspended solids	mg/l	30	fpdcs	fpdcs	-	2 days per year
Sulphate	mg/l	-	fpdcs	-	-	2 days per year
Chloride	mg/l	-	fpdcs	-	-	2 days per year
Nitrite	mg/l	-	fpdcs	-	-	2 days per year
TOC	mg/l	-	fpdcs	-	-	2 days per year

fpdcs = flow proportional unsettled homogenised daily composite sample

Table 17: Results of external monitoring 2013 and 2014 for process wastewater (Source: Spar TANN, email 13-8-2014 and 29-8-2014)

External monitoring 2013/2014					
Parameter		**Daily average value (21-2-2013)**	**Daily average value (1-10-2013)**	**Daily average value (7-1-2014)**	**ELV**
Q (discharge)	m^3/d	324	471	464	600
T	°C	-	-	-	30
pH		7.33	7.81	7.71	6.5-8.5
Conductivity	µS	3,810	3,090	3,210	-
COD	mg/l	58	63	46	90
BOD	mg/l	6	6.3	4.2	20
total N	mg/l	3.3	2.4	2.4	10
total P	mg/l	0.36	0.51	0.53	1
Low volatile lipophilic substances	mg/l	2	3	< 2	20
NH_4-N	mg/l	1.00	0.14	0.14	5
AOX	mg/l	0.02	0.02	0.02	0.1
Total suspended solids	mg/l	20	12	4.5	30
Total Cl	mg/l	not verifiably	not verifiably	not verifiably	0.4
Chloride	mg/l	987	785	810	

The methods applied for external monitoring are in accordance with the general Ordinance on wastewater discharges and the Ordinance on wastewater emissions from the meat industry.

Table 18: Specific loads based on the results of the external monitoring from 2013 and 2014 (Source: own calculation, Spar TANN, email 29-8-2014)

External monitoring 2013/2014 – specific loads				
Parameter	**Unit**	**Based on external monitoring from 21-2-2013**	**Based on external monitoring from 1-10-2013**	**Based on external monitoring from 7-1-2014**
Influent				
Q inlet	m³/d	374	471	464
COD inlet	mg/l	2,873	1,620	2,205
	kg/d	1074.502	763.02	1,023.12
BOD_5 inlet	mg/l	1,482	436	1,025
	kg/d	554.268	205.356	475.6
N inlet	mg/l	162.3	159.5	63.4
	kg/d	60.7002	75.1245	29.4176
P inlet	mg/l	81.4	42.4	35.5
	kg/d	30.4436	19.9704	16.472
Effluent				
Q discharge	m³/d	324[1)]	471	464
COD discharge	mg/l	58	63	46
	kg/d	18.792	29.673	21.344

External monitoring 2013/2014 – specific loads				
Parameter	**Unit**	**Based on external monitoring from 21-2-2013**	**Based on external monitoring from 1-10-2013**	**Based on external monitoring from 7-1-2014**
BOD_5 discharge	mg/l	6	6.3	4.2
	kg/d	1.944	2.9673	1.9488
N discharge	mg/l	3.3	2.4	2.4
	kg/d	1.0692	1.1304	1.1136
P discharge	mg/l	0.36	0.51	0.53
	kg/d	0.11664	0.24021	0.24592
Removal efficiency				
COD	%	98.0	96.1	97.9
BOD	%	99.6	98.6	99.6
total N	%	98.0	98.5	96.2
total P	%	99.6	98.8	98.5
Quantities of products	t/d	57.5	56.0	56.2
Influent				
Q (specific wastewater)	l/kg	6.5[1)]	8.4	8.3
COD per ton of product	kg/t	18.7	13.6	18.2
BOD_5 per ton of product	kg/t	25.8	7.8	18.3
total N per ton of product	kg/t	0.16	0.16	0.06
total P per ton of product	kg/t	0.08	0.04	0.04
Effluent				
Q (specific wastewater)	l/kg	5.6[1)]	8.4	8.3
COD per ton of product	kg/t	0.3	0.5	0.4
BOD_5 per ton of product	kg/t	0.10	0.11	0.07
N per ton of product	kg/t	0.02	0.02	0.02
P per ton of product	kg/t	0.002	0.004	0.004

1) the inlet was 50m³ higher than the discharged wastewater volume

Table 19: Excerpt of the results from self-monitoring January to June 2013 (Source: own calculation, Spar TANN, email 10-11-2014)

Self-monitoring – first half of 2013 (excerpt)				
Parameter	**Unit**	**Daily average max**	**Daily average min**	**ELV**
COD	mg/l	90	17	90
total P	mg/l	1.40[1)]	0.07	1
NH_4-N	mg/l	4.77	0.20	5
BOD	mg/l	16[2)]	3[2)]	20

1) 3 out of ~130 measurements exceeded the ELV (5 measurements per week)

2) based on 28 BOD_5 measurements

The daily average (fpdcs) of TOC during 2013 was 15.8 mg/l and 59.7 mg/l for COD. (Source: Spar TANN, email 13-8-2014)

Due to production expansions it is planned to extend the WWTP (by introducing a 1,000 m³ activated sludge basin and other measures) at the end of 2014 as some measuements exceeded the ELVs in the 2nd half of 2013. (*Source: Spar TANN, email 10-11-2014)*

2.2.2 Hochreiter Fleischwaren, 4190 Bad Leonfelden

2.2.2.1 General description

Table 20: General description (Wasserbuch: HOCHREITER 2014 and BH Urfahr-Umgebung, written information 28-7-2014)

Name of the installation	**Hochreiter Fleischwaren GmbH, Kommunestraße 1, 4190 Bad Leonfelden**
IPPC activity	6.4 (b) (meat products)
Capacity	140 t/d
Products	"Extra" sausage (Austrias most popular type of scalded cold cut sausage), salami, ham, dumplings and lasagne.
Operating hours	Monday to Saturday 04:00-22:00 h
Description	Hochreiter – a family business still – has been producing meat products since 1948. Hochreiter exports not only to various European countries (such as Germany, Spain, Italy, United Kingdom, Hungary, Czech Republic and Poland) but also overseas and Russia. Exports currently account for 85%. (HOCHREITER 2014 and BH Urfahr-Umgebung, mail 28-7-2014)

Production process

The production process includes cutting, cooking, fermentation, smoking and brining/curing/picking to produce the different products. Hochreiter also operates a refrigerated warehouse, a packaging area and several washing areas. (Source: BH Urfahr-Umgebung, written information 28-7-2014)

2.2.2.2 Waste management

- Meat waste is disposed of through an external service provider.
- Packaging materials are only used if mandatory under the relevant laws and regulations.
- Reusable pallets are used.

The amount of residual waste was reduced from 240 to 204 tons between 2008 and 2009 (minus 15%) despite increasing production. *(Source: BH Urfahr-Umgebung, mail 28-7-2014)*

2.2.2.3 Noise emissions

Table 21: Sources of noise emission and countermeasures (Source: BH Urfahr-Umgebung, written information 28-7-2014)

Noise	
Sources	Truck loading station
Measures to reduce noise pullution	Route selection, external noise measurements (maximum ambient sound level: 40 dB)

2.2.2.4 Water and wastewater

Table 22: Summary of wastewater streams (Source: BH Urfahr-Umgebung, written information 28-7-2014)

Summary of wastewater streams	
Partial wastewater streams	Process wastewater: internal treatment via mechanical cleaning (rotary sieve), flotation and neutralisation in a buffer tank followed by indirect discharge into public sewage system Surface and rain water are treated separately Sanitary wastewater is discharged indirectly without pre-treatment
Description of external WWTP	The process conducted at the external wastewater treatment plant of Bad Leonfelden consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a maximum of 10,000 population equivalents (EW, equates to about 1,000 kg/d COD of which a maximum of 320 kg/d comes from the IPPC installation Hochreiter Fleischwaren). The treated wastewater is discharged into the river Große Rodl. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 23: Emission limit values for the indirect discharge of process wastewater into the sewage systems (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

Process wastewater				
Parameter	**Permit**	**Type of sample (self- and external monitoring)**	**Self-monitoring – frequency**	**External monitoring – frequency**
Q (wastewater quantities)	290 m^3/d, 35 m^3/h	MID (magnetically inductive flowmeter)	continuous	daily during 1 working week per year
COD load	320 kg/d 260 kg/d[1)]	fpdcs	1 per week	daily during 1 working week per year
Total suspended solids	800 mg/l	spot sample	-	daily during 1 working week per year
Settleable substances	10 ml/l	spot sample	-	daily during 1 working week per year
AOX	1.0 mg/ml	fpdcs	-	daily during 1 working week per year
pH	6.0-9.5	spot sample	continuous	daily during 1 working week per year
T	35 °C	spot sample	continuous	daily during 1 working week per year
Total Cl	0.4 mg/l	spot sample	-	daily during 1 working week per year
Low volatile lipophilic substances	150 mg/l	fpdcs	-	daily during 1 working week per year
total P[2)]	5 kg/d[1)]	fpdcs	-	daily during 1 working week per year
total N[2)]	20 kg/d[1)]	fpdcs		daily during 1 working week per year

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] weekly average

[2)] requirement as specified in the contract for indirect discharges with the external WWTP

Methods for sampling and analysis are applied according to the general Ordinance on wastewater discharges and the Ordinance on wastewater emissions from the meat industry. (*source: BH Urfahr-Umgebung, mail 28-7-2014)*

Pretreated wastewater is discharged into the municipal sewer system of Bad Leonfelden. *(WB HOCHREITER FLEISCHWAREN)*

Table 24: Methods applied for the analysis of external monitoring of process wastewater – 2012 and 2013 (source: BH Urfahr-Umgebung, written information 28-7-2014)

Methods for analysis (external monitoring)	
Parameter	**Methods applied for external monitoring**
wastewater quantities	**(stationary MID)**
COD load	ÖN M 6265
BOD_5 load	ÖN EN 1899-1
P load	ÖN EN ISO 6878
N load	ÖN EN 12260
Total suspended solids	DIN 38409-H2
Settleable substances	ÖN M 6271
AOX	ÖN EN ISO 9562
pH	DIN 38404-C5
T	ÖN M 6616
Total Cl	ÖN EN ISO 7393
Low volatile lipophilic substances	DIN 38409-H56

External Monitoring 2012

Table 25: Summary of the results from external monitoring 2012 of discharged process wastewater (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

External Monitoring 2012 (May 8-22, 2012)					
Parameter		**Daily average max**	**Daily average min**1)	**Average of 2 weeks**1)	**ELV**
Wastewater quantities	m³/d	308	198	259	290
COD load2)	kg/d	375	184	272	320 and 260 an a weekly average
BOD_5 load2)	kg/d	209	100	150	-
P load2)	kg/d	4.68	2.22	3.26	53)
N load2)	kg/d	13.1	6.36	9.3	203)
Total suspended solids4)	mg/l	270	160	210	800
Settleable substances4)	ml/l	4	1.5	2.4	10
AOX2)	mg/l	0.12	0.05	0.10	1.0
pH4)		9.4	6.4	8.3	6.0-9.5
T4)	°C	30.1	26.2	27.7	35
Total Cl4)	mg/l	< 0.1	< 0.1	< 0.1	0.4
Low volatile lipophilic substances2)	mg/l	139	42	85	150

1) based on 9 production days with normal production capacity

2) in 2012 nine representative flow proportional unsettled homogenised daily composite samples were taken

3 weekly average

4) based on 6 spot samples

Exceedance of COD loads (2 times) and wastewater quantity (1 day) was recorded and explained with the start-up of a new production line.

Table 26: Production figures between 8 and 22 May 2012 (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

Production figures from 8 to 22-5-2012		
Product type	**Total over 10 days**	**Daily average**
Sausage, ham, salami	966 t	96.6 t
Dumplings (sweet and savoury)	102 t	10.2 t
Lasagne	33 t	3.3 t
Total	**1,101 t**	**110 t**

According to the measurement report, the results of self-monitoring show sufficient accuracy.

External Monitoring 2013

Table 27: Summary of the results from external monitoring for 2013 (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

External Monitoring 2013 (September 23-30, 2013)					
Parameter		**Daily average max**	**Daily average min[1)]**	**Weekly average[1)]**	**ELV**
Q (wastewater quantities)	m³/d	274	186	238	290 and 260 an a weekly average
COD load[2)]	kg/d	320	182	258	320
BOD_5 load[2)]	kg/d	178	96.7	141	-
P load[2)]	kg/d	4.97	2.29	3.5	5[4)]
N load[2)]	kg/d	12.8	7.62	9.8	20[4)]
Total suspended solids[3)]	mg/l	780	250	487	800
Settleable substances[3)]	ml/l	3	0.2	2.1	10
AOX[2)]	mg/l	0.21	0.07	0.1	1.0
pH[3)]		9.3	7.4	8.6	6.0-9.5
T[3)]	°C	28.6	27.8	28.2	35
Total Cl[3)]	mg/l	< 0.1	< 0.1	< 0.1	0.4
Low volatile lipophilic substances[2)]	mg/l	130	41	74	150

1) based on 5 production days with normal production capacity

2) in 2013 five representative flow proportional unsettled homogenised daily composite samples were taken

3) based on 3 spot samples

4) weekly average

The results from external monitoring for 2013 show that in general, the ELVs are complied with.

Table 28: Production figures between 23 and 30 September 2013 (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

Production figures from 23 to 30-9-2013		
Product type	**Total over 6 days**	**Daily average**
Sausage, ham, salami	521.9	87.0
Lasagne	26.5	4.4
Total	548.4	91.4

According to the measurement report, the results of self-monitoring show sufficient accuracy.

Specific wastewater loads 2012 and 2013

Table 29: Specific loads per ton of final product in process wastewater discharged between 23 and 30 September 2013 and between 8 and 22 May 2012 – own calculation based on external monitoring in 2012 and 2013 (Source: Measurement report, BH Urfahr-Umgebung, written information 28-7-2014)

Specific loads per ton of final product			
Parameter	**Unit**	**2012**	**2013**
Specific wastewater	m³/t	2.35	2.60
COD per ton of product	kg/t	2.47	2.82
BOD_5 per ton of product	kg/t	1.36	1.55
total N per ton of product	kg/t	0.084	0.108
total P per ton of product	kg/t	0.030	0.038

2.2.3 Landhof, 4020 Linz

2.2.3.1 General description

Table 30: General description (Source: Landhof, Homepage and email 8-9-2014)

Name of the installation	**Landhof GmbH & Co, Lederergasse 59, 4020 Linz**
IPPC activity	6.4 (b) (meat products)
Capacity	>70 t/d
Products	Sausages, ham, canned food, barbecue and other meat products as well as a range of meatless products
Description	Landhof has a production area of approximately 22,000 m² where 160 tonnes of sausages, grill specialities and hams are produced per day by 595 employees. The annual turnover was 190 million Euros in the year 2012. The most important export markets are Germany, Hungary, Czech Republic, Slovakia, Italy, Sweden, Spain and Portugal (export share 2012: 18.9%). (LANDHOF 2014)

2.2.3.2 Energy generation and use

Table 31: Energy procurement 2013 (Source: Landhof, email 8-9-2014)

Energy procurement	
Electrical power (external)	9.676 GWh
Consumption of natural gas	1,889,000 m³
Main energy consumers	Machinery, cooling (3.225 GWh), steam boilers, lighting

Table 32: Combustion plants operated on site (Source: Landhof, email 8-9-2014)

Combustion plants	**Steam boiler 1**	**Steam boiler 2**
Type	**gas fired boiler**	**gas fired boiler**
Rated thermal input (MW)	2.5	3.1
Start of operation	1999	2004
Fuel	Natural gas	Natural gas
Flue gas cleaning	-	-
Flue gas temperature (°C)	117	116
Operating hours (h/a)	ca. 6,000	ca. 6,000
Energy recovery	Economiser (for preparation of hot water and feed water pre heating)	Economiser (for preparation of hot water and feed water pre heating)
Steam production (t/h)	6	6
Steam parameter (p, T)	7.2 bar	7.2 bar

Table 33: Results of external monitoring for both steam boilers operated on site (expressed as half hour average value), (Source: Landhof, email 8-9-2014)

External monitoring 2013				
Pollutant	**Steam boiler 1 (half hour average)**	**Steam boiler 2 (half hour average)**	**External monitoring – frequency**	**ELV (Steam boiler 1 and 2)**
Dust (mg/Nm^3; 3% O_2)	< 3 mg/m³	< 3 mg/m³	1 per year	5
NO_x (mg/Nm^3; 3% O_2)	109	89	1 per year	100
CO (mg/Nm^3; 3% O_2)	5	5	1 per year	80

2.2.3.3 Waste management

Table 34: Type and amount of waste 2013 (Source: Landhof, email 8-9-2014):

Waste management 2013			
Type	**Source**	**Amount**	**Treatment/Disposal**
Commercial waste		525 t	Licensed waste disposal company (waste incineration)
Biowaste	smoke house	29 t	Licensed waste disposal company (waste incineration)
Cardboard packages		84 t	Licensed waste disposal company (recycling)
Plastics and Paper	packaging	74 t	Licensed waste disposal company (waste incineration)
Scrap metal		10 t	Licensed waste disposal company (recycling)
Meat waste	production	149 t	Licensed waste disposal company
Sludge from WWTP	Wastewater treatment	unknown	External biogas plant

2.2.3.4 Noise and odour emissions

Noise

According to Landhof there are no relevant noise emmissions.

Odour

Table 35: Sources of odour and odour emission control measures (Source: Landhof, email 8-9-2014)

Odour	
Sources	Sewage discharge, production (waste)
Measures to reduce odour emissions	Cooling, housing, exhaust air filter

2.2.3.5 Water and wastewater

Table 36: Summary of wastewater streams (Source: Landhof, email 8-9-2014, Wasserbuch Landhof):

Water and wastewater	
Water consumption	136,500 m³/y (2013)
Partial wastewater streams	Process wastewater is discharged indirectly into the municipal sewer system of Linz after an internal wastewater treatment process including dissolved air flotation, a sieving plant and neutralisation Surface water from a truck cleaning place is sent to an oil separator and discharged into the public sewer system after neutralisation A completely separated rain water seepage draining system is in place (max. allowed quantity: 167 l/s)
Description of external WWTP	The process at the external wastewater treatment plant Asten (Linz-Land) includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal, with a treatment capacity of 950,000 population equivalents. The treated, wastewater is discharged into the river Danube. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 37: Emission limit values and minimal frequencies for self- and external monitoring of process wastewater (Source: Landhof, email 8-9-2014, Wasserbuch Landhof)

Process wastewater				
Parameter	**Unit**	**ELV – daily average**	**External monitoring – type of sample**	**Min. frequency for external monitoring (permit)**
Q (wastewater quantities)		520 m³/d, 450 m³/d (in a 85-percentile)[1)] 70 m³/h, 19.4 l/s	Spot sample	representative 5 cons. days
Load of total suspended solids	kg/d	520[2)]	Spot sample	representative 5 cons. days
Load of total Cl		208 g/d, 416 g/week[2)]	Spot sample	representative 5 cons. days
Load of low volatile lipophilic substances	kg/d	78	fpdcs	representative 5 cons. days

Process wastewater				
Parameter	**Unit**	**ELV – daily average**	**External monitoring – type of sample**	**Min. frequency for external monitoring (permit)**
Load for AOX		520 g/d, 1.04 kg/week	fpdcs	representative 5 cons. days
AOX	mg/l	1.0[1)]	fpdcs	representative 5 cons. days
Low volatile lipophilic substances	mg/l	150[1)]	fpdcs	representative 5 cons. days
pH		6.0-9.5[3)]	Spot sample	representative 5 cons. days
T	°C	35[3)]	Spot sample	representative 5 cons. days
Total suspended solids	mg/l	1,000[1), 2)]	Spot sample	representative 5 cons. days
Total Cl	mg/l	0.4[1), 2)]	Spot sample	representative 5 cons. days

[1)] as specified in a contract with the external WWTP

[2)] spot sample

[3)] continuous measurement

fpdcs = flow proportional unsettled homogenised daily composite sample

The wastewater quantity (by MID), T and the pH-value are measured continuously by self-monitoring.

Table 38: Methods applied for the analysis of external monitoring of process wastewater – 2012 and 2013 (source: BH Urfahr-Umgebung, written information 28-7-2014)

Parameter	**Applied methods for external monitoring**
Wastewater quantities	(stationary MID)
Total suspended solids	DIN 38409-H2
Total Cl	ÖN EN ISO 7393
Low volatile lipophilic substances	DIN 38409-H56
AOX	ÖN EN ISO 9562
pH	DIN 38404-C5
T	ÖN M 6616

Table 39: Summary of the results from external monitoring 2013: indirect discharges of process wastewater (Source: Landhof, email 8-9-2014)

External Monitoring 2013 (fpdcs from November 22-28, spot samples from November 22-26, 2013)					
Parameter		**Daily average min[1)]**	**Daily average max[1)]**	**Average[1)]**	**ELV (daily average)**
Q (wastewater quantities)	m³/d	404[2)]	440	376	520[3)]
	m³/h	13	32	22	70[3)]
Load of total suspended solids[4)]	kg/d	58	141	116	520[4)]

External Monitoring 2013 (fpdcs from November 22-28, spot samples from November 22-26, 2013)					
Parameter		**Daily average min[1)]**	**Daily average max[1)]**	**Average[1)]**	**ELV (daily average)**
Load of total Cl[4)]	g/d	<31.8	<31.8	<31.8	208[4)]
	g/week	-	-	<191	416[4)]
Load of low volatile lipophilic substances	kg/d	11.5	41	26.0	78
Load of AOX	g/d	20.2	27.9	22.4	520
	g/week	-	-	< 110	1,040
AOX[5)]	mg/l	0.05	0.14	0.07	1.0
Low volatile lipophilic substances[5)]	mg/l	42	96	67.4	150
pH	mg/l	9.2	9.5	9.3	6.0-9.5[3)]
T	°C	25	27.3	25.9	35[3)]
Total suspended solids[4), 5)]	mg/l	184	444	365	1,000[4)]
Total Cl[4), 5)]	mg/l	<0.1	<0.1	<0.1	0.4[4)]

[1)] *based on 5 representative working days*

[2)] *based on 4 representative working days*

[3)] *continuous measurement*

[4)] *spot sample*

[5)] *as specified in a contract with the external WWTP*

All values measured under the external monitoring programme 2013 are in accordance with the permit conditions and the contract agreed with the external WWTP.

2.3 Dairies

Milk processing

Most dairy products in Austria are produced from cow's milk. Practically all dairy products are energy-intensive food products: Milk has to be cooled down quickly during or shortly after the milking process. Processing starts with a centrifugation step to remove impurities. Another centrifugation process is used to separate milk into skimmed (or semi-skimmed) milk and cream.

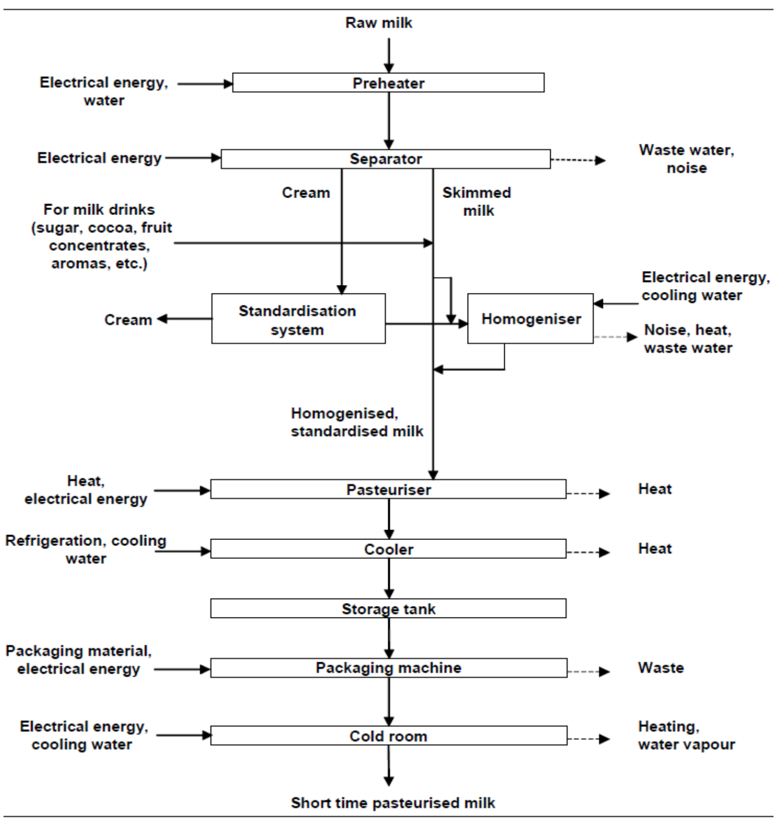
Further processing includes homogenisation and various heat treatments like pasteurisation or sterilisation (see Figure 1).

The production of powdered milk or condensed milk consumes additional energy.

Typically, the pasteurisation of milk takes place at 72 °C for 15 seconds and a plate heat exchanger is used (flash pasteurisation or high-temperature short-time (HTST) processing). Following pasteurisation, the milk is immediately cooled back to <7 °C. UHT (ultra-heat treated) milk is heated up to 135 °C for a very short period of time (1-2 seconds) which kills all living bacteria and spores in the milk. This can either be done indirectly, using heat-exchangers, or directly by mixing steam and preheated (80 °C) milk. The shelf life of UHT-milk is extended (at least 6 months). Sterilised milk can be produced from UHT-milk by additional heat treatment in an autoclave at approximately 110-125 °C for 20-40 minutes.

Figure 1: Short time milk pasteurisation process.

Short time milk pasteurisation process



Source: EUROPEAN COMMISSION (2006, p.80)

Even more energy is needed for the production of condensed milk as well as milk powder. For condensed milk up to 60% of the water is removed by evaporators and/or semi-permeable membranes. After packing in tins or bottles an additional sterilisation step is needed. Milk powder can be produced like condensed milk but with additional heat treatment using spray or drum drying which results in a water content of no more than 4%.

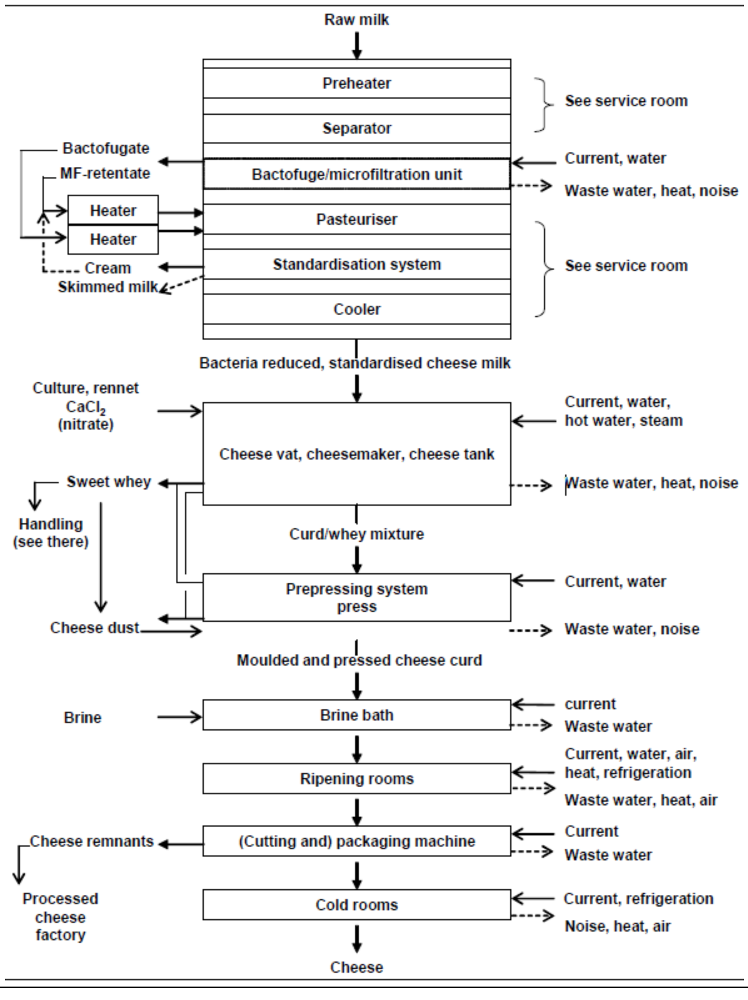
Countless other dairy products such as cream, cheese and butter are produced from milk. Almost all of them require several heating and cooling processes, resulting in high energy consumption. Most processes also generate considerable volumes of wastewater with a high content of organic substances. (EUROPEAN COMMISSION 2006, ULLMANN 2007)

Cheesemaking

There is a wide range of cheese varieties which can be classified according to several criteria: source of milk (in Austria mainly cow's milk), kind of milk coagulation (e.g. casein or lactic acid), consistency (extra-hard to soft, depending on moisture as reported on a fat-free basis), fat content (from >60% for a high fat content to <10% for low-fat cheese), ripening (with or without white or blue mould, uncured or cured, with or without rind etc.), and potential use (e.g. grating, cutting, meltable cheese). However, some production steps are always more or less the same: production of a coagulum, separation and manipulation of the curds to produce the desired type of cheese. Today's manufacture of cheese is highly mechanised (Figure 2):

Figure 2: Manufacture of cheese.

Manufacture of cheese



Source: EUROPEAN COMMISSION (2006, p.86) umweltbundesamt

Quite similar to the dairy sector, the energy demand for cooling and heating is high. Also, big amounts of wastewater with a high COD load are released. A special case is the high concentration of salt which is needed for some types of cheese. Also, solid curd waste and small pieces of cheese may be found in the wastewater. The solid output is 1 to 20 kg per metric tonne. (EUROPEAN COMMISSION 2006, ULLMANN 2007)

2.3.1 SalzburgMilch, 5020 Salzburg

2.3.1.1 General description

Table 40: General description (Source: Mag. Salzburg, email 2-7-2014; and http://www.milch.com/de/unternehmen/facts/)

Name of the installation	**SalzburgMilch GmbH, Milchstraße 1, 5020 Salzburg**
IPPC activity	6.4 (c)
Capacity	250,000 t milk/y, 500 t milk per day
Processed/delivered Milk	160,000 t/y (2011); 214,000 t/y (2013)
Products	600 Articles; whole range of milk products, including products from organic farming and ESL products: Milk, ESL milk[1)], curd cheese, butter, sour cream, whipping cream, crème fraiche, sour milk drinks, yogurt, fruit yogurt etc.
Operating hours	continuous (2- or 3 shifts depending on the season)
Raw materials	Milk, whey, sugar, fruit preparations
Auxiliary materials	cleaning agents (nitric acid, sodium hydroxide solution and peracetic acid in the CIP plant); for cooling water preparation: "OptiDOS 39D" (caustic biocide) and "OptiDOS C747" (caustic stabilising agent)
Recent developments	2007: construction of a new cold storage facility (fully automated high bay warehouse); new NH_3 refrigeration plant

[1)] *Extended Shelf Life milk*

Production process

Production processes include:

a. Delivery – inspection/approval pumping into collection tanks including cooling and air separation (there are separate tanks for "conventional" milk and milk from organic farming, as well as "NOP" milk (US standard referring to the US National Organic Program)),

b. separation into skimmed milk and cream from raw milk via centrifuges,

c. adjustment of the fat content of the skimmed milk with cream for further processing, namely:

   fresh, ESL (extended shelf-life) and UHT milk:

   - different types of heat treatment,
   - homogenisation using pressure nozzles

   butter, cream and sour cream:

   - heat treatment of cream (pasteurisation) followed by one of the following:
   - dispatch to an external butter-production plant,
   - production of curd cheese,
   - direct marketing as coffee cream or whipping cream,
   - fermentation to produce sour cream or crème fraiche

   curdled milk products and natural as well as fruit yoghurt:

   - inoculation with specific lactic acid bacteria and addition of aromatic ingredients to optimise the flavour of the finished product

   All products are packed and dispatched or sold directly.

2.3.1.2 Energy generation and use

Table 41: Combustion plants operated on site (Source: Mag. Salzburg, email 2-7-2014 and oral information 30-9-2014)

Combustion plants 2011		
	Steam boiler 1	**Steam boiler 2**
Type of combustion plant	steam boiler (used as reserve plant)	Steam boiler
Rated thermal Input (MW)	2.2	4.3
Start of operation	1995	2005
Fuel	natural gas	natural gas
Emission limit value		
Dust (mg/Nm^3; 3% O_2)	-	5
NO_x (mg/Nm^3; 3% O_2)	125	100
CO (mg/Nm^3; 3% O_2)	80	80

Cooling

A refrigerator based on ammonia has been in place since 2008 for cold storage rooms and the ice water installations. The cooling capacity is 2,600 kW. The unit has been designed for up to 5,000 kg of R717 (ammonia) but currently only 3,000 kg are used.

2.3.1.3 Water and wastewater

Table 42: Summary of wastewater streams (Source: Mag. Salzburg, email 2-7-2014)

Water and wastewater	
Partial wastewater streams	Process wastewater: internal treatment via neutralisation; indirect discharge into public sewage system Surface water: oil-separation (20 m^3/d; TOC max. 10 mg/l and 200 g/d) Cooling water: discharge into Salzach (400 m^3/d; T max: 30 °C; delta T: max 10 °C) Other minor wastewater streams (e.g. from boiler feedwater treatment) are separated from the process wastewater and individually monitored (each less than 20 m^3/d).
Descripton of external WWTP	The process at the external wastewater treatment plant ARA Siggerwiesen next to the city of Salzburg includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capacity of 680,000 population equivalents (EW_{60}, ~40,800 kg/d BOD_5 of which a maximum of 1,560 kg/d comes from SalzburgMilch). The treated wastewater is discharges into the river Salzach. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 43: Emission limit values and minimal frequencies for self- and external monitoring of process wastewater (Source: Mag. Salzburg, email 2-7-2014)

Process wastewater					
Parameter	**Unit**	**ELV Permit /Contract[1)]**	**Self-monitoring – type of sample**	**Self-monitoring – frequency**	**External monitoring – frequency**
Q (discharge)	m^3/d	650/750	continuous	daily	4 per year
Conductivity					4 per year
T	°C	35	spot sample	daily[2)]	4 per year[3)]
pH		6.5-9.5	continuous	daily[2)]	4 per year[3)]
COD load	kg/d	2,600/3,000	fpdcs	daily	4 per year[4)]
BOD_5 load	kg/d	1,560/1,875	-	-	4 per year[4)]

Process wastewater					
Parameter	**Unit**	**ELV Permit /Contract[1)]**	**Self-monitoring – type of sample**	**Self-monitoring – frequency**	**External monitoring – frequency**
total N load	kg/d	80/165	-	-	4 per year[4)]
total P load	kg/d	10/45	fpdcs	every 14 days	4 per year[4)]
Separable lipophilic substances	mg/l	100	fpdcs	-	4 per year[4)]
Settleable substances	ml/l	10	fpdcs	daily	4 per year[3)]
NH_4-N	mg/l		fpdcs	every 14 days	4 per year[4)]
Total Cl	mg/l	0.4	-	-	4 per year[3)]
AOX	mg/l	0.5	-	-	4 per year[4)]
Chloride	mg/l		-	-	4 per year
Sulfate	mg/l	200	-	-	4 per year

fpdcs = flow proportional unsettled homogenised daily composite sample

1) the contract with the external WWTP specifies a max. volume of 750 m^3/d, higher values for COD, BOD, tot-P, tot-N and a limit value for sulphate of 200 mg/l

2) requirement as specified in the contract for the indirect discharge

3) spot sample

4) flow proportional unsettled homogenised daily composite sample

Permit conditions for external monitoring: Methods for sampling and analysis according to Annex C of the general Ordinance on wastewater discharges

Table 44: Methods applied for the analysis of external monitoring of process wastewater (Source: DI Hofeneder, oral information)

Methods for analysis – External monitoring	
Parameter	**Method**
Volume	MID (magnetically inductive flowmeter)
Temperature	ÖNORM M 6616
pH	ÖNORM M 6244
COD	ÖNORM M 6265
BOD	ÖNORM M 6277
Ammonium (as N)	ÖNORM ISO 7150-1
Total Kjeldahl N (as N)	ÖNORM EN 25663
total P (as P)	ÖN EN ISO 6878
Low volatile lipophilic substances	DIN 38409 - H17
Settleable substances (2 hours)	ÖNORM M 6271
Chloride (as Cl)	ÖN EN ISO 10304-1
Total chlorine (as Cl_2)	rapid test (DPD)
AOX	EN ISO 9562
Sulfate (as SO_4)	ÖN EN ISO 10304-1
Conductivity	-

Table 45: Summary of the results from self-monitoring 2013 (Source: Measurement report, DI Hofeneder Wasser & Bau Consulting GmbH, email 7-7-2014)

Process wastewater – Self-monitoring 2013								
Parameter		**Daily average lower range[1)]**	**Daily average higher range[2)]**	**Monthly average min**	**Monthly average max**	**Annual average**	**ELV (daily average – Permit)**
Q (discharge)	m³/d	270-370	620-690	463	538	510	650/750[3)]
pH[4)]		> 6.2	< 10.4	7.4	9.5	8.9	6,5-9,5
COD load	kg/d	950-1,300	2,100-2,440	1,653	2,032	1,792	2,600
Separable lipophilic substances	mg/l	1	15[5)]	1	7.7	2.6	100

[1)] *a lower range usually refers to days with low or no production*

[2)] *excluding one day (21-2-2013) where emitted loads were higher than ELVs*

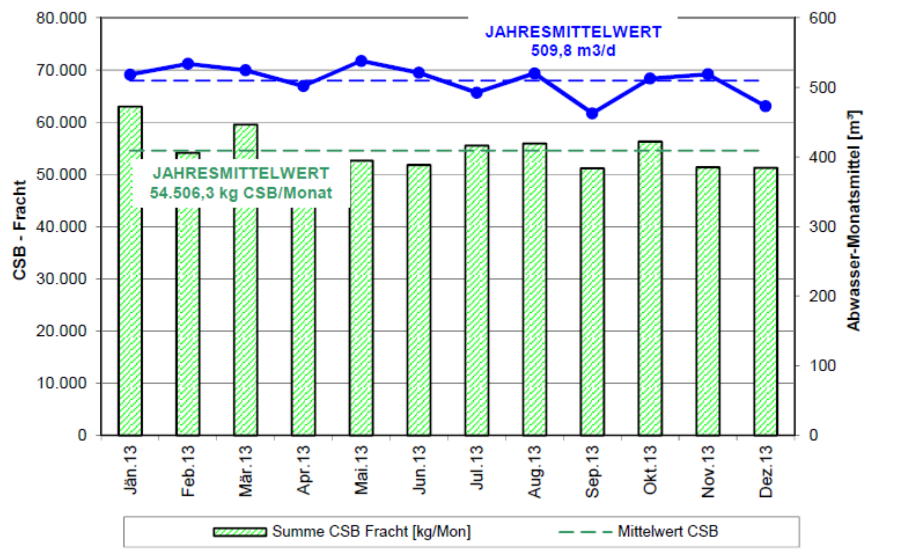
[3)] *the contract with the external WWTP specifies a max. volume of 750 m³/d*

[4)] *continuously measured pH values show short term variations (6.0-10.5) due to cleaning operations*

[5)] *concentrations of >10-15 mg/l were reported only in the first 6 weeks of 2013; from 12-2-2013 onwards levels were at 5 mg/l and below*

Figure 3: Summary of COD loads and wastewater volumes from self-monitoring (Source: Measurement report, DI Hofeneder Wasser & Bau Consulting GmbH, email 7-7-2014)

CSB loads and wastewater volumes from self-monitoring



Source: Measurement report, DI Hofeneder Wasser & Bau Consulting umweltbundesamt

Data from self-monitoring show that highest loads occurred in January 2013 with an average of 2,033 kg COD per day. The average yearly COD load was 1,792 kg/d and the wastewater volume 509.8 m³/d (Total for 2013: wastewater volume: 186.036 m³; COD: 654,076 kg).

On 21-2-2013, the ELVs for wastewater volume (775 m³ per day) and COD (2.673,8 kg per day) were exceeded. Whether this was caused by a malfunction or heavy precipitation is not known. However, when applying the "four out of five" rule, it was found that compliance with the ELVs for wastewater discharges had been achieved.

Some short-term pH variations have been recorded which were outside the permitted range of 6.5-9.5 and had been caused by cleaning operations. These variations are not considered cases of non-compliance as their duration was short and the extent low (”four out of five“ rule).

Each of the other pollutants measured was below the ELVs during the whole year 2013.

Table 46: Results of external monitoring 2013 (Source: Measurement report, DI Hofeneder Wasser & Bau Consulting GmbH, email 7-7-2014)

Process wastewater – External Monitoring 2013 (daily average)						
Parameter		**20-02-2013**	**11-06-2013[1)]**	**24-09-2013**	**04-12-2013**	**ELV[2)]**
Q (discharge)[3)]	m³/d	567	566	380	507	650/750
Settleable substances[4)]	ml/l	10.0	10.0	10.0	10.0	10
Chloride[4)]	mg/l	1,620	316	38	568	-
Total Cl[4)]	mg/l	< 0.1	< 0.1	< 0.1	< 0.1	0.4
COD[5)]	mg/l	3,320	3,780	1,730	2,980	4,000[6)]
COD load[5)]	kg/d	1,882	2,139	657	1,511	2,600/3,000
BOD_5[5)]	mg/l	1,860	2,060	924	1,570	2,400/2,500[6)]
total N[5)]	mg/l	141.0	234.0	84.6	103	123/220[6)]
total P[5)]	mg/l	32.9	31.1	19.4	29.9	15/60[6)]
Separable lipophilic substances[5)]	mg/l	< 10	6	7	10	100
AOX[5)]	mg/l	< 0.01	0.62	0.026	0.079	0.5
Sulphate[5)]	mg/l	22.60	13.80	9.40	28.0	200
Milk processed	t/d	191.94	351.33	351.33	297.20	

1) not representative due to a malfunction in the installation including an unplanned emptying of the neutralisation tank

2) the contract with the external WWTP specifies a max. volume of 750 m^3/d, higher values for COD, BOD, tot-P, tot-N and a limit value for sulphate of 200 mg/l

3) continuous measurement

4) spot sample

5) daily average value (fpdcs)

6) calculated value based on limit values for load and wastewater volume by DI Hofeneder Wasser& Bau Consulting GmbH

Sampling for external monitoring is performed by using the stationary sampling unit (fpdcs). Data from external monitoring show general ELV compliance (except for the sample taken on 11-6-2013)

Table 47: Specific loads, calculations based on the results of monitoring 2013 (own calculation)

Specific loads 2013				
Data basis: 3 representative daily average samples 2013[1)]			**Self-monitoring – whole year[2)]**	
Parameter	**Unit**	**Value**	**Unit**	**Value**
Q	m³/d	485	m³/y	186,036
COD load	kg/d	1,350	kg/y	654,076
N load	kg/d	53		
P load	kg/d	13		
Milk processed	t/d	280	t/y	214,000
Specific wastewater	l/l	1.70	l/l	0.85
COD per ton of milk	kg/t	4.82	kg/t	3.06
total N per ton of milk	kg/t	0.19		
total P per ton of milk	kg/t	0.05		

[1)] *production during the external monitoring campaigns was significantly lower (280 t/d) than for the rest of the year (586 t/d)*

[2)] *based on fpdcs*

Table 48: External monitoring frequency and pollution parameters of other wastewater streams (Source: Measurement report, DI Hofeneder Wasser & Bau Consulting GmbH, email 7-7-2014)

External monitoring frequencies of other wastewater streams			
Oil separator	**Refrigeration systems**	**Feedwater treatment (boiler)**	**Desalination (boiler circuit)**
TOC, COD: 1 per year	AOX, TOC, pH: 4 per year	AOX, Zn: 4 per year	AOX, free Cl, pH: 4 per year

2.3.2 Salzburg Milch, 5112 Lamprechtshausen

2.3.2.1 General description

Table 49: General description (Sourctae: BH Salzburg-Umgebung, email 2-6-2014)

Name of the installation	**Salzburg Milch GmbH, Käsereistraße 1, 5112 Lamprechtshausen**
IPPC activity	6.4 (c) (cheesemaking)
Products	Main products are semi-soft and hard cheese (projected: 12,000-15,000 t per year)
Capacity	After extension: 330 t milk per day (161,000 t/a)
Processed Milk	Start of operation: 2014
Operating hours	Multi-shift operation, 7 days per week
Raw materials (projected)	161,000 t milk, 140 t salt, 3,000 t cheese
Description	An existing cheesemaking factory is currently being rebuilt to increase the annual production capacity to 15,000 t; a modern fully automated high-bay warehouse will be added. The construction has begun in August 2013 and should be finished in autumn 2014.

Production process

a. delivery, inspection/approval pumping into collection tanks using cooling and air separators (separate tanks for normal and organic milk)

b. separation of skimmed milk and cream from raw milk, adjustment of the fat content using the ratio of skimmed milk and cream for further processing

c. cheesemaking (culture treatment, incubation, coagulation, cutting and washing of the curd, moulding, pressing, salt bath, maturing, cutting)

d. The resulting whey is thickened by the use of a reverse osmosis system and a polisher.

All products are packed and dispatched (Source: BH Salzburg-Umgebung, email 2-6-2014).

Table 50: Overview of auxiliary materials – projected (Source: BH Salzburg-Umgebung, email 2-6-2014)

Auxiliary materials (projected)				
Name	**Type**	**Amount (kg)**	**Primary ingredients**	**Classification (safety data sheet)**
Anti-Germ AZ Soure L	Cleaning agent (acid)	3,500	H_3PO_4, polymer	low water dangerous
Anti-Germ SX	Cleaning agent (acid)	30,000	HNO_3, H_3PO_4	hazardous to water
Anti-Germ SR S10	Cleaning agent (acid)	2,500	H_3PO_4, H_2SO_4,	hazardous to water
Anti-Germ KNO	Cleaning agent (acid)	6,000	HNO_3, H_2O_2, Diethylene glycol butyl ether, alkylamineoxide	hazardous to water
Anti-Germ Peroxan	Cleaning agent (acid)	1,000	H_2O_2, acetic acid, Peracetiv acid,	hazardous to water
Anti-Germ AX	Cleaning agent (alkali)	51,000	NaOH, KOH	low water dangerous
Anti-Germ Ventol	Cleaning agent (alkali)	1,000	Alkylamineoxide, NaOH, KOH, hypochlorite solution	hazardous to water
NaOH	Cleaning agent	25,000	-	-
HNO_3	Cleaning agent	25,000	-	-
Ultrasil 75	Cleaning agent	1,000	HNO_3, H_3PO_4	low water dangerous
Ultrasil 112	Cleaning agent	1,000	NaOH, alkyl benzene sulphonate	low water dangerous
Ammoniac	Refrigerant	1,800	-	-
Glycol	Refrigerant	1,500	-	-
VTA 303-Polymer	Coagulation	10,000	Water soluble anionic polyacrylamid emulsion	low water dangerous
VTA 25/3	Precipitant and flocculant	10,000	Poly aluminium hydroxide chloride	low water dangerous
Waterdos RSK 20	Additive for boiler water	-	sodium hydrogen sulphite	low water dangerous
Waterdos KPA 45	Additive for boiler water	-	Na_3PO_4	low water dangerous
Ferrofos 8426	Additive for boiler water	-	Poly phosphonic acid, polycarboxylic acid	low water dangerous
BerkeCID-HYDREX 7310	Additive for boiler water	-	Methylchloroisothiazolinone, Methylisothiazolinone	hazardous to water

2.3.2.2 Energy generation and use

An ammonia based cooling machine will be used with glycol water or ice water as cooling media. The demand for heat will be provided via steam generator powered by natural gas (Source: BH Salzburg-Umgebung, email 2-6-2014).

2.3.2.3 Water and wastewater

Table 51: Overview of wastewater treatment (Source: BH Salzburg-Umgebung, email 2-6-2014)

Wastewater	
Partial wastewater streams (projected)	The major part of the wastewater comes from cleaning (CIP) and disinfection (364 m³/d). Other sources are: 36 m³/d from the boiler and cooling system (vapour condensation, desalination, sludge blow-off, reverse osmosis), the laboratory (only 200 l distilled or de-ionised water per day) and about 12 m³/d brine solution. The maximum wastewater volume will be 400 m³/d. Volume, pH and temperature are monitored continuously. Domestic wastewater is separated from the process water and discharged indirectly into the municipal sewer system. Permeate from reverse osmosis of the whey contains mainly minerals and lactose and is further filtrated and used cleaning purposes. Excess permeate is discharged directly (together with rainwater, if applicable) into the river Pladenbach.
Internal treatment of WW from the process	The process wastewater is discharged indirectly after internal wastewater treatment, including a drum screen, buffer tank (300m³) with neutralisation and dissolved-air-flotation. An emergency tank (150m³) has also been implemented.
Description of external WWTP	The process at the external wastewater treatment plant "Reinhalteverband Pladenbach" consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a maximum of 24,000 population equivalents (EW_{60}, 1440 kg/d BSB5 of which a maximum of 360 kg/d comes from Salzburg Milch Lamprechtshausen, after extension). The treated wastewater is discharged into the river Salzach. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 52: Emission limit values for the indirect discharge of wastewater (SOURCE: PERMIT BH SALZBURG LAND – SALZBURG MILCH, BH SALZBURG-UMGEBUNG, email 2-6-2014))

Process wastewater		
Parameter	**Permit (after extension[1])**	**Permit (existing plant)**
Q (discharge)	400 m³/d	180 m³/d
BOD_5 load	360 kg/d	246 kg/d
COD load	720 kg/d	492 kg/d
Total Cl load	160 g/d	72 g kg/d
AOX load	400 g/d	180 g
Separable lipophilic substances load	40 kg/d	18 kg/d
Settleable substances load	4,000 l	1,800 l/d
total N		
total P		
pH	6.0-10.5	6.0-10.5
T	35 °C	35 °C

Process wastewater		
Parameter	**Permit (after extension[1])**	**Permit (existing plant)**
AOX	1 mg/l	1 mg/l
Total Cl	0.4 mg/l	0.4 mg/l
Settleable substances	10 ml/l	10 ml/l
Separable lipophilic substances	100 mg/l	100 mg/l

[1)] date of finalisation: 31-6-2015

Table 53: Minimum frequencies for self- and external monitoring – remaining unchanged after the extension (Source: BH Salzburg-Umgebung, email 2-6-2014 and DI Hofeneder, email 7-7-2014)

Minimum frequencies for self- and external monitoring					
Parameter	**Unit**	**Self-monitoring – type of sample**	**Min. frequency self-monitoring (permit)**	**External monitoring – type of sample**	**Min. frequency external monitoring (permit)**
Q (discharge)	m^3/d	continuous	continuous	spot sample	4 times per year
T	°C	continuous	continuous	spot sample	4 times per year
pH		continuous	continuous	fpdcs	4 times per year
COD load	kg/d	-	-	fpdcs	4 times per year
BOD_5 load	kg/d	-	-	fpdcs	4 times per year
total N	kg/d	-	-	fpdcs	4 times per year
total P	kg/d	-	-	fpdcs	4 times per year
Separable lipophilic substances	mg/l	-	-	fpdcs	4 times per year
Settleable substances	ml/l	-	-	fpdcs	4 times per year
Total Cl	mg/l	-	-	fpdcs	4 times per year
AOX	mg/l	-	-	fpdcs	4 times per year

fpdcs = flow proportional daily composite sample

Methods for sampling and analysis according to AEV Milchwirtschaft and the AAEV (see Appendix).

External monitoring has to be carried out at least four times a year based on an unsettled, homogenised and representative flow proportional daily composite sample *(*PERMIT BH SALZBURG LAND – SALZBURG MILCH*)*.

In the case of self-monitoring the parameters temperature, wastewater quantity and the pH value must be measured continuously. The measuring equipment has to be calibrated at least once a week. *(*PERMIT BH SALZBURG LAND – SALZBURG MILCH*)*

Table 54: Summary of the results of external monitoring 2013 (Source: Measurement report, DI Hofeneder, email 7-7-2014)

External Monitoring 2014 (representative flow proportional daily composite samples measured by RHV Salzburg)						
Parameter		**03.03. 2014[1)]**	**16.06. 2014[1)]**	**2 day average[1)]**	**ELV[2)]**	**Method**
Q (discharge)	m³/d	167	144	155.50	180	flowmeter
pH		7.0 (7.9-8.8)	6.6 (8.4-9.2)	6.80	6.0-10.5	DIN EN ISO 10523
COD	kg/d	474.3	312.5	393.38	492	ISO 15705
BOD_5	kg/d	384.1	248.4	316.25	246	DIN EN 1899-2
total N	kg/d	20.5	12.5	16.52	-	DIN EN 26777
total P	kg/d	4.8	4.1	4.44	-	ÖNORM EN ISO 6878
Separable lipophilic substances	mg/l	< 1.6	< 1.6	< 1.6	100	DIN 38409-19
Settleable substances	ml/l	< 0.1	0.50	< 0.3	10	DIN 38409-9
Total Cl	mg/l	0.09	0.11	0.10	0.4	DIN38408-4
AOX	mg/l	0.03	0.07	0.05	1.0	DIN EN 1485

1) in general data represent daily average values

2) applies to the new installation after approval by the competent authority

Except for BOD_5 the results of external monitoring show compliance with all ELVs.

Surface water

Discharged surface water has to be monitored externally by a spot sample (ELVs: 30 mg/l of total suspended solids, 75 mg/l COD, 20 mg/l BOD_5 and 10 mg/l sum of hydrocarbons) after the first year of operation.

2.3.3 Gmundner Molkerei, 4810 Gmunden

Table 55: General description (Source: BH Gmunden, email 10-7-2014)

Name of the installation	**Gmundner Molkerei reg.Gen.m.b.H., Theresienthalstraße 16, 4810 Gmunden**
IPPC activity	6.4 (c)
Products	milk, long-life milk, sour cream, butter, yoghurt and cheese, etc.
Capacity	1,060,000 l/d (permitted 2011, full production starting 2014, previously 340,000 l/d)
Type and amount of products 2013	UHT milk: 95,822 t Milk and dairy drinks: 30,407 t Butter: 3,788 t Cheese: 5,168 t
General information	The dairy was founded in the year 1931 as a dairy cooperative by around 40 farmers. Today, approximately 3,200 farmers deliver their raw milk to Gmunden or to one of the other two smaller dairies in Wartberg and Sattledt. An increase in the processing capacity (up to 300,000 t per year) was planned for the year 2014. Key products in Gmunden are fresh and UHT milk, yoghurt, butter and semi-hard cheese. About 45% of the products are exported mainly to European countries (GMUNDNER MILCH 2014).

Production process

a. the production processes are: delivery, inspection/approval, pumping into collection tanks using cooling and air separators (separate tanks for normal and organic milk),
b. separation of skimmed milk and cream from raw milk,
c. adjustment of the fat content of products and further processing, namely:

fresh, ESL, UHT milk and sour cream

- different types of heat treatment,
- homogenisation due to nozzles,
- possible addition of fruit preparations or
- folled by fermentation to produce e.g. sour cream

butter and buttermilk

- (buttermaking and separation of buttermilk)

cheesemaking

- culture treatment, incubation, coagulation, cutting and washing of the curd, moulding, pressing, salting, maturing and possibly smoking

whey and whey concentrate

- skimming of the raw whey followed by concentrating due to evaporation

Whey which can not be used for human consumption (due to surplus production) is used as animal feed (about 1,833,215 kg in the year 2007).

2.3.3.1 Energy generation and use

An energy management system has been implemented.

Two 6 bar steam boilers are operational today of which one is fired by gas (max 10 t/h, actually 9 t/h) and the reserve boiler by oil.

Specific energy consumption 2013	
Processed milk	182,798,829 kg
Natural gas	1,960,011 m³
(1 m³ = 11.2 kWh)	21,952,123 kWh
Electrical power	11,261,027 kWh
Specific energy consumption (kWh per kg of processed milk)	0.182 kWh/kg

Table 56: Energay consumption per processed milk 2013 (Source: Gmundner Molkerei, email 30-9-2014)

2.3.3.2 Waste management

Table 57: Type and amount of waste according to the waste management concept 2007 (Source: BH Gmunden, email 10-7-2014):

Hazardous waste		
Type	**Amount**	**Treatment/Disposal**
Content of sand filter	18,620 kg	authorised disposal company
Content of the oil separator	4,400 kg	authorised disposal company
Waste oil	600 kg	authorised disposal company
Non hazardous waste		
Type	**Amount**	**Treatment/Disposal**
Expired foods	135,839 kg	authorised disposal company (e.g. biogas plant)
Paper and carton laminated	76,650 kg	authorised disposal company
Paper and carton	69,160 kg	authorised disposal company
Plastic films	33,740 kg	authorised disposal company

2.3.3.3 Noise emissions

Table 58: Sources and measures against noise emissions (Source: BH Gmunden, email 10-7-2014):

Sources and measures against noise emissions	
Sources	cleaning station for tank-vehicles and traffic noise
Measures to reduce noise emission	installation of noise-reduction barriers

2.3.3.4 Water and wastewater

Table 59: Summary of water consumption and wastewater streams 2013 (Source: BH Gmunden, email 10-7-2014 and Gmunder Molkerei, email 30-9-2014):

Water and wastewater	
Water consumption 2013	522,532 m³/y Water well with a max. capacity of 2,650 m³/d
Wastewater production 2013	328,049 m³/y
Partial wastewater streams	whey condensate is discharged directly into the river Traun (65,092 m³/y, max. 30 °C) surface water from a truck cleaning place is sent to an oil separator and discharged into the public sewer system after neutralisation process wastewater (327,702 m³/y) indirect discharge into the public sewer system after treatment in a neutralisation plant.
Measures in case of other than normal operating conditions	retention tank (120m³), redundant pump systems
Description of external WWTP	The process at the external wastewater treatment plant Traunsee-Nord includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capacity of 106,000 population equivalents (EW_{60}, ~6,360 kg/d BSB5 of which a maximum of 900 kg/d comes from the Gmundner Molkerei). The treated wastewater is discharged into the river Traun. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

The permit for wastewater discharge (maximum 1,000 m^3/d and 870 m^3/d in a 7-day average) includes in addition to wastewater from the process all other partial streams, namely:

- WW from production (805 m^3/d)
- WW from the laboratory (1 m^3/d)
- WW from water treatment (boiler feedwater preparation, 7 m^3/d)
- WW from cooling systems (40 m^3/d)
- Surface water (6 m^3/d)
- Truck cleaning and petrol station (5 m^3/d)
- Blowdown water from cooling systems (1.9 m^3/d)
- Condensates from compressor units (0.1 m^3/d)

Due to an increase in production it is planned to increase the total volume to 1,600 m^3/d (a 7-day average) in agreement with the external WWTP. The WW stream from production will be virtually doubled to 1,724 m^3/d (max 1,524 m^3/d as a 7-day average).

Whey condensate

Condensate from whey thickening is directly discharged into the river Traun (regulated parameters are shown in Table 60). Monitoring is performed once a year via a spot sample

Table 60: Emission limit values for the direct discharge of whey condensate (WB GMUNDNER MOLKEREI)

Discharged whey condensate	
Parameter	**Permit**
Q (discharge)	400 m^3/d
BOD_5	15 mg/l
COD	75 mg/l
total P	0.3 mg/l
TOC	20 mg/l
pH	6.5-8.5
T	30 °C

Truck cleaning and gas station

Wastewater from the truck washing station and gas station are externally monitored once a year via a spot sample (pH, settleable substances and sum of hydrocarbons)

Blowdown water from cooling systems

One spot sample per year has to be taken by an external institution. Parameters: sum of hydrocarbons, Cu, total P, pH and total suspended solids

Process wastewater

Process wastewater is discharged indirectly into the municipal sewer system after internal pretreatment (neutralisation). External monitoring is to be performed within a period of maximum production capacity once a year on 7 consecutive days. In addition it includes an assessment of the quality of self-monitoring, the status of the wastewater treatment plant, a check of the log book, an evaluation of cases of exceedances (COD and Q) and the compliance measures taken by the operator.

Table 61: Emission limit values and minimal frequencies for self- and external monitoring for the process wastewater (Source: BH Gmunden, email 10-7-2014)

Process wastewater						
Parameter	**Unit**	**ELV Permit**	**Self-monitoring – type of sample**	**External monitoring – type of sample**	**Min. frequency for self-monitoring (permit)**	**Min. frequency for external monitoring (permit)**
Q (discharge)	m³/d	1,000 (and 870 m³/d in a 7-day average)	continuous	Magnetic flow meter	daily	7 consecutive days per year
T	°C	35	continuous	spot sample	daily	7 consecutive days per year
pH		6-10.5	continuous	spot sample	daily	7 consecutive days per year
COD load	kg/d	1,500 / 1,200[4]	fpdcs	fpdcs	daily	7 consecutive days per year
BOD_5 load	kg/d	900 (and 720 kg/d in a 7-day average)	-	fpdcs	-	7 consecutive days per year
total N load	kg/d	60 (7-day average)	-	fpdcs	-	7 consecutive days per year
total P load	kg/d	50 (7-day average)	-	fpdcs	-	7 consecutive days per year
Low volatile lipophilic substances	mg/l	300[1)]	-	fpdcs	-	7 consecutive days per year
Separable lipophilic substances	mg/l	100[2)]	-	-	-	See footnote [2)]
Settleable substances	ml/l	10	spot sample	spot sample	daily[3)]	7 consecutive days per year
Total Cl	mg/l	0.4	-	spot sample	-	2 days per year
AOX	mg/l	1.0	-	fpdcs	-	2 days per year
Sum of hydrocarbons	mg/l	10	-	fpdcs	-	2 days per year
Conductivity	µS/cm	-	-	spot sample	-	-

fpdcs = flow proportional unsettled homogenised daily composite sample

Methods for sampling and analysis according to AEV Milch and AAEV (see Appendix)

[1)] DIN 38409-H56

[2)] DIN 38409-H19, has to be measured if the result from 1) exceeds 300 mg/l

[3] requirement as specified in the contract for the indirect discharge (RHV Traunsee-Nord)

If the total amount of discharged wastewater is increased to 1,600 m³/d (a 7-day average) the following ELVs (loads) will be changed (T, pH and concentration limits will stay the same):

Table 62: Requested emission limit values for the planed extension in agreement with the external WWTP (Source: Gmundner Molkerei – Konsensantrag, email 30-9-2014)

Requested ELV after planned extension		
Parameter	**Unit**	**Requested ELV (increased loads)**
Q (discharge)	m³/d	1,800
	m³/d	1600 (7-day average)
	m³/h	90
	l/s	25
COD load	kg/d	2,500 (7-day average)
		3,000
BOD_5 load	kg/d	1,500 (7-day average)
		3000
total N load	kg/d	110 (7-day average)
total P load	kg/d	95 (7-day average)

Self-monitoring

Table 63: Summary of results from self-monitoring 2013 (Source: Measurement report, OIKOS umwelt-management GmbH from BH Gmunden, email 10-7-2014)

Self-monitoring (March 2013 - February 2014)						
Parameter		**Daily average max**	**Daily average – ELV**	**Weekly average min**	**Weekly average max**	**Weekly average ELV**
Q (discharge)	m³/d	997	1,000	805	975	870
COD	kg/d	1,475	1,500	802	1,196	1,200

Whereas the parameter COD and daily discharged wastewater volume were within the emission limit values, exceedances of the weekly average for wastewater volume were reported. This was caused by a constant increase in production; the operator has already informed the authority and applied for approval to increase the allowed wastewater volume.

Table 64: Specific water consumption and amount of wastewater 2012 and 2013 (Source: Gmundner Milch, email 30-9-2014)

Specific water and wastewater consumption			
	Unit	**2012**	**2013**
Milk processed	kg	162,534,996	182,798,829
Fresh water consumption	m³	513,837	522,532
Wastewater	m³	304,183	328,049
Specific fresh water consumption	l/kg	3.2	2.9
Specific wastewater	l/kg	1.9	1.8

The specific water consumption and wastewater amount depends heavily on the produced products. The Gmunder Molkerei had moved from drinking milk to an increased cheese production.

During the shift to increased cheesemaking an increase in water and wastewater consumption was recorded (consumption of almost 4 l fresh water per litre of processed milk). Starting from May 2013 reduced cheeseproduction led to generally lower water consumptions (min. specific fresh water consumption of 2 l/l of processed milk).

External Monitoring

Table 65: Results of external monitoring 2014 – spot samples (Source: Measurement report, OIKOS umwelt-management GmbH from BH Gmunden, email 10-7-2014)

External Monitoring 2014 (3 spot samples)						
Parameter	**Unit**	**24-02-2014**	**26-02-2014**	**28-02-2014**	**ELV**	**Method**
Conductivity	µS/cm	1,070	1,970	1,510	-	ÖN EN 27888
T	°C	27.8	28.2	26.9	35	DIN 38404-C5
pH		10.2	9.9	10.1	6.0-10.5	
Settleable substances	ml/l	0.4	0.5	0.3	10	ÖN M 6271
Sum hydro-carbons	mg/l	1.4		1.1	10	ÖN M 6608
AOX	mg/l	0.06		0.04	1.0	ÖN EN ISO 9562

The results of external monitoring show a general compliance with all emission limit values.

Table 66: Summary of results of external monitoring 2014 after plant extension (Source: Measurement report, OIKOS Umwelt-management GmbH GZ: 2407/14/01-15)

External Monitoring 2014 after plant extension (7 representative flow proportional daily composite samples in the period November 3-9, 2014)					
Parameter	**Unit**	**Average**	**Max**	**Min**	**Method**
Q (discharge)	m³/d	1,137	1,370	817	Magnetic induction flow measurement
COD	mg/l	2,498	3,010	1,750	ÖNORM M 6265
settleable substances	ml/l	0,3	0,5	0,2	ÖN M 6271
TSS	mg/l	819	910	690	DIN 38409-H2
Low volatile lipophilic substances	mg/l	445	558	320	DIN 38409-H56

The monthly average specific COD load in March 2015 was 3.7 kg COD per tonne of processed milk. This value varies as a result of production changeovers.

2.3.4 NÖM AG, 2500 Baden

2.3.4.1 General description

NÖM Baden currently employs 550 people. 300,000 tonnes of milk are processed annually and around 50% of the goods are exported mainly to European Countries. The site in Baden is an important supplier of milk and yoghurt drinks in Germany. (NÖM 2014)

Table 67: General description (Source: BH Baden, email 10-7-2014)

Name of the installation	**NÖM AG, Vöslauerstraße 109, 2500 Baden**
IPPC activity	6.4 (c)
Products	fresh milk, butter, curd cheese, milk powder and many others
Capacity	800 t of milk per day
Operating hours	continuous production, 7 days / week, 52 weeks / year
Products 2013	milk and (fruit, curdled) yoghurt-products, (sour) cream, (fruity) whey drinks, etc., but no cheese
Auxiliary materials	cleaning agents (nitric acid, sodium hydroxide solution and 1-1.5% nitric acid in the CIP plant)

Production process

Production processes include *(Source: BH Baden, email 10-7-2014)*:

Delivery – inspection/approval – pumping into collection tanks including cooling and air separation, adjustment of the fat content of the skimmed milk with cream for further processing, heat treatment, separation of skimmed milk and cream from raw milk via centrifuges, homogenisation, cooling, storage, filling and packaging

2.3.4.2 Energy generation and use

Table 68: Combustion plants operated on site (Source: BH Baden, email 10-7-2014)

Combustion plants	**Steam boiler 1**	**Steam boiler 2**
Rated thermal Input (MW)	7.371	4.91
Start of operation	2010	1996
Fuel	natural gas	natural gas
Flue gas cleaning	low NO_x firing system	-
Flue gas temperature (°C)	65	120
Operating hours (h/a)	8744	0 (reserve plant)
Energy recovery	2 ECO: 461 + 334 kW	ECO 204 kW
Steam production (t/h)	10.8	7
Steam parameter (p, T)	10.5 bar, 186 °C	7.5 bar, 173 °C
Fuel use (%)	100.2 (condensing heat exchanger)	90
Oxygene content (%)	1.9-3.0	3

Table 69: Emission limit values and short term measurements for the operated combustion plants (Source: BH Baden, email 10-7-2014)

Short term emission level (half-hourly average)				
	Steam boiler 1		**Steam boiler 2**	**Emission limit value (30 min average)**
Pollutant	**Minimum**	**Maximum**	**Maximum**	
Dust (mg/Nm³; 3% O_2)		< 5	< 5	5
NO_x (mg/Nm³; 3% O_2)	52	72	79	100
CO (mg/Nm³; 3% O_2)	0	4	2	80

2.3.4.3 Waste management

Table 70: Main types and amounts of waste (Source: BH Baden, email 10-7-2014)

Waste management			
Waste Type	**Source**	**Amount**	**Treatment/Disposal**
Oil and fat	production	1,121 t	BIOGAS (external)
Expired foodstuff	production	1,002 t	authorised waste disposal company
Commercial waste	production	1,123 t	authorised waste disposal company
Paper	production	369 t	authorised waste disposal company
Packaging and cartons	production	158 t	authorised waste disposal company

2.3.4.4 Noise emissions

Table 71: Sources of noise emissions and countermeasures (Source: BH Baden, email 10-7-2014)

Sources of noise emissions and countermeasures	
Sources	machine hall
Measures to reduce noise pullution	housing

2.3.4.5 Water and wastewater

Table 72: Summary of wastewater streams and fresh water consumption (Source: BH Baden, email 10-7-2014 and HP AWA BADVOESLAU (2015))

Water and wastewater	
Water consumption	550,391 m³/y (2013)
Partial wastewater streams	process wastewater, domestic and surface wastewater
Measures in case of other than normal operating conditions	redundant pump systems, rainwater retention basins and tanks (3,874 m³ in total)
Internal treatment of WW from the process	domestic ww: indirect discharge to the municipal sewer system (max. 60-100 m³/d), water from the roof is discharged by means of a drainage system, process wastewater is indirectly discharged to an external wastewater treatment plant after mechanical cleaning (2 mm slotted sieve) and a neutralisation process; 60 m³/d are discharged to the municipal sewer system of the municipality Baden
Description of the external WWTP	The external wastewater treatment plant ARA GV Abwasserbeseitigung Raum Bad Vöslau operates a separated high perfomance step for wastewater from NÖM only. The process further includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capactity of 105,000 population equivalents (EW_{60}, ~of which a max. of 50,000 stem from NÖM Baden). The plant also has a buffer tank and a retention basin. The treated wastewater is discharged into the channel “Wiener Neustädter Kanal”. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Surface and roof surface water

Surface wastewater is cleaned by 2 oil separator units and 2 sludge collectors (30l/s each – consecutive systems). The maximum allowed oil content is 10 mg/l. Roof surface water goes directly to a drainage system and must contain less than 0.1 mg/l residual oil.

Process wastewater

The process wastewater is indirectly discharged into the municipal sewer systems of Baden (max. 60 m^3/d) and to the WWTP Bad Vöslau (max. 1,400 m^3/d) after internal wastewater treatment. Regulated parameters for the indirect discharge of process wastewater are shown in Table 73.

Table 73: Emission limit values and monitoring frequency for the indirect discharge of process wastewater (Source: BH Baden, email 10-7-2014)

Process wastewater						
Parameter	**Unit**	**ELV Permit**	**Self-monitoring – type of sample**	**External monitoring – type of sample**	**Self-monitoring – frequency**	**External monitoring – frequency**[1]
Q (discharge)		1,400 m^3/d and 100 m^3/h; (+60 m^3/d to the municiple sewer systeme)	continuous		daily	1 per year
T	°C	35	continuous	spot sample	daily	1 per year
pH		6.5-10.5	continuous	spot sample	daily	1 per year
COD load	kg/d	5,000	-	fpdcs	-	1 per year
BOD_5 load	kg/d		-	fpdcs	-	1 per year
total N load	kg/d		-	fpdcs	-	1 per year[2]
total P load	kg/d		-	fpdcs	-	1 per year[2]
Separable lipophilic substances	mg/l	100	-	fpdcs	-	1 per year
NH_4-N	mg/l		-	fpdcs	-	1 per year[2]
AOX	mg/l	1.0	-	fpdcs	-	1 per year
NO_2-N	mg/l		-	fpdcs	-	1 per year[2]
NO_3-N	mg/l		-	fpdcs	-	1 per year[2]
Settleable substances[3]	ml/l	10	-	spot sample	-	1 per year
Total Cl[3]	gg/l	0.4	-	fpdcs	-	1 per year

fpdcs = flow proportional unsettled homogenised daily composite sample

[1] Permit condition: methods for analysis according to AEV Milchwirtschaft and AAEV

[2] as an information to the operator of the external WWTP, additional parameters are recorded (including chloride, sulphate and the sum of hydrocarbons)

[3] requirement as specified in the contract for the indirect discharge

Continuous turbidity measurement for discharged wastewater is installed (high values indicate a high COD due to a high milk/product content and will set off an alarm signal).

Table 74: Results of external monitoring 2013 for the process wastewater (Source: BH Baden, email 10-7-2014)

External Monitoring (representative flow proportional daily composite sample November 26/27-11-2013)				
Parameter		**Daily average**	**ELV**	**Method**
Q (discharge)[1)]	m³/d	1,156 + 60	1,400	Continuous (data from self-monitoring)
T[1]	°C	26.5	35	Continuous (data from self-monitoring)
pH[2)]		11.2	6.5-10.5	
Settleable sub-stances[2)]	ml/l	5	10	ÖNORM M 6271
COD – WWTP Bad Vöslau		3,341 kg/d 2,890 mg/l	5,000 kg/d	ÖNORM M 6265
COD – municipal sewer system		173 kg/d 2,890 mg/l	240 kg/d	ÖNORM M 6265
total N	mg/l	117		(sum of individual values)
total P	mg/l	65.9		ÖNORM EN ISO 6878
Separable lipophilic substances	mg/l	< 20	100	DIN 38409-Teil 19
Organic N	mg/l	90.6		TKN – NH4-N
NH_4-N	mg/l	26.4		ÖNORM ISO 7150-1
Chloride	mg/l	60.1		ÖN EN ISO 10304-1
Free Cl	mg/l	< 0.1		ÖN EN ISO 7393-1
Total Cl	mg/l	< 0.1	0.4	ÖN EN ISO 7393-1
AOX	mg/l	< 0.01	1.0	EN ISO 9562
Sulphate	mg/l	41		ÖN EN ISO 10304-1
NO_2-N	mg/l	< 0.01		ÖNORM EN 26777
NO_3-N	mg/l	< 0.5		ÖN EN ISO 10304-1
Sum of hydrocarbons	mg/l	2.7		ÖNORM M 6608-1

1) *continuous measurement*

2) *spot sample*

On the day of sampling 709 t of milk were received.

All parameters with the exception of pH were within the ELVs. However, wastewater from the process is discharged into the primary clarifier of the external WWTP where neutralisation will occur.

Table 75: Specific loads, calculations based on the results of external monitoring 2013 (own calculation)

Specific loads – External monitoring 2013		
Discharge:		
Q	m³/d	1,216
COD load	kg/d	3,514
Milk processed	t/d	709
Specific wastewater	l/l	1.72
COD per ton of milk	kg/t	4.96

Specific COD is in the upper range of the reported values and is caused by a highly diverse product range.

2.3.5 Kärntnermilch, 9800 Spittal an der Drau

2.3.5.1 General description

Name of the installation	**Kärntnermilch reg.Gen.m.b.H., Villacherstraße 92, 9800 Spittal/Drau**
IPPC activity	6.4c
Capacity	340,000 l milk per day are processed
Products 2013	Processed milk 2013: 115 million kg About 340 different products such as drinking milk, sour milk drinks, yogurt, fruit yogurt, whey drinks, butter and 27 different types of semi-soft and hard cheese. Amounts 2013: 3,000 tons of cheese, 33 million kg of milk in tetra packs and 17 million kg of products in plastic cups (PS and PP).
Operating hours	7 days a week, 1 to 3 shift operation (depending on the order situation)
History	Kärntnermilch was founded in 1928 as "Oberkärntner Molkerei". Today it's the market leader in Carinthia with about 180 employees and a turnover of 82.3 million Euros (2010).

Table 76: General description (Source: BH Spittal an der Drau, email 23-6-2014 and Kärntnermilch, email 2-7-2014)

Production process

Production processes include: delivery, inspection/approval, pumping into collection tanks using cooling and air separators, separation of skimmed milk and cream from raw milk, adjustment of the fat content of products such as different types of milk (different types of heat treatment) and several fermented milk products (drinks and yoghurt). Also butter-, cheesemaking and sour cream production takes place. All products are packed and dispatched.

2.3.5.2 Energy generation and use

Electricity and heat from a district heating network is purchased. In addition one steam boiler is operated (see below).

Energy procurement 2013	
Electric power	9,870 MWh
Heat demand (from district heating network)	15,735 MWh

Table 77: Energy procurement 2013 (Source: Kärntnermilch, email 2-7-2014)

Table 78: Main energy consumers and consumption of electric power (Source: Kärntnermilch, email 2-7-2014)

Main energy consumers	
Energy consumption	most of the energy consumption is needed for cooling (ice water production), other consumers are compressed air and whey thickening
Electrical power 2013	cooling: 3,069 MWh main supply for milk products: 1,179 MWh compressed air: 642 MWh whey thickening: 475 MWh

So far no energy management system has been installed.

Table 79: Specific Energy procurement 2009-2011 (Source: HP Kärntnermilch, Nachhaltigkeitsbericht 2012, accessed 2-10-2014)

Specific Energy procurement 2009-2011					
	Unit	**2009**	**2010**	**2011**	**Change 2010/2011**
Natural gas	kWh	14,463,794	15,630,903	15,554,769	-76,134
Specific consumption of natural gas	kWh/t	152.39	151.59	141.96	-6.36%
Electrical power	kWh	8,852,513	9,578,510	9,899,670	+321,160
Specific consumption of electrical power	kWh/t	93.27	92.89	90.35	-2.74%

2.3.5.3 Waste management

Table 80: Different types of waste reported in the year 2013 (Source: Kärntnermilch, email 2-7-2014)

Hazardous waste		
Type	**Source**	**Amount**
Contents of sand filters	Gas station	2,780 kg
Oil sludges from the oil separator	Oil separator	1,380 kg
Waste oil	plants	1,300 kg
Lead accumulators	Forklift trucks	657 kg
Screens	computer	650 kg
Spray cans	workshop	62 pieces
Printing ink residues	printer	246 pieces
Copper cables	plants	1,410 kg
Tissues used to whip off oil	workshop	195 kg
Non-hazardous waste		
Type	Source	Amount
Paper and carton	Packaging	103,870 kg
Residual waste	Production	64,080 kg
Tetra paper	Production	36,400 kg
PE film	Production	17,760 kg
HDPE-PP-buckets	Production	6,890 kg
Aluminium	Production	1,080 kg

All waste types are sent to licensed treatment/disposal operations.

2.3.5.4 Noise emissions

According to the company there is no source of odour emissions.

Noise emissions	
Sources	truck loading and transport
Measures to reduce noise pullution	noise barriers, reduced truck traffic during night time
Control	sound level meters are installed in and outside the installation; the noise level shall not exceed 35 dB(A) in the nearest residential areas at night

Table 81: Noise emissions (Source: Kärntnermilch, email 2-7-2014)

Combustion plant	
Type	**Steam boiler**
Combustion Technology	Gasfiring
Rated thermal Input (MW)	4 MW
Start of operation	14-4-1993
Fuel	1,527,678 m³ natural gas 2013
Flue gas cleaning	Low-NO_x burner, Ecojet-Injection
thereof retrofitted	Ecojet-Injection 2009
Flue gas temperature (°C)	165
Operating hours (h/a)	6,500
Steam production (t/h)	193 Nm^3/h fuel – ca. 1.9 MW steam

Table 82: There is one known combustion plant at the IPPC installation (Source: Kärntnermilch, email 2-7-2014)

Air emissions 2011 and 2013			
Pollutant	**2011** **Short term (30min) emission level maximum**	**2013** **Short term (30min) emission level maximum**	**ELV** **(30 min measurement)**
Dust (mg/Nm³)	2.0	1.7	10
NO_x (mg/Nm³)	92.0	76	-
CO (mg/Nm³)	7.0	5	100

Table 83: Related air emissions measured in the years 2011 and 2013 (Source: Kärntnermilch, email 2-7-2014 and HP Kärntnermilch, Nachhaltigkeitsbericht 2012, accessed 2-10-2014)

2.3.5.5 Water and wastewater

Water and wastewater	
Consumption of fresh water	ca. 1,050 m³/d; 383,250 m³/y (2013)
Cooling water	7.7 m³/d
Discharged wastewater (self-monitoring: continuous measurement)	2013: 249,884 m³/y January to August 2014: Monthly minimum: 16,848 m³/month Monthly maximum: 19,550 m³/month
Partial wastewater streams	711 m³/d process wastewater; 265 m³/d infiltration

Table 84: Overview of the consumption and treatment of water 2013 (Source: Kärntnermilch, email 2-7-2014)

	well; 3.5 m³/d to the product (as curd washing water)
Description of the process wastewater	cleaning water from the CIP system, rinse water from the production (normal domestic wastewater is separated and discharged indirectly without further treatment)
Internal treatment of WW from the process	2 pairs of neutralisation tanks (4 times 50 m³) with NaOH and HNO_3 dosing device, indirect discharge to an external wastewater treatment plant
Measures in case of other than normal operating conditions	retention tanks – discharge into sewage system is stopped automatically if a malfunction is detected
Description of the external WWTP	The external wastewater treatment plant Wasserverband Millstätter See (A-9871 Seeboden) includes a biological treatment step and phosphorus removal with a treatment capacity of 130,000 population equivalents (EW_{60}, from which a maximum of 18,000 stem from Kärntnermilch). The treated wastewater is discharged into the river Drau. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 85: Emission limit values and minimal frequencies for self- and external monitoring of the process wastewater (Source: Kärntnermilch, email 2-7-2014)

Process wastewater						
Parameter	**Unit**	**ELV Permit – daily average**	**Self-monitoring – type of sample**	**Self-monitoring – frequency (Permit)**	**External monitoring – type of sample (Permit)**	**External monitoring – frequency (Permit)**
Q (discharge)	m³/d	1,200[1)]	Venturi flume	continuous		yearly
T	°C	35[1)]	-	continuous		yearly
pH		6.0-10.5[1)]	-	continuous		yearly
COD	mg/l	1,800	fpdcs	-[2)]	fpdcs	yearly
BOD	mg/l	1,080		-	fpdcs	yearly
total N	mg/l	-		-	fpdcs	yearly
total P	mg/l	-		-	fpdcs	yearly
Separable lipophilic substances	mg/l	-		-	fpdcs	yearly
Settleable substances	ml/l	10		-	fpdcs	yearly
Total Cl	mg/l	-		-	fpdcs	yearly
NH_4-N	mg/l	-		-		as required
AOX	mg/l	0.5		-	fpdcs	yearly

1) continuous measurement

2) in addition to the permit voluntary self-monitoring is performed daily based on fpdcs (COD)

fpdcs = flow proportional unsettled homogenised daily composite sample

Specific fresh- and wastewater consumption 2009-2011					
	Unit	**2009**	**2010**	**2011**	**Change 2010/2011**
Fresh water	m³	376,896	384,018	391,103	+7085
Specific fresh water consumption	m³/t	3.97	3.72	3.57	-4.16%
Wastewater	m³	251,104	266,949	269,080	2131
Specific wastewater consumption	m³/t	2.65	2.59	2.46	-5.15%

Table 86: Specific fresh- and wastewater consumption 2009-2011 (Source: HP Kärntnermilch, Nachhaltigkeitsbericht 2012, accessed 2-10-2014)

Self-monitoring 2013								
Parameter		**Daily average min**	**Daily average max**	**Monthly average min**	**Monthly average max**	**Yearly average**	**ELV – daily average**	**Method**
T	°C	15.0	23.0	17.0			35[1)]	pt100 sensor
pH		6.8	8.2	7.2			6.0-10.5[1)]	pH probe
COD	mg/l	1,600	3,600	1,700			1,800[2)]	cuvette test: Nanocolor 4000

1) continuous measurement

2) fpdcs

Table 87: Emission parameters for the year 2013 – self- and external monitoring (Source: Kärntnermilch, email 2-7-2014 and 15-9-2014)

Wastewater quantities were measured continuously with a venturi flume and ranged from 16,848 m³ to 19,550 m³ per month from January to August 2014 (~562-652 m³/d as a monthly average). The yearly wastewater volume 2013 was 249,884 m³ (~685 m³/d as a yearly average) and exceeded the permitted daily maximum frequently. An outlet control valve prevents discharges of more than the permitted 90 m³/h.

The loads (e.g. COD) and wastewater volumes exceed the applicable ELV after a sharp increase in production. Therefore it is planned to increase the permitted amount of discharged wastewater (request for amendment submitted in January 2014). (Source: Kärntnermilch, email 15-9-2014)

External Monitoring 2012

Methods for sample treatment	
Sampling	DIN 38402
Preservation of the sample	DIN EN ISO 5667-3
Sample preparation	DIN 38402

Table 88: Methods for sample treatment 2012 (Source: Kärntnermilch, email 15-9-2014)

Table 89: Results of external monitoring 2012 for the process wastewater (Source: Kärntnermilch, email 15-9-2014)

External Monitoring 2012 (14-3-2012)					
Parameter		**value**	**Type of sample**	**method**	**ELV**
Q (discharge)	m³/d	748	continuous	venturi flume	1,200
T	°C	20-30	continuous	Hach Sension 156 / WTW	35
pH		7.21 (6.8-9.3)	continuous	Hach Sension 156 / WTW	6.0-10.5
COD	kg/d	1,659	fpdcs	DIN ISO 15705	1,800
BOD	kg/d	724	fpdcs	DIN EN 1899-2	1,086
total N	mg/l	102	fpdcs	LCK 138, LCK 238, LCK 338	-[1)]
total P	mg/l	14	fpdcs	DIN EN ISO 6878	-[1)]
Separable lipophilic substances	mg/l	65	fpdcs	DIN 38406-E5	100
Low volatile lipohilic substances	mg/l	766	fpdcs	DIN 38409-H56	-[1)]
Settleable substances	ml/l	6	fpdcs	DIN 38409-H9	10
NH_4-N	mg/l	3.2	fpdcs	DIN 38406-E5	-[1)]
Total Cl	mg/l	0.14	spot sample	LCW 510	0.4
Free Cl	mg/l	0.14	spot sample	LCW 510	-[1)]
AOX	mg/l	0.45	fpdcs	LCK 390	0.5
Chloride	mg/l	78	fpdcs	DIN 38405-D1	-[1)]
Sulphate	mg/l	70	fpdcs	DIN 38405-D5	-[1)]
Conductivity	µS/cm	1,692	fpdcs	Hach Sension 156 / WTW	-[1)]

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] *measured in addition to the permitted parameters*

Compliance with ELVs was observed for all parameters during external monitoring on 14-3-2012.

Table 90: Specific loads, calculations based on results of external monitoring from 2012 (own calculation)

Specific loads – External monitoring 2012		
Specific loads per ton of processed milk	**Unit**	**Based on external monitoring from 14-3-2012**
discharge:		
Q discharge	m³/d	748
COD discharge	kg/d	1,659
BOD_5 discharge	kg/d	724
N discharge	kg/d	76
P discharge	kg/d	10
Milk delivered	t/d	298
Milk processed	t/d	230
Untreated wastewater		
Q (specific wastewater)	l/l	3.3
COD per ton of milk	kg/t	7.2
BOD_5 per ton of milk	kg/t	3.1
total N per ton of milk	kg/t	0.33
total P per ton of milk	kg/t	0.05

2.3.6 Berglandmilch, 3361 Aschbach-Markt

2.3.6.1 General description

Name of the installation	**Berglandmilch, Molkereistraße 5, 3361 Aschbach-Markt**
IPPC activity	6.4 (c)
Capacity	> 200 t milk per day
Processed milk 2013	ca. 250,000,000 kg
Products 2013	Butter Curd chese Drinking milk Sour milk Yoghrt Cream Fruit yoghurt Desserts Mixed milk beverages Cheese
Operating hours	7 day week, shift operation
Raw materials	Milk, cream, sugar, fruit preparations, protein powder
Auxiliary materials	cleaning agents: NaOH (50%), HNO_3 (53%) and stabiliser “Calgonit LZ liquid” for the CIP system; several other cleaining agents (e.g. H_2O_2, H_3PO_4)
Description	Berglandmilch is the biggest milk processing company in Austria with a total of eleven sites. Their largest manufacturing facility is located in Aschbach and houses a modern high bay warehouse and the biggest cup filling system in Austria.

Table 91: General description (Source: BH Amstetten, email 20-8-2014 and Berglandmilch, email 17-10-2014)

Production process

The production process includes: production of drinking milk, ESL milk (heat treated and filtrated), UHT milk, stirred and set sour cream, cream, fruit and plain yoghurt, mixed milk beverages, butter, clarified butter and blends as well as some types of cheese and curd cheese.

2.3.6.2 Energy generation and use

The installation operates two gas boilers fired by natural gas (each 10 t/h steam, equipped with economisers).

Energy procurement 2013	
Electric power	ca. 22,5 GWh
Consumption of natural gas	ca. 40 GWh

Table 92: Energy procurement 2013 (Source: Berglandmilch, email 17-10-2014)

2.3.6.3 Air emissions

Enclosure for parts of the WWTP with the use of biofilters.

2.3.6.4 Water and wastewater

Fresh water comes from an internal well system and the public grid.

Table 93: Summary of wastewater streams (Source: BH Amstetten, email 20-8-2014 and 17-10-2014)

Water and wastewater	
Partial wastewater streams	The installation runs its own wastewater treatment plant and discharges into the river Url (after biological treatment, nitrification plus denitrification, phosphorus removal, continuous sand filter, retention basin) but also discharges another part of its process wastewater to the municipal sewer system and an external wastewater treatment plant (Gemeindeabwasserverband Amstetten, see below). Currently, a pre-treatment step for the indirect discharge as well as plans for making changes to the internal WWTP are being negotiated with the authority. A separation system is installed to separate process wastewater from domestic wastewater which is discharged into the municipal sewage system. Roof and surface water is separated and led to a retention basin and finally to the river Url.
Descripton of external WWTP	The process at the external wastewater treatment plant ARA GAV Amstetten includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a capacity of 150,000 population equivalents (EW_{60}, with a maximum of 1500 kg/d BOD_5 (~25,000 EW) coming from the Berglandmilch in Aschbach Markt). The treated wastewater is discharged into the river Ybbs. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Indirectly discharged process wastewater:

External monitoring of this wastewater stream is compulsory on 7 days per year (given by the contract with the external WWTP).

Table 94: Frequency of self-monitoring for indirect discharges of process wastewater (Source: Berglandmilch, email 17-10-2014)

Frequency of self-monitoring for indirect discharges of process wastewater	
Parameter	**Frequency of self-monitoring)**
Q	continuous
pH	daily
T	continuous
Conductivity	daily
COD	daily
BOD	monthly
total N	monthly
total P	monthly
NH_4-N	monthly
NO_3-N	monthly

External Monitoring from 13 to 19-11-2013 (indirect discharges of process wastewater)					
Parameter		**Daily min**	**Daily max**	**Weekly average**	**ELV (contract with the external WWTP)**
Q[1]	m³/d	546	1,208	687	1,200
BOD[1]	kg/d	161	610	284	1,500 and 1,200 in a weekly average
COD[1]	kg/d	344	1,017	577	2,500 and 1,500 (weekly average)
AOX[1]	mg/l	0.054		-	1.0
pH[2]	mg/l	7.9		-	6.0-10.5[2]
Settleable substances[2]	ml/l	< 0.1		-	10[2]
T[2]	mg/l	32.1		-	35[2]
Total Cl[2]	mg/l	< 0.1		-	0.4[2]
Separable lipophilic substances[2]	mg/l	< 10		-	100[2]

[1] *seven flow proportional unsettled homogenised daily composite samples (except AOX with only 1 sample)*

[2] *spot sample (1 measurement on 13-11-2013)*

Table 95: Overview of external monitoring 2013 for indirectly discharged process wastewater (Source: Measurement report, BH Amstetten, email 20-8-2014)

Note: Currently a new pre-treatment plant for indirectly discharged process wastewater is being negotiated with the authority. This study describes only the existing plant.

There was a slight exceedance of the ELV for the parameter wastewater volume on 13-11-2013 (1,208 m^3/d in comparison to 1,200 m^3/d). Besides that, general compliance with ELVs was observed.

Direct discharged process wastewater:

ELV – Direct discharges of process wastewater					
Parameter	**ELV Permit**	**Type of sample – external monitoring**	**Type of sample – self-monitoring**	**Self-monitoring – frequency**	**External monitoring – frequency**
Q (discharge)	600 m^3/d	continuous	IDM	continuous	1 per year
BOD_5	11 mg/l	fpdcs	DEV 46. Lieferung 2000 – H55	5 times per week	1 per year
COD	41 mg/l	fpdcs	DIN 38409-H41 – H44	daily	1 per year
TOC	14 mg/l	fpdcs	-	-	1 per year
total P	2 mg/l	fpdcs	EN 1189	daily	1 per year
NH_4-N	3 mg/l[1]	fpdcs	DIN 38406-E5	1 per week	1 per year

Table 96: Emission limit values for the direct discharge of wastewater (WB Berglandmilch Aschbach Markt and measurement report - BH Amstetten, email 20-8-2014 and Berglangmilch, email 25-11-2014)

ELV – Direct discharges of process wastewater					
Parameter	**ELV Permit**	**Type of sample – external monitoring**	**Type of sample – self-monitoring**	**Self-monitoring – frequency**	**External monitoring – frequency**
total N	> 75%	fpdcs	EN ISO 11905-1	1 per week	1 per year
pH	6.5-8.5	spot sample	-	continuous	1 per year
T	30 °C	spot sample	-	continuous	1 per year
AOX	0.1 mg/l	fpdcs	-	-	1 per year
Total Cl	0.4 mg/l	spot sample	-	-	1 per year
Separable lipophilic substances	10 mg/l	spot sample	-	-	1 per year
Settleable substances	0.3 ml/l	spot sample	-	-	1 per year

fpdcs = flow proportional unsettled homogenised daily composite sample

1) if temperature is >5 °C

Table 97: Results of external monitoring for directly discharged process wastewater 2013 (Source: Measurement report, BH Amstetten, email 20-8-2014)

External Monitoring 13-11-2013 (direct discharges of process wastewater)					
Parameter		**Inflow to the WWTP (daily average)**	**Discharge to river Url (daily average)**	**Removal**	**ELV**
Q	m³/d	597	597	-	600
BOD	mg/l	368	4	99%	11
COD	mg/l	932	13	99%	41
TOC	mg/l	344	6	98%	14
total N	mg/l	66	8.4	87%	min. 75%
NH_4-N	mg/l	1.3	< 0.1	-	3
NO_3-N	mg/l	10.9	6.2	-	-
NO_2-N	mg/l	35.4	< 0.1	-	-
total N (Kjehldahl)	mg/l	19.7	2.2	-	-
total P	mg/l	10	0.4	96%	2
Chloride	mg/l	203[1)]	232[1)]	-	-[1)]
AOX	mg/l	-	0.011[1)]	-	0.1[1)]
pH		7.6[1)]	8.0[1)]	-	6.5-8.5[1)]
Separable lipophilic substances	mg/l	-	< 10[1)]	-	10[1)]
Settleable substances	ml/l		< 0.1		0.3[1)]

1) spot samples

A general compliance with all ELVs was observed on the day of sampling.

Methods for analysis – External monitoring	
Parameter	**Applied methods for sampling: Indirect discharge – external monitoring**
NH_4-N	DIN 38406-5
NO_3-N	ÖNORM M 6283
COD	DIN 38409-41/44
BOD	ÖNORM EN 1899-1
total N (Kjehldahl)	ÖNORM EN 25663
total P	ÖNORM EN ISO 6878
TOC	ÖNORM EN 1484
Settleable substances	DIN 38409-9
pH	DIN 38404-5
T	DIN 38404-4
Free Cl	ÖNORM M 6256
Total Cl	ÖNORM M 6256
Chloride	ÖNORM M 6283
Separable lipophilic substances	DIN 38409-19
Low volatile lipophilic substances	DIN 38409-17
AOX	(extern – unknown)
Total suspended solids	DIN 38409-2

Table 98: Methods applied for analysis in external monitorings (Source: Measurement report, BH Amstetten, email 20-8-2014)

2.3.7 Berglandmilch, 6300 Wörgl

2.3.7.1 General description

Name of the installation	Berglandmilch Lattellaplatz 1, 6300 Wörgl
IPPC activity	6.4 (c) since 2007
Products	milk, whey, cream, butter, yoghurt, cheese and curd cheese
Production capacity	280,000 tons of milk per year
Processed milk 2013	ca. 205,000,000 kg
Operating hours	7 days, 3 shift operation (cheesemaking) 5 days, 3-shift operation (milk filling) 5 days, 2-shift operation (cup filling)
Products 2013	Packaged cheese Cups/buckets Butter Soft packages (milk, sour cream, whey drinks)
Raw materials	Milk, whey (the production of whey drinks was abandoned in 2013), sugar, fruit preparations

Table 99: General description (Source: BH Kufstein, email 17-6-2014)

Production process

The installation is divided into two main lines: the milk processing line and the whey processing line.

The production processes are: delivery, inspection/approval, pumping into collection tanks using cooling systems and air separators, separation of skimmed milk and cream from raw milk, adjustment of the fat content of the products such as:

- fresh and ESL milk (different types of heat treatment, homogenisation using nozzles)
- milk drinks, puddings and other sweet desserts (preparation with aromatic ingredients, fruit or cacao)
- cheesemaking in 6 cheese vats (culture treatment, incubation, coagulation, cutting and washing of the curd, moulding, pressing, salting, maturing)
- butter (buttermaking and separation of buttermilk)
- sour cream, curd cheese (general heat treatment followed by: production of curd cheese, fermentation to produce sour cream)
- curdled milk products and natural as well as fruit yoghurt and whey drinks (inoculation with specific lactic acid bacteria and finishing with aromatic ingredients)

All products are packed and dispatched.

Until the end of 2013 extra whey was delivered in addition to the internally produced whey. The new cheesemaking plant went into operation in March 2014. Part of the whey is thickened in an evaporation line, then the condensate from evaporation will be used for cleaning the membranes and/or sent to the WWTP. Concentrated whey is transported to other locations for further processing.

2.3.7.2 Energy generation and use

Table 100: Combustion plants operated on site (Source: BH Kufstein, email 17-6-2014)

Combustion plants			
Steam boiler plants	**Number 1**	**Number 2**	**Number 3**
Type of combustion plant	heating plant	heating plant	biomass heating plant
Combustion Technology		Gas firing	grate furnace
Rated thermal Input (MW)	2.7 MW	3.5 MW	7.1 MW
Fuel	"extra light" heating oil	natural gas	wood and bark
Flue gas cleaning and discharge		20 m stack	multi cyclone, electrostatic precipitator, 15 m stack
Operating hours (h/a)			continuous
Steam production (t/h)			9.2 t/h
Steam parameter (p, T)			14 bar, 198 °C

Air emissions from the biomass plant		
Pollutant	**Half hour average (mg/Nm^3, 13% O_2)**	**ELV (half hour average)**
Dust (mg/Nm^3, 13% O_2)	16	20
NO_x (mg/Nm^3, 13% O_2)	119	200
CO (mg/Nm^3, 13% O_2)	19	100
Org. C (mg/Nm^3, 13% O_2)	5	20

Table 101: Air emissions from the biomass plant (Source: BH Kufstein, email 17-6-2014, measurements according to permit 3.1-249-K and emission limit values to permit 3.1-249-H)

Cooling for production processes is provided by an ammonia based cooling plant.

2.3.7.3 Waste management

Waste management 2014		
Type	**Amount (t)**	**Treatment/Disposal**
Expired foodstuff (employees)	1.6	authorised waste disposal company
Waste wood(e.g. packaging)	2.6	authorised waste disposal company
Paper and cardboard boxes	224.1	reamains in cardboard boxes
Document shredding	3.64	authorised waste disposal company
Wood ash, staw ash	366.04	internal wastewater treatment
Scrap	37.76	internal wastewater treatment
Non-ferrous scrap metal	0.185	internal wastewater treatment
Stainless steel V2A	7.94	internal wastewater treatment
Gas discharge lamps	0.074	authorised waste disposal company
Waste oil	0.354	authorised waste disposal company
Fats	0.015	authorised waste disposal company
Contents of sand traps	27.84	reamains in cardboard boxes
Solid grease and oil-contaminated operating materials (garage, industrial and filling station wastes)	0.346	authorised waste disposal company
Halogen-free solvent mixtures	0.203	internal wastewater treatment
Waste paints	0.073	internal wastewater treatment
Plastic packagins	21.521	internal wastewater treatment
Plastic foils	33.14	internal wastewater treatment
Municipal and commersial waste	213.4	authorised waste disposal company
Construction site waste (no building rubble)	2.3	
Mixed plastics	1.88	

Table 102: Different types of waste reported in the year 2014 (Source: BH Kufstein, email 3-10-2014, Verwertungs-Pass Berglandmilch Wörgl)

2.3.7.4 Noise emissions

Table 103: Noise emissions (Source: BH Kufstein, email 17-6-2014, partly from permit 3.1-249-H)

Noise emissions	
Sources	truck loading and transport, biomass heating plant
Measures to reduce noise pollution	several measures to reduce noise emissions e.g. housing of the biomass heating plant to reduce the immission level to 30 dB at a distance of 170 m (closest neighbour)
Control	sound level meters

2.3.7.5 Water and wastewater

Table 104: Summary of wastewater streams (Source: BH Kufstein, email 17-6-2014)

Water and Wastewater	
Partial wastewater streams	sanitary wastewater and process wastewater
Internal treatment of WW from the process	sanitary wastewater discharge into the municipal sewer system (indirect) process wastewater: direct discharge into the river Brixentaler Ache after passing the internal wastewater treatment plant (a part of appr. 550 m^3/d is sent to an external WWTP)
Description of the wastewater treatment plant	pre-treatment plant, 2 activated sludge basins, sludge line, final clarification basin On 9-2-2009 the increase of the hydraulic load (up to 2,100 m^3/d and 100 m^3/h) and the pollution load (up to 4,200 kg/d COD and 2,100 kg/d BOD) were permitted on the basis of certain technical changes; so far the aeration system and the capacity of the compressors have been increased; the originally planned extension of the final clarifier has not been implemented so far. Partially treated wastewater is (appr. 550 m^3/d) sent to the external WWTP Kirchbichl.
Description of external wastewater treatment plant	The process at the external wastewater treatment plant Kirchbichl consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a capacity of 90,000 population equivalents. The treated wastewater is discharged into the river Inn. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)
Measures in case of other than normal operating conditions	over-dimensioned aeration system at the activated sludge basin

Table 105: Emission limit values and minimal frequencies for self- and external monitoring of the process wastewater (Source: BH Kufstein, email 17-6-2014)

Process wastewater					
Parameter	**Unit**	**ELV Permit**	**Type of sampling (self- and external monitoring)**[1)]	**Min. frequency self-monitoring**	**Min. frequency external monitoring**
Q (discharge)	m^3/d	1,400 / 2,100[2)]		continuous	2 per year
T	°C	30		continuous	2 per year
pH		6.5-8.5		continuous	2 per year
COD	mg/l	75	fpdcs	3 times a week	2 per year
BOD	mg/l	20	fpdcs	monthly	2 per year
total N	%	75	fpdcs	3 times a week	2 per year
total P	mg/l	2.0	fpdcs	3 times a week	2 per year
Separable lipophilic substances	mg/l	10	fpdcs	-	2 per year
Settleable substances	ml/l	0.3	spot sample	daily	-
NH_4-N	mg/l	3.5[3)]	fpdcs	3 times a week	2 per year
Chloride	mg/l	-	fpdcs	-	-
Total Cl	mg/l	0.3	spot sample	-	2 per year
AOX	mg/l	0.1	fpdcs	-	2 per year
NO_3-N	mg/l	-	fpdcs	3 times a week	-
TOC	mg/l	25	fpdcs	-	2 per year

fpdcs. = flow proportional unsettled homogenised daily composite sample

1) Permit condition: Methods for sampling and analysis according to AEV Milchwirtschaft and AAEV

2) the higher value of 2,100 m^3/d applies upon finalisation of the second extension step

3) ELV applies at a temperature >12°C

In addition to the parameters given in the table above, concentrations of certain parameters are measured upstream (BOD, COD, total N and total P) to determine the loads to be treated in the the wastewater treatment plant as well as the removal efficiency. Also, the oxygen content in the activated sludge basin is monitored continuously as well as the sludge volume and the sludge index plus dry matter (daily).

Table 106: Summary of the results of self-monitoring 2013 – whole year (Source: BH Kufstein, email 26-6-2014, own calculation)

Self-monitoring 2013 (internally treated process wastewater) – whole year 2013								
Parameter		**Daily average – min**	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**Yearly average**	**ELV (daily average)**
Q (discharge)[1)]	m^3/d	687	2,329	1,388	1,948	1,612	1,400[2)]
T[1)]	°C	20.0	31.5	21.0	30.0	25.3	30
pH[1)]		7.3	8.1	-	-	7.5	6.5-8.5
COD	mg/l	20	75	31	67	51	75
COD removal	%	96	99	-	-	98	-
BOD	mg/l	6.0	29.0	7.0	24	14.6	20
BOD_5 removal	%	98	99	-	-	99	-
total N removal	%	73	99	88	95	92	75
total P	mg/l	1.4	2.1	1.6	1.8	1.7	2.0
Settleable substances[3)]	ml/l	0.1	0.2	0.1	0.2	0.1	0.3
NH_4-N	mg/l	0.2	8.5	0.4	2.8	1.3	3.5 (>12°C)
NO_3-N	mg/l	0.4	0.9	0.1	0.5	0.3	

1) continuous measurement

2) by the date of finalisation of the extended WWTP a new limit of 2,100 m^3/d will apply

3) spot sample

Data from self-monitoring cover the period Jannuary 2013 to December 2013. In general wastewater volumes exceeded the limit of 1,400 m^3/d. This was caused by an increase in the production and the fact that the higher limit of 2,100 m^3/d would apply only after finalisation of the second extension step (i.e. new final clarifier basin). In the meantime, part of the pre-treated wastewater (appr. 550 m^3/d) is sent to the WWTP Kirchbichl. In addition it was recognized that the aeration system was not functioning well; as a consequence all hose aerators were replaced.

Temperatures of >30°C were measured in the summer season June to September.

Exceedances of BOD_5 concentration levels (>20 to 29 mg/l) occurred in the period April to June due to a pollution overload of the WWTP and the weak performance of the aeration system. In the last quarter of 2013 daily average levels were below 12 mg/l and the removal efficiency in the range of 99%.

COD concentrations were generally in line with the ELV and even lower (below 35 mg/l as daily average) in the last quarter of 2013. The minimum efficiency of COD removal was 98% as a daily average.

In October an exceedance of the ELV for NH_4-N was observed on two days; all other daily average levels were below 2.5 mg/l in the last quarter of 2013.

N-removal efficiency was well above 85% in the last quarter of 2013 (daily average) with a maximum of 97%.

Settleable substances were fully compliant with the ELV with a maximum daily average of 0.2 ml/l.

The concentration of tot-P was exceeded once in April 2013, all other daily average levels were in compliance with the ELV (with concentration levels of 1.4 - 1.8 mg/l).

Table 107: Summary of the results of self-monitoring 2013 – last quarter, after a repair of the aeration system (Source: BH Kufstein, email 26-6-2014, own calculation)

Self-monitoring 2013 (internally treated process wastewater) – last quarter 2013						
Parameter		**Daily average – min**	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**ELV**
Q (discharge)[1)]	m³/d	903	1,949	1,392	1,476	1,400[2)]
T[1)]	°C	21.6	28.2	22.3	26.5	30
pH[1)]		7.7	8.1	-	-	6.5-8.5
COD	mg/l	20	51	31	34	75
COD removal	%	98	99	99	99	-
BOD	mg/l	8	12	7	11	20
BOD_5 removal	%	99	99	99	99	-
total N removal	%	85	97	91	95	>75
total P	mg/l	1.4	1.9	1.6	1.7	2.0
Settleable substances[3)]	ml/l	0.1	0.2	0.1	0.1	0.3
NH_4-N	mg/l	0.2	8.5	0.4	2.1	3.5 (>12°C)
NO_3-N	mg/l	0.4	0.7	0.1	0.3	

1) *continuous measurement*

2) *by the date of the finalisation of the extended WWTP a new limit of 2,100 m³/d will apply*

3) *spot sample*

Table 108: Summary of results of external monitoring 2013 (Source: BH Kufstein, email 17-6-2014)

External monitoring 2013					
Parameter		**Daily average (21-10-2013)**	**Daily average (25-11-2013)**	**ELV**	**Method**
Q (discharge)[1)]	m³/d	1,244[2)]	1,493[2)]	1,400[3)]	rectangular weir
T[1)]	°C	25.8	22.6	30	via sensor: WTW Multi 350i
pH[1)]		7.7	8.0	6.5-8.5	
COD	mg/l	41	29	75	ÖNORM M 6265
BOD	mg/l	10	5	20	ÖNORM M 6277
total N removal	%	89	97	75	ÖNORM ISO 7150-1
total P	mg/l	2.08	1.63	2.0	ÖN EN ISO 6878
Separable lipophilic substances	mg/l	< 5	< 10	10	DIN 38409-Teil 19
Settleable substances[4)]	ml/l	0.1	0.2	0.3	
NH_4-N	mg/l	10.9	0.43	3.5	ÖNORM ISO 7150-1
chloride	mg/l	386	373	-	ÖN EN ISO 10304-1
Total Cl[4)]	mg/l	< 0.1	< 0.1	0.3	ÖN EN ISO 10304-1
AOX	mg/l	0.025	0.017	0.1	EN ISO 9562
NO_3-N	mg/l	0.6	0.5	-	ÖNORM EN ISO 10304-1
TOC	mg/l	14.5	9.6	25	ÖNORM EN 1484
Processed milk	l/d	appr. 493,000	appr. 590,000		

1) continuous measurement

2) part of pre-treated wastewater (appr. 550 m³/d) is sent to the WWTP Kirchbichl

3) by the date of the finalisation of the extended WWTP a new limit of 2,100 m³/d will apply

4) spot sample

Compliance with ELVs could be observed for all parameters except NH_4-N (21-10-2013) and tot-P (21-10-2013). In general, the correlation between results of self- and external monitoring was good – the non-compliance of NH_4-N was also determined by self-monitoring (see above). On 25-11-2013 all parameters were in line with the ELVs (volume of wastewater has already been discussed above).

Table 109: Specific loads, calculations based on results of the external monitoring from 2013 (own calculation)

Specific loads – external monitoring 2013			
Specific loads	Unit	**Based on external monitoring from 21-10-2013**	**Based on external monitoring from 25-11-2013**
Inlet:			
Q inlet	m³/d	1,795	1,962
COD inlet	kg/d	6,570	7,632
BOD_5 inlet	Kg/d	3,428	4,022
N inlet	kg/d	219.7	237.4
P inlet	kg/d	105.7	74.2
Discharge:			
Q discharge	m³/d	1,244[1)]	1,493[1)]
COD discharge	kg/d	51	43.3
BOD_5 discharge	kg/d	12.4	7.5
N discharge	kg/d	17.3	5.8
P discharge	kg/d	2.6	5.4
Milk processed	t/d	492.500 l (502 t) +430.000 l whey[2)]	590.000 l (602 t) (no additional whey)
Untreated wastewater			
Q (specific wastewater)	l/l	3.6	3.3
COD per ton of milk	kg/t	13.1	12.7
BOD_5 per ton of milk	kg/t	6.8	6.7
total N per ton of milk	kg/t	0.44	0.39
total P per ton of milk	kg/t	0.21	0.12
Treated wastewater			
Q (specific wastewater)	l/l	3.6	3.3
COD per ton of milk[3)]	kg/t	0.147	0.095
BOD_5 per ton of milk[3)]	kg/t	0.036	0.016
N per ton of milk[3)]	kg/t	0.050	0.013
P per ton of milk[3)]	kg/t	0.007	0.012

1) part of pre-treated wastewater is sent to the external WWTP Kirchbichl

2) the additional whey is not included in the calculation of the loads

3) based on the assumption that the removal efficiency of the external WWTP is the same as for the internal WWTP

Differences in the specific load values can be explained by the fact that no whey was processed at the date of the second external monitoring period. Regarding the specific load for total N the removal efficiency was lower on 21st October 2013.

2.3.8 Berglandmilch, 5134 Feldkirchen b. M.

2.3.8.1 General description

Table 110: General description (Source: BERGLANDMILCH 2014, Amt der OÖ Landesregierung, email 28-8-2014, BH Braunau, email 2-9-2014)

Name of the installation	**Berglandmilch reg.Gen.m.b.H., Ottenhausen 35, 5134 Feldkirchen bei Mattighofen**
IPPC activity	6.4 (c) (cheesemaking)
Capacity	860,000 l/d processed milk
Proces-sed/delivered Milk	2011: ca. 268 million kg of milk 2012: ca. 292 million kg of milk 2013: ca. 280 millionkg of milk
Products	foil-matured sliceable cheese mozarella
Operating hours	7-day, 3-shift operation (about 90 employees)
Raw materials	Milk, salt
Auxiliary materials	NaOH, KOH, H_3PO_4, HNO_3, active chlorine, H_2O_2, peracetic acid, nitrilotriacetic acid, P3-ultrasil 110 (5-10% EDTA and 2-5% LAS, consumption 2012: 13,500 kg); P3-ultrasil 112 (2-5% LAS; consumption 2012: 225 kg); P3-ultrasil 115 (7-10% EDTA, consumption 2012: 6,200 kg)
Description	The site in Feldkirchen bei Mattighofen is the largest cheese factory of Berglandmilch.

LAS: Linear Alkylbenzene Sulfonate

2.3.8.2 Energy generation and use

Table 111: Energy procurement 2013 (Source: BH Braunau, email 2-9-2014)

Energy procurement 2013	
Electrical power	ca. 16 MWh
Consumption of natural gas	ca. 31 MWh (2 steam boilers)

Main consumers of energy are the pasteurisation and whey thickening units.

So far no energy management system has been installed.

Table 112: Combustion plants operated on site 2013 (Source: BH Braunau, email 2-9-2014)

Combustion plants 2013		
	Number 1	**Number 2 (reserve plant)**
Type of combustion plant	Steam boiler	Steam boiler
Combustion Technology	Gas or oil firing	Gas firing
Rated thermal Input (MW)	6.878	5.778
Rated thermal Output (MW)	6.530	5.200
Fuel	Natural gas	Natural gas
Flue gas temperature (°C)	61-132	
Operating hours (h/a)	8664	96
Steam production (t/h)	10	6
Steam parameter (p, T)	max. 16 bar, 204 °C	max. 10 bar, 184 °C
Fuel use	94.9% (incl. Economiser 0.381 MW)	90%

Table 113: Air emissions for steam boilers (Source: Source: BH Braunau, email 2-9-2014)

Air emissions for the 2 steam boilers 2013			
Pollutant	**Number 1** **Short term emission level[1)]**	**Number 2** **Short term emission level[2)]**	**Emission Limit Value**
NO_x (mg/Nm³, 3% O_2)	91.5 (90-93)	94.5 (83-109)	100
CO (mg/Nm³, 3% O_2)	3.75 (1-8)	1.5 (0-3)	80

[1)] average of 4 measurements (30min) at 6,355, 4,375, 2,915 and 1,241 kW

[2)] average of 5 measurements (each 30min) at 5,083, 4,022, 3,013, 2,006, 1,645 kW

2.3.8.3 Air emissions

Noise and Odour

No statutory requirements need to be observed. There have been no complaints from neighbours until now.

2.3.8.4 Water and wastewater

Fresh water comes from the public water supply grid (100 m³/d) and a company-owned well (1,500 m³/d).

Table 114: Wastewater treatment (Source: WB Berglandmilch, Amt der OÖ Landesregierung, email 28-8-2014)

Water and wastewater	
Water consumption 2013	688,000 m³/y
Treatment of wastewater	• Separation of all partial wastewater streams. • The process wastewater is discharged indirectly into the municipal sewer system after an internal wastewater treatment (mechanical sieve, biological treatment (3 SBR reactors), buffer tank, filter belt press for sludge dewatering) • Cooling waters are separately discharged into the stream called Otterbach (max 450 m³/d)
Description of external wastewater treatment plant	The process at the external wastewater treatment plant Braunau und Umgebung includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a capacity of 38,500 population equivalents (EW, equivalent to about 3,850 kg COD of which a maximum of 312 kg stem from Berglandmilch). The treated wastewater is discharged into the river Inn. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014 and Wasserbuchauszug 19-8-2014)

Direct Discharge into the Otterbach

Currently reverse osmosis (RO) permeate and cooling water are discharged with a maximum allowed quantity of 700 m³/d (average 8 l/s, strongly fluctuating). The Otterbach itself has a minimum temperature of 2°C in winter and a flow of 4-22 l/s. Water fed into the Ottenbach has a maximum temperature of 23°C and an increase of the temperature of 15°C has already been measured. Due to the impacts on the water quality the discharge of cooling/RO-water will be stopped completely during the next years (finally 2016). Currently, permeate from reverse osmosis is used for cleaning purposes in order to reduce the wastewater volume (source: negotiation protocol from 9-12-2013).

Table 115: Emission limit values for indirectly discharged process wastewater (WB Berglandmilch Feldkirchen, Amt der OÖ Landesregierung, email 28-8-2014)

Process wastewater					
Parameter	**ELV Permit**	**Self-contol – type of sample**	**External monitoring – type of sample**	**Min. frequency for self-monitoring (permit)**	**Min. frequency for external monitoring**
Q (discharge)	2,600 m^3/d and 30 l/s	Continuous (MID)	stationary counter	daily	4 consecutive production days per year
BOD_5 load	104 kg/d	fpdcs	fpdcs	weekly	4 consecutive production days per year
COD load	312 kg/d	fpdcs	fpdcs	3 per week	4 consecutive production days per year
total P load	52.0 kg/d	fpdcs	fpdcs	3 per week	4 consecutive production days per year
total N load	41.6 kg/d	fpdcs	fpdcs	3 per week	4 consecutive production days per year
Settleable substances	10 ml/l	fpdcs	fpdcs	daily	4 consecutive production days per year
pH	6.0-10.5	continuous	fpdcs	continuous	4 consecutive production days per year
T	35 °C	continuous	-	continuous	4 consecutive production days per year
Low volatile lipophilic substances	100 mg/l	-	fpdcs	-	4 consecutive production days per year
AOX	1.0 mg/l	-	fpdcs	-	4 consecutive production days per year

fpdcs = flow proportional unsettled homogenised daily composite sample

Some parameters are measured more frequently than required by the permit (e.g. COD daily instead of 3 times per week).

Table 116: Summary of results of self-monitoring 2013, own calculation based on data from the self-monitoring (Source: Amt der OÖ Landesregierung, email 28-8-2014)

Self-monitoring 2013 (indirect discharged process wastewater)						
Parameter		**Daily average – min**	**Daily average – max**	**Annual average**	**Number of fpdcs**	**ELV**
Q (discharge)	m³/d	692	3,370	2,003	365 (continuous)	2,160/ 2,600[2)]
COD	mg/l	90	277	187	276	-
total P	mg/l	10.1	22	16	256	-
total N	mg/l	1.1	22	12	255	-
BOD	mg/l	16	48	32	54	-
COD load	kg/d	116	624	372	276 (calculated)	200/ 312[1), 2)]
total P load	kg/d	12	55	31	256 (calculated)	52.0[1)]
total N load	kg/d	2.2	46.7	23.7	255 (calculated)	41.6[1), 2)]
BOD_5 load	kg/d	25	121	66	54 (calculated)	32/104[1), 2)]

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] as a weekly average

[2)] higher ELVs apply from 30-9-2014 (with finalisation of the 1. stage of the extended WWTP)

Retrofitting the existing WWTP

Due to the observed exceedances of the emission limit values (especially COD and wastewater volume) it is planned and approved by the authority to build an additional SBR reactor and to implement additional measures (e.g. maximum temperature in the reactor: 35°C, optimised use of precipitating agent with continuous detection of wastewater inflow to each SBR reactor). A second expansion stage includes a completely new flotation unit and one SBR reactor will be used for mixing and equalizing.

The first expansion stage must be completed until 30-9-2014. (source: permit 9-5-2014 and Berglandmilch, email 10-12-2014)

The maximum volume of discharged wastewater after completing the second expansion stage will be 4,500 m³/d (source: negotiation protocol from 9-12-2013).

Table 117: Results of external monitoring 2014 (Source: Measurement report, Mahringer & Watschinger Labor GmbH from Amt der OÖ Landesregierung; corrected by own calculation, email 28-8-2014)

External monitoring 2014 (5 fpdcs between 6-3-2014 and 10-3-2014)						
Parameter	**Unit**	**Daily minimum**	**Daily maximum**	**Daily average**	**ELV**	**Method**
Q (dis-charge)	m³/d	1,737	2,118	1,964	2,160/2,600[1)]	stationary counter (MID)
BOD_5 load	kg/d	21	63	39	32/104[1), 2)]	DIN 38409-H51
COD load	kg/d	139	306	202	200/312[1), 2)]	DIN 38409-T41
total P load	kg/d	22	29	25	52.0[2)]	DIN 38405-T11
total N load	kg/d	2.84	4.02	3.30	41.6[2)]	DIN 38409-T11
Settleable substances	ml/l	< 0.1	< 0.1	< 0.1	10	DIN 38409-H9
pH		7.0	7.7	7.4	6.0-10.5	DIN 38404-C5
Low volatile lipophilic substances	mg/l	3.8	5.1	4.5	100	DIN 38409-H17
AOX	mg/l	0.02	0.18	0.08	1.0	DIN EN 1485-1

1) higher ELVs apply from 30-9-2014 (with finalisation of the 1. stage of the extended WWTP)

2) as a weekly average

Processed milk between 6-3 and 10-3-2014: ca 3,800,000 kg

External monitoring in the year 2013 has been carried out at 5 consecutive production days instead of only 4 (required by permit).

2.3.9 Berglandmilch, 4600 Wels

2.3.9.1 General description

The installation in Wels has been taken over by Berglandmilch eGen in 2009 which in total operates 12 installations in Austria. The location in Wels is specialised in the production of cottage and cream cheese (BERGLANDMILCH 2014).

Table 118: General description (Source: Magistrat der Stadt Wels, email: 1-7-2014)

Name of the installation	Berglandmilch Wels, Schubertstraße 30, A-4600 Wels
Processed milk 2013	ca. 48,000,000 kg
Products 2013	Cottage Cheese Heat treated curd cheese Curd cheese Cream cheese
Employees 2013	85
Operating hours	3-shift operation, 5-7 days a week
Raw materials	Milk

2.3.9.2 Energy generation and use

Combustion plants at Berglandmilch Wels are described in Table 119 and Table 120.

Table 119: Overview of combustion plants operated on site (Source: Magistrat der Stadt Wels, email: 1-7-2014)

Combustion plants operated on site			
	Nr. 1	**Nr. 2**	**Nr. 3**
Type of combustion plant	steam boiler	steam boiler	Gas engine, combined heat and power
Rated thermal Input (MW)	2.950	2.950	1.456
Start of operation	1965	1966	permit from 2000
Fuel	Fuel oil	gas	Biogas
Flue gas volume (Nm^3/h) – max		3,110	2,413
Flue gas temperature (°C)		180	120
Operating hours (h/y)	459	6,259	8,086

Table 120: Gas engine: Emission limit values and emission levels (Source: Control measurement; 6-12-2012; Magistrat der Stadt Wels, email: 1-7-2014)

ELV and Emission levels from the gas engine		
Pollutant	**Short term emission level (mg/Nm³, 5% O_2)**	**Emission Limit Value (mg/Nm3, 5% O_2)**
NO_2	195-341	400
CO	94-100	650
org. C	31-70	150
H_2S	< 1	5

2.3.9.3 Noise emissions

Table 121: Noise emissions and countermeasures (Source: Magistrat der Stadt Wels, email: 1-7-2014)

Noise emissions and countermeasures	
Sources	power plant
Measures to reduce noise emissions	inlet and exhaust silencers

2.3.9.4 Water and wastewater

Table 122: Overview of wastewater streams (Source: Magistrat der Stadt Wels, email: 1-7-2014)

Wastewater	
Partial wastewater stream	Rain and cooling water: absorbing well Process wastewater: indirect discharge (Abwasserverband Welser Heide) after internal treatment via neutralisaton
Description of external WWTP	The process at the external wastewater treatment plant Welser Heide consists of biological treatment, a nitrification plus denitrification stage and phosphate removal with a maximum of 160,000 population equivalents (based on EW_{60}) of which a maximum of 30,000 comes from Berglandmilch (population equicalent based on EW_{100}, COD). The treated wastewater is discharged into the river Traun. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Rain and cooling water is separately discharged by an absorbing well with the emission limit values shown in Table 123. The use of groundwater for the cooling process is limited to 22 hours a day.

Table 123: Emission limit values for the direct discharge of rain and cooling water (WB BERGLANDMILCH WELS)

Rain and cooling water	
Parameter	**Limit**
Q (discharge)	600 m^3/d, 33 l/s
T	5-15 °C
T spread	< 6 K

Process wastewater is discharged indirectly into the municipal sewer system. Regulated parameters and monitoring frequencies are shown in Table 124.

Table 124: Emission limit values and monitoring frequency for the indirect discharge of process wastewater (WB BERGLANDMILCH WELS AND Messbericht OIKOS)

Process wastewater					
Parameter	**Unit**	**ELV Permit1)**	**Self-monitoring – type of sample**	**Self-monitoring – frequency**	**External monitoring – frequency**
Q (discharge)	m³/d	900 and 20 l/s	continuous	daily	2 times per year
T	°C	35	continuous	continuous	2 times per year[2)]
pH		6.0-10.5	fpdcs	continuous	2 times per year[2)]
COD load	kg/d	3,000 per day and 1,700 kg/d as a weekly average	fpdcs	daily	2 times per year[3)]
BOD_5 load[4)]	kg/d	-	-		2 times per year[3)]
Conductivity[4)]	µS/cm	-	-		2 times per year[2)]
total N load	kg/d	130 (weekly average)	-		2 times per year[3)]
total P	mg/l	30	fpdcs	daily	2 times per year[3)]
Separable lipophilic substances	mg/l	60[5)]/200[6)]	-		2 times per year
Low volatile lipophilic substances	mg/l	200	-		2 times per year[3)]
Settleable substances	ml/l	10	fpdcs	daily	2 times per year[2)]
NH_4-N	mg/l	40	fpdcs	daily	2 times per year[3)]
Total Cl	mg/l	0.24	-		2 times per year[2)]
AOX	mg/l	0.8	-		2 times per year[3)]
Sulphide	mg/l	0.2	-		2 times per year[2)]
Zn	mg/l	0.8	-		2 times per year[3)]

fpdcs. = flow proportional unsettled homogenised daily composite sample; methods for sampling and analysis according to AEV Milch and AAEV (Appendix)

1) *ELVs are identical with the limit values given in the contract with the operator of the external WWTP*

2) *spot sample (taken on 5 consecutive days within a representative week)*

3) *based on a flow proportional unsettled homogenised daily composite sample*

4) *no ELV, but measured during external monitoring*

5) *separable lipophilic substances DIN 38409-H19*

6) *low volatile lipophilic substances DIN 38409-H56*

External monitoring – permit condition: at least every 6 months; based on flow proportional daily composite sample of a representative operating week; sample and analyses has to be done in line with the General Ordinance on Wastewater Discharge (FLG. Nr. 186/1996) and the Specific Ordinance on Diaries (FLG. II Nr. 11/1999); external monitoring includes a quality check of self-monitoring and a compliance check with ELVs as well as a check of the general condition of the WWTP, technical inspection of measuring devices and an assessment of the log book.

Self-monitoring also requires record keeping in a log book (recording of daily measurements of Q (m^3/d), COD (kg/d), P (mg/l, kg/d), NH_4-N (mg/l, kg/d), pH, T, settleable substances (ml/l); functioning of sampling devices, malfunctions of operational units, maintenance and calibration).

The following table shows summarised results of self-monitoring for the second half of the year 2013 (Source: Messbericht OIKOS):

Table 125: Results of self-monitoring of the second half of the year 2013 (Source: OIKOS Umweltmanagement GmbH: Bericht über die Fremdüberwachung 2013, Teil 2)

Self-monitoring (June – December 2013, based on representative flow proportional daily composite samples)[1)]					
Parameter		**Daily average min**	**Daily average max**	**Long term average (June – December 2013)**	**ELV**
Q (discharge)	m^3/d	133	900	692	900
T	°C	21.9	32.3	29.0	35
COD	kg/d	190	1,646	1,015	3,000 (1,700 kg/d as a weekly average)
total P	mg/l	8.0	22.0	16.7	30
NH_4-N	mg/l	1.0	25.0	14.0	40

[1)] average values include non operating periods (weekends)

Results of self-monitoring show general compliance with ELVs.

The following table gives summarised results of external monitoring in the second half of the year 2013 (Source: OIKOS Umweltmanagement GmbH: Bericht über die Fremdüberwachung 2013, Teil 2)

Table 126: Summary of results of external monitoring of the second half of the year 2013 (Source: OIKOS Umwelt-management GmbH: Bericht über die Fremdüberwachung 2013, Teil 2)

2nd external monitoring 2014 (representative flow proportional daily composite samples between 29-11-2013 and 06-12-2013)						
Parameter		**Weekly average**	**Daily average – max**	**Daily average – min**	**ELV**	**Method**
Q (discharge)	m³/d	695	869	362	900	venturi ultra-sound
Conductivity	µS/cm	1,273	1,440	1,030	-	ÖN EN 27888
pH		7.9	8.6	7.1	6.0-10.5	DIN 38404-C5
COD	kg/d	942	1,538	206	3,000	ÖN M 6265
BOD	kg/d	477	797	99	-	ÖN EN 1899-1
total N	kg/d	52.2	138.0	28.5	130 (weekly average)	ÖN EN 12260
total P	mg/l	14.0	20.0	7.8	30	ÖN EN ISO 6878
Low volatile lipo-philic substances	mg/l	129	192	59	200	DIN 38409-H56
NH_4-N	mg/l	3.53	5.66	2.38	40	DIN 38406-E5
AOX	mg/l	< 0.05	< 0.05	< 0.05	0.8	ÖN EN ISO 9562
Zn	mg/l	0.18	0.24	0.11	0.8	ÖN ISO 8288
Total Cl	mg/l	0.2	0.2	0.1	0.24	ÖN EN ISO 7393
Sulfide	mg/l	< 0.1	< 0.1	< 0.1	0.2	ÖN M 6615
Settleable sub-stances	ml/l	0.68	0.9	0.4	10	ÖN M 6271

Processed milk in the period from 29-11-2013 to 06-12-2013: ca. 900 t.

Table 127: Specific loads – calculations are based on results of self-monitoring and external measurements shown above (own calculation):

Specific loads				
Parameter	**External monitoring 2013**		**Self-monitoring (average June-December 2013)**	
	Unit	**Value**	**Unit**	**Value**
Q	m³/week	4,865	m³/d	692
COD load	kg/week	6,594	kg/d	1,015
BOD_5 load	kg/week	3,338	-	-
total N load	kg/week	365	-	-
total P load	kg/week	68	kg/d	11.6
Milk processed	t/week	890	t/d	124
Specific wastewater	l/l	5.36	l/l	5.47
COD per ton of milk	kg/t	7.41	kg/t	8.20
BOD_5 per ton of milk	kg/t	3.75	-	-
N per ton of milk	kg/t	0,41	-	-
P per ton of milk	kg/t	0.08	kg/t	0.09

Data show a general compliance with ELVs.

2.3.10 Obersteirische Molkerei, 8720 Knittelfeld

2.3.10.1 General description

Name of the installation	**Obersteirische Molkerei eGen, Hautzenbichlstraße 1, 8720 Knittelfeld**
IPPC activity	6.4 (c) (mainly cheesemaking)
Products	Milk, milk powder, whey powder, processed cheese, butter, hard and semi hard cheese, curd cheese
Processed Milk	200-300 t/d (total 2012: 119,733 t)
Products (2012)	5,277 t hard-, soft- and semi hard cheese 5,637 t curd cheese 2,329 t butter 4,418 t whey- and milk powder (including concentrates) 27,002 t milk and skimmed milk
Operating hours	152 employees about 6,000 production hours per year (365 days per year), 3-shift-operation
Auxiliary materials (2012)	cleaning agents: nitric acid (97,765 kg), sodium hydroxide solution (215,720 kg), sodium hydroxide (solid, 19,175 kg) other cleaning agents: 7,120 kg (acidic and alkaline cleaner from Ecolab) disinfectants: 15,202 kg (Ecolab) lubricants: 647 kg (food grade lubricants only) refrigerants: 110 kg

Table 128: General description, reference year 2012 (Source: BH Murtal, letter from 23-7-2014 and OBERSTEIRISCHE MOLKEREI 2014)

Production process

Delivery, inspection/approval, separation of skimmed milk and cream from raw milk via centrifuges, pasteurisation, adjustment of the fat content of the skimmed milk with cream for further processing, namely:

- butter making
- production of curd cheese
- cheese making (including processed cheese)
- production of whey and milk powder in the factories own drying facility

All products are packed and dispatched.

2.3.10.2 Energy generation and use

Energy procurement 2012	
Electrical power (all external)	7,315,418 kWh
Natural gas	3,384,219 m³ (~33,842,190 kWh)
Heating oil extra light	55,555 l (~633,327 kWh)
Diesel	32,649 l
Total	42,117,426 kWh

Table 129: Energy procurement 2012 (Source: BH Murtal, letter from 23-7-2014)

Table 130: Combustion plant operated on site (Source: BH Murtal, letter from 4-11-2014)

Combustion plant 2014	
Type of combustion plant	steam boiler
Rated thermal Input (MW)	9.16
Start of operation	1990
Fuel	natural gas
Flue gas ccleaning	Low NO_x Burner
Fuel use (%)	93.9
Oxygene content (%)	3.4
Short time emission level (half hourly mean value on 7-4-2014)	
NO_x (mg/Nm^3)	123
CO (mg/Nm^3)	< 1
Dust (mg/Nm^3)	< 1
Emission limit values (30 min average)	
NO_x (mg/Nm^3)	-[1)]
CO (mg/Nm^3)	100
Dust (mg/Nm^3)	10

1) no ELV (Low NO_x burner)

Table 131: Specific consumptions per ton of processed milk 2012 (Source: BH Murtal, letter from 23-7-2014)

Specific consumptions per ton of processed milk 2012	
Natural gas	28.26 Nm³/t
Electrical power	61.1 kWh/t
Wastewater	2.07 m³/t
Cleaning agents and disinfectants	0.19 kg/t
Acid	0.82 kg/t
Brine	1.80 kg/t

2.3.10.3 Waste management

Table 132: Different types of waste reported in the year 2012 (Source: BH Murtal, letter from 23-7-2014)

Hazardous waste	
Type	**Amount**
Gas discharge lamps	160 kg
Electriconic waste	480 kg
Non-hazardous waste	
Type	**Amount**
Whey	12,620,000 kg
Paper and carton	21,420 kg
Residual waste	52,214 kg
Iron (e.g. buckets and containers)	7,660 kg

Treatment/Disposal is carried out by authorised disposal companies. Whey and biowaste are given to external biogas plants.

2.3.10.4 Noise emissions

- Housing of the wastewater tank to reduce the sound level to 37 dB (reduction of 10 dB) at a distance of 18 m under full-load operation.
- 15 tanks (for raw milk, products and also cleaning agents) which are fitted with an agitator give a maximum sound level of 60 dB(A) at a distance of 1 m to the agitator.
- Several noise measurements at neighbour-sites to determine the actual noise levels and sources of noise to be able to set countermeasures, if required. (Source: BH Murtal, letter from 23-7-2014)

2.3.10.5 Water and wastewater

Table 133: Overview about the consumption and treatment of water 2012 (Source: BH Murtal, letter from 23-7-2014)

Consumption and treatment of water 2012	
Consumption of fresh water	247,195 m³/y; (own wells: 172,627 m³, public grid: 74,568 m³)
Wastewater	248,009 m³/y
Internal treatment of WW from the process	neutralisation tank, indirect discharge to the wastewater treatment plant
Measures in case of other than normal operating conditions	Buffer tank, discharge is stopped automatically if the pH-ELV is exceeded (continuous measurement)
Describtion of the process wastewater	cleaning water from the CIP system, rinse water from the production
Description of external WWTP	The process at the external wastewater treatment plant Wasserverband Knittelfeld und Umgebung (A-9871 Seeboden) includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capacity of 70,000 population equivalents (the maximum value from Obersteirische Molkerei is unknown but limited by a civil law contract with the external WWTP). The treated wastewater is discharged into the river Mur. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

The emission limit values for indirect discharged process wastewater are given by the contract with the external wastewater treatment plant (Abwasserverband Knittelfeld und Umgebung). These EMLV are identical to those of the Ordinance for dairies; however, additional emission limit values are prescribed for both CSB and BSB5 loads. (Source: BH Murtal, letter from 23-7-2014)

2.4 Production of sugar

In Austria sugar is industrially manufactured exclusively using sugar beet. Therefore the beets are washed, cut into thin slices called cossettes and transferred into the extraction apparatus called diffuser. Hot water (68-72 °C) is used to extract the sugar. The crude juice extraction still contains unwanted components which must be removed by the use of lime and carbon dioxide. The result is thin juice with 16% saccharose. The crystallisation process takes place in pans in which the juice is boiled under vacuum to reduce the involved temperatures to a peak of 80 °C. Most of the non-sugar substances remain in the liquid phase and can be separated as molasses by centrifugation. To increase the purity from 96 to 99.96% the sugar can be recrystallised in water. Sugar must be dedusted and cooled in order to be stored in silos.

From the environmental perspective, high amounts of wastewater as well as a high heat demand have to be considered. The wastewater treatment has to deal with high amounts of dissolved and solid organic matter. Both Austrian sugar plants are direct dischargers. Additionally huge amounts of sugar beet pulp arise which can be sold as sweet feed for cattle. Molasses can be added to the beet pulp or used for the production of products like yeast, citric acid or ethanol production by fermentation.

In Austrian, sugar beet is cultivated on an area of about 45,000 hectares and roughly 3 million metric tons of sugar beet are harvested per year. Average yearly consumption of sugar in Austria comes to 35-38 kg of sugar per capita. AGRANA Zucker GmbH is the only sugar producer in Austria which also holds stakes in six eastern European countries. (AGRANA 2013, EUROPEAN COMMISSION 2006, ULLMANN 2007 and verbal information from 15-4-2015)

2.4.1 Agrana Zucker, 3430 Tulln

2.4.1.1 General description

The plant in Tulln houses the management of AGRANA. Also the second largest sugar silo in Europe was erected in 2011 (70,000 t) so that the total storage capacity in Tulln is now 182,000 t. Almost the whole product range for household purposes is packed at this installation. The daily sugar beet processing is about 13,000 t during the campaign *(Source: AGRANA 2014).*

Table 134: General description (Source: Agrana Zucker GmbH, email 29-7-2014)

Name of the installation	**Agrana Zuckerfabrik Tulln, Josef-Reither-Straße 21-23, 3430 Tulln**
IPPC activity	6.4 b2: Plants for production and refining of sugar from sugar beets or raw sugar with a production capacity greater than 300 tonnes per day 1.1: Combustion installations > 50 MW
Products	appr. 2,000 t/d white sugar, ca. 600 t/d animal feed
Capacity	12,000 t sugar beet per day
Operating hours	Campaign, appr. 3,500 h/a
Auxiliary materials	Limestone for juice-purification

2.4.1.2 Energy generation and use

Agrana operates three high-pressure steam boilers (41 bar) with a rated thermal input of 127 MW in total powered by natural gas.

Table 135: Related air emissions and ELV for all three steam boilers measured in the year 2012 (Source: Agrana, email 12-11-2014)

Air emissions and ELV		
Pollutant	**2012** **Short term (30 min) emission level maximum**	**ELV** **(30 min measurement)**
Dust (mg/Nm³)	-	10
NO_x (mg/Nm³)	190, 201 and 264	300
CO (mg/Nm³)	< 5 (all 3)	100

Two boilers produce hot water for heating the buildings (3.7 MW each).

Limekiln:

For the process of juice-purification a lime-kiln is operated (slake-lime is mixed with raw-juice, heated up to more than 90 °C and mixed with fluegas (CO_2) from the kiln to precipitate none-sugars and lime contained in the raw juice). The capacity of the vertical kiln is approximately 300 m³/d. There are no emission limits in the actual permit (gases from the kiln are used for carbonatation of the juice)

Drying of extracted beets is done in two drum-drying units:

Table 136: Drying of extracted beets (Source: Agrana Zucker GmbH, email 29-7-2014)

Drying of extracted beets	
Type of drying	2 rotary kiln drum drying units, combined with a low-temperature drying facility (upstream)
Type of burner	gas burner
Rated thermal input (MW)	14 MW each
Start of operation	2013: reduced capacity (previously: 30 MW each)
Fuel	natural gas
Flue gas cleaning	cyclone, waste gas is used in the low-temperature drying process
Flue gas temperature (°C)	rotary kiln north: appr. 95°C rotary kiln south: appr. 110°C
Operating hours (h/a)	3.360
Energy recovery	condensation of vapour after crystallisation, flue gas from boilerhouse, condensation of vapour after high temperature dryers; use of waste heat in the low-temperature drying process

Emission limit value for dust has been set at 10 mg/m^3 and is measured after the low-temperature drying process. Frequency of measurement is once every five years. ELV for noise (38,7 db) and odour (1,000 odour units) have been set as well (Frequency of measurement is once every five years). ELVs are calculated as mean-value over all four ducts of the LTD.

Low temperature drying (LTD)

In order to reduce the amount of energy needed during the production of animal feed (as a by-product of sugar production), AGRANA use so-called "low-temperature drying facilities" at its facilities in Tulln and Leopoldsdorf at the start of the campaign season 2012. This enables the de-sugared and pressed beet pulp to be pre-dried in a particularly efficient way before being final-dried in rotary-drum high temperature driers and then turned into dried beet pulp pellets, a popular kind of feed for livestock farming. By harnessing waste heat from upstream production steps, it is possible to cut annual energy consumption of the drying process by around 50 percent. Moreover, the new facilities not only reduce odour and dust emissions but also reduce the burden of CO_2 emissions on the environment by almost 20 percent annually. (Source: Agrana press release; www.agrana.com)

Type of fuels: natural gas, biogas, coke (limekiln)

- Main energy consumers are pulp drying, sugar production and storage.
- An Energy management system is implemented since March 2014.

2.4.1.3 Waste management

Table 137: Generation of solid waste (Source: Agrana Zucker GmbH, email 29-7-2014)

Hazardous waste	
Type	**Treatment / Disposal**
Cooling appliances	Licensed disposal company
Used screens	
Lead accumulators	
Fluorescent tubes	
Waste oils	
grease	
Materials containing oil and grease	
Non halogenated solvents	
Paints	
Glues	
Polyolefines	
Pressurised gas containers	
Non hazardous waste	
Type	**Treatment / disposal**
Wood waste – non contaminated	Licensed disposal company
Waste paper	
Filtermaterials	
Glass	
Ironwaste	
Electronic scrap	
Municipal solid waste and industrial waste	
Packaging waste	
Mixed waste for composting	

By-products:

- Lime is dewatered and stored on site, it is reused in agriculture as fertilizer
- Sewage sludge contains only remanents from the production process (no domestic wastewater included): appr. 1,000 t per year; is pumped to the pre-sedimentation ponds together with sugar beet soil
- Sugar beet soil: accumulates in the pre-sedimentation ponds (appr. 5.5-7% of sugar beet; 60,000 t per year); ponds are emptied after sufficient dewatering, at latest after two years; wastewater is sent to the WWTP
- Molasses: used as feed-stuff (mixture with pressed pulp before drying) and raw material for fermentation-industry. The major part (also molasses from the second site Leopoldsdorf) is used internally for production of another sugar-rich juice, that is crystallised in another so called "thick-juice"-campaign, further more a betain-containing fraction is produced, the remaining fraction is used for feed-production (like normal molasses – mixed with pressed pulp before drying) or as fertilizer

2.4.1.4 Odour emissions

Sources of odour emissions are the storage facilities for sugar beets, drying of extracted sugar beets and the sedimentation ponds.

Measures against odour:

- Using cold water from the Danube or groundwater to wash the beets. Thus microbiological activity and odour nuisance are reduced.
- Application of the low-temperature drying process

2.4.1.5 Noise emissions

Sources of noise emissions are delivery and handling of sugar beets, boiler house, sugar house, limekiln and stacks.

Measues include encapsulation and installation of silencers, as well as management of the whole delivery process. Periodic noise measurements are carried out at defined spots (installations boundaries).

2.4.1.6 Water and wastewater

(Note: Information given in this subchapter has been taken from relevant permits, in particular permit WA1-27.967/035-2005, dated 11-5-2011; permit WA1-W-27.967/33-02, dated 23-8-2002; permit WA1-27.967/25-98, dated 8-6-1998; permit WA1-27.967/22-98, dated 11-5-1998)

The majority of the organic pollution of the WW comes from sugar beet washing. Every wastewater stream during beet-campaign containing high loads of organic substances is first collected in the sedimentation ponds, which act as a buffer and equalisation system. Thus, pollution peaks will not occur at the WWTP.

The WWTP includes pre-sedimentation (there are 4 sedimentation ponds with an operational volume of 55,000 to 60,000 m^3, respectively). During normal operation (average soil content of the sugar beets), one sedimentation pond is in operation and a second one is used as reserve.

After pre-sedimentation, water is sent to anaerobic treatment, followed by aerobic treatment (2 aeration tanks, including denitrification; design parameter: 9 t COD/d and 5.3 t BOC/d; in case of a malfunction of the anaerobic part: 22.5 t COD/d and 15 t BOC/d).

Anaerobic treatment reactor is designed to deal with 31 t COD/d (whole WWTP: 40 t/d as average), 19.2 t BOD/d and a hydraulic load of 5,700 m^3/d, removal rates of 95% will be achieved if the COD concentration is between 25-40 g/l and a sludge content of 6-10 g/l (dry substance).

An essential part of the whole WWTP is the anaerobic sludge thickener (designed for 0.26 $m^3/(m^2*h)$): It is important to keep the sludge content in the reactor at the required level, the efficiency of the aerobic part will decrease, if sludge is carried over to the aerobic part. When calculating design parameters it has been assumed that in case of peaks from sugar refining no wastewater from the sedimentation ponds is sent to the activated sludge tanks.

Volume of wastewater from washing the sugar beets can be up to 5,700 m^3/d, in the operation mode „reduction of odour" peaks up to 9,500 m^3/d will occur, because cold fresh water is added to reduce the temperature in the sedimentation ponds and thus odour generation by anaerobic degradation of C. Total volume of all wastewater streams will be between 15,000 and 18,000 m^3/d with peaks up to 20,500 m^3/d.

Wastewater from the sugar refining will be generated in the amount of 400 m^3/d (average) with peaks up to 600 m^3/h.

Treated wastewater is discharged into the river Danube (WB AGRANA TULLN).

Outside of the campaign about 50-100 kg/d COD and 50-120 kg/d N will occur during normal operation; in case of other than normal operations: additional 3,000 kg/d COD and 30 kg/d N may be generated.

Wastewater from sedimentation ponds will contain appr. 500 kg/d COD (February to May), from May onwards most of C will be biodegraded. N-load is estimated to be in the order of 50 kg/d.

Run-off water from the "sugar beet storage Süd" is sent to two sedimentation basins with a storage capacity of 480 m³ and further sent to the WWTP.

When the sugar campaign starts it takes approximately 4 weeks, until a balance is reached between WW coming from the process and WW which is treated in the WWTP.

N-containing substances are generated mainly in the sugar refining process and the pollution level will be relatively stable.

Outside of the sugar campaign wastewater has a low organic content but high peaks will occur.

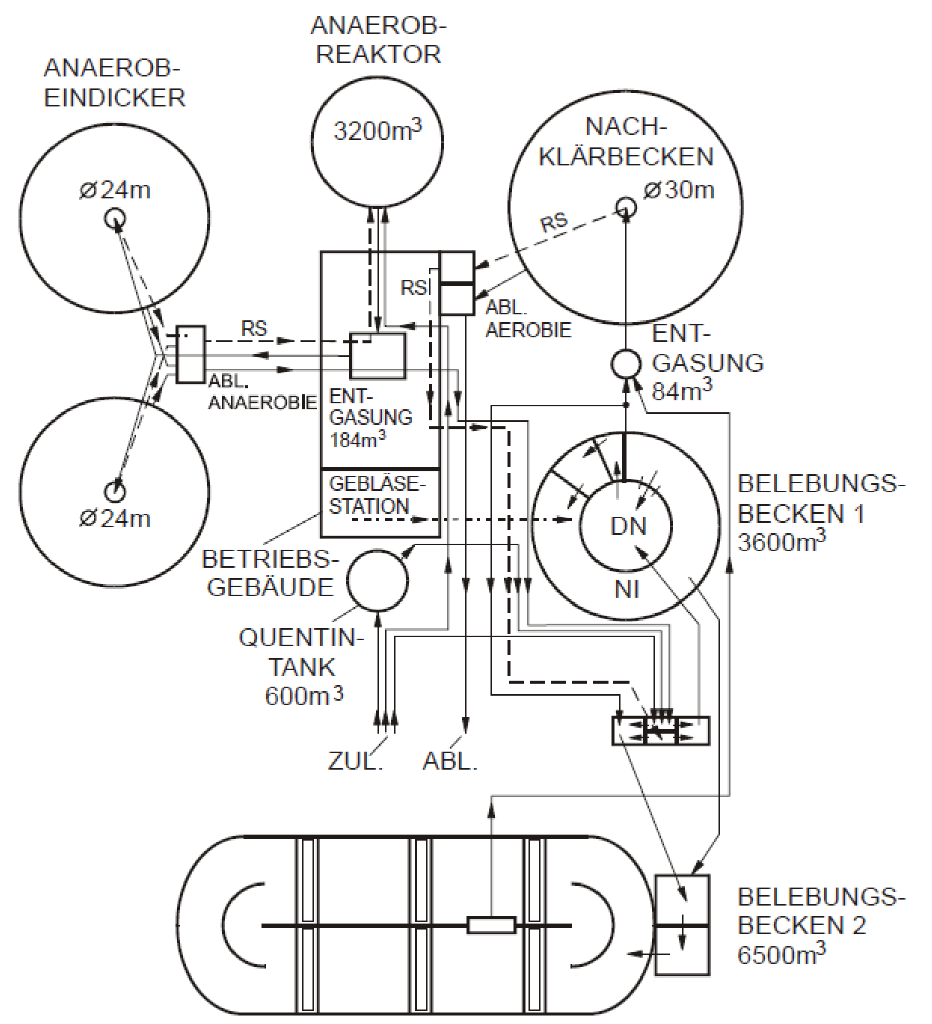
Proper management of the whole WWTP is key in achieving low emission, in particular storage and buffering wastewater streams are essential operations as well as how to send individual wastewater streams to the activated sludge tanks.

For an efficient denitrification the C-N ratio has to be balanced: a certain wastewater stream from the sedimentation pond is routed directly to the aerobic part, temperature of the activated sludge tank is kept at 20-30°C by using warm water from the evaporation or pre-heating the return flow from the sedimentation ponds.

Hot water and condensate from crystallisation is cooled by means of a cooling tower after utilizing a part of the waste-heat in the low temperature driers, and then re-used in the process. Appr. 1,000 m³/d are withdrawn and sent to the activated sludge tank. N-substances are concentrated in this partial stream, so that the nitrification-denitrification process can run efficiently. WW can be withdrawn before and after the cooling tower, so that the temperature in the activated sludge tank can be adjusted in a range of 5°C.

Outside of the campaign, only one activated sludge tank is in operation and one post-sedimentation tank is used as an additional activated sludge tank. High polluted wastewater streams from sugar refining will be intermediately stored and further used as substrat for the denitrification process. If needed, additional C may be added to the intermediate storage tank. Dosing of C-containing wastewater streams to the activated sludge tank is done manually. However, in case of oxygen deficiency in the activated sludge tanks, dosage is stopped automatically and has to be re-adjusted manually.

Scheme of the WWTP in Tulln



Source: Agrana

umweltbundesamt

Figure 4: Scheme of the WWTP in Tulln (Source: Agrana, email 12-11-2014)

The regulated parameters for process wastewater are shown in Table 138.

Table 138: Emission limit values for the direct discharge of process wastewater (WB AGRANA TULLN and Amt der NÖ Landesregierung; Bescheid vom 11-5-2011, WA1-27.967/22-98)

Process wastewater		
Parameter	**ELV – Permit**	**Frequency of self-control**[1)]
Wastewater quantities	20,500 m³/d, 2,000 m³/h, 18,000 m³/d[2)], 3,200 m³/d[3)]	Individual wastewater streams: daily
BOD_5	0.04 kg/t or 20 mg/l[3)]	Weekly
COD	0.35 kg/t[4)] 0.5 kg/t[5)] or 500 mg/l[3), 6)]	Daily
total P	1 mg/l	Weekly
NH_4-N	5 mg/l (only at T over 12 °C)	Daily
total N	> 75%	
Settleable substances	0.3 ml/l	Daily
pH	6.5-8.5	
T	30 °C or 35 °C[7)]	
NO_3-N		Daily

[1)] *flow proportional unsettled homogenised daily composite sample*

[2)] *maximum average over the whole campaign*

[3)] *outside of the sugar campaign*

[4)] *without application of the Quentin process; ELVs applies to the period including beet processing, juice processing and processing of wastewater*

[5)] *if the Quentin process is applied*

[6)] *equal to 95% COD removal at the max. feed concentration of 10 g/l*

[7)] *when the outdoor temperature reaches at least 25 °C*

External monitoring (Permit dated 11-5-1998, WA1-27.967/22-98):

Technical inspection of the WWTP by independent and qualified experts or institutions during highest possible load conditions

- Inflow sludge digester (flow proportional homogenised unsettled daily composite sample): BOD_5, COD, TOC, total-N, NH_4-N, NO_3-N
- Outlet flow sludge digester (flow proportional homogenised unsettled daily composite sample): BOD_5, COD, TOC, total-N, NH_4-N, NO_3-N
- Other wastewater streams (to activated sludge tank, 6 four-hours mixed samples): COD, NH_4-N
- Other wastewater streams (to activated sludge tank, flow proportional homogenised unsettled daily composite sample): COD, BOD_5, TOC, total-N, NH_4-N, NO_3-N
- Outlet flow final clarifier (6 four-hours mixed samples): settleable solid, COD, NH_4-N, NO_3-N, PO_4-P
- Outlet flow final clarifier (flow proportional homogenised unsettled daily composite sample): total suspended solids, COD, BOD_5, TOC, total-N, NH_4-N, NO_3-N, total-P, PO_4-P, settleable substances

- External monitoring includes in addition:
  - control of wastewater volume,
  - control of operating parameters (log book),
  - control of sludge disposal
- In case of exceedances of ELVs: assessment of the causes; description of feasible counter-measures in the operational manual; if applicable, proposals for more efficient self-monitoring

Table 139: Emissions into water – data from self-monitoring (Source: Agrana Zucker GmbH, email 29-7-2014 and 12-11-2014)

Process wastewater (campaign from 12-9-2013 to 27-1-2014)				
Parameter	**Unit**	**Emission Limit Value**	**Measured values**	
			Daily average max	**Average – campaign**
Processed sugar beet	t/d	12,000		
Volume of WW during campaign	m³/d; m^3/h	20,500 daily max.; 18,000 average during campaign; 2,000 m^3/h		
Volume of WW outside of campaign	m³/d	3,200		
Temperature	°C	30°C if ambient air T >25°C: 35°C		27°C, sometimes higher than ELV
pH	pH	6.0-9.0	7.6-9.0	8.7
COD[1)]	kg/t processed sugar beet	with Quentin: 0.35 without Quentin: 0.5	0.34	0.071
COD (campaign)	mg/l	75	142[2)]	54
COD (outside of campaign)	mg/l	300	155 (outside campaign)	81 (outside campaign)
BOD_5 (campaign)[3)]	kg/t processed sugar beet	0.04	0.024	0.0044
BOD_5 (outside of campaign)	mg/l	20	8	3.8
N-removal (campaign)	%	>75		76.5
total P (campaign)	mg/l	1	1.04[4)]	0.37
total P (outside of campaign)	mg/l	1	2.51[5)]	0.51
Total suspended solids	mg/l			91
NH_4-N (as N)	mg/l	5	9.6[6)]	0.30

1) *Average efficiency of COD removal during the campaign: 96.2%; ELVs applies to the period including beet processing, juice processing and processing of wastewater*

2) *Peak values occured in the first days of the campaign; here the new anerobic digester has been put into operation*

3) *Average efficiency of BOD_5 removal during the campaign: 99.7%*

4) *ELV has been exceeded marginally due to peak loads*

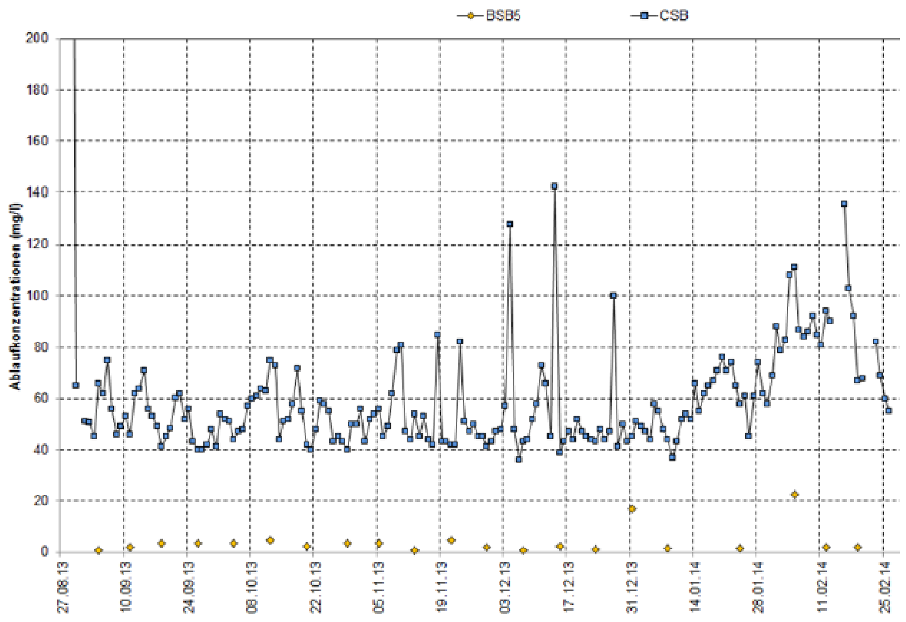
5) *In the opinion of the expert who performed the external control, exceedances could have been prevented by accurate adjustment of dosing rates of the precipitating agents*

6) *Highest value during the campaign; exceedances of ELV were reported on three days*

Diagrams containing the results of each daily average value for COD and BOD_5 are shown in the following figure:

Figure 5: COD and BOD5 in mg/l in discharged process wastewater (Source: Agrana, email from 12-11-2014)

COD and BOD_5 in discharged process wastewater



Source: Agrana

Assessment of self-monitoring: Water intake was slightly higher than the permitted value (one day). COD emission levels were exceeded on two days at the beginning of the campaign due to optimization of the digester which has been put into operation just before; in addition the aerobic part of the WWTP was not fully adjusted to the pollutant loads. Wastewater volume was always in line with the ELV as well as COD (kg/t processed beet; disregarding the two peaks mentioned above) and BOD. Both COD (mg/l) and BOD_5 (kg/t processed beet) were far below the ELVs. NH4-N was higher than the ELV on three days with a peak at 9.6 mg/l. Regarding P some exceedances of ELV were observed due to insufficient control of dosing the precipitating agents. Overall compliance with ELVs was good.

Process wastewater – External control (25/26-11-2013)			
Parameter	**Unit**	**Emission Limit Value**	**Daily average**
Processed sugar beet	t/d	12,000	
Volume of WW during campaign	m³/d; m³/h	20,500 daily max.;	
		18,000 average during campaign; 2,000 m³/h	
Temperature	°C	30°C if ambient air T >25°C: 35°C	25
pH	pH	6.0-9.0	8.7
COD	mg/l	75	34
COD	kg/t processed sugar beet	with Quentin: 0.35	0.04
		without Quentin: 0.5	
BOD	mg/l		4.6
BOD_5 (campaign)	kg/t processed sugar beet	0.04	0.0055
NH_4-N (as N)	mg/l	5	0.08
N-removal (campaign)	%	>75	91.5
total P (campaign)	mg/l	1	0.3

Table 140: Emissions into water – data from external monitoring (Source: Agrana Zucker GmbH, email 29-7-2014)

Data from external monitoring show general compliance with ELVs.

2.4.2 Agrana Zucker, 2285 Leopoldsdorf

2.4.2.1 General description

The sugar refinery in Leopoldsdorf exclusively produces sugar for further processing (soft beverages, producers of confectionary, other food products and the fermentation industry). Products are shipped either in silo tankers, big bags or 50 kg bags. The average daily sugar beet processing is about 13,000 t during the campaign and therefore practical the same as in Tulln. The storage capacity for sugar is up to 122,500 t (AGRANA 2014).

Name of the installation	**Agrana Zuckerfabrik Leopoldsdorf, Bahnstraße 104, 2285 Leopoldsdorf im Marchfelde**
IPPC activity	6.4 b2: Plants for production and refining of sugar from sugar beets or raw sugar with a production capacity greater than 300 tonnes per day 1.1: Combustion installations > 50 MW
Products	appr. 2,000 t/d white sugar, ca. 600 t/d animal feed
Capacity	appr. 12,000 t sugar beet per day
Operating hours	Campaign, appr. 3,500 h/a
Raw materials	depending on campaign length (100 to 160 d)
Auxiliary materials	Limestone for juice purification

Table 141: General description (Source: Agrana Zucker GmbH, email 29-7-2014)

2.4.2.2 Energy generation and use

In Leopoldsdorf two high-pressure steam boilers (41 bar) with a rated thermal input of 115 MW in total powered by natural gas.

Table 142: Related air emissions measured in the year 2012 (Source: Agrana, email 12-11-2014)

Air emissions 2012		
Pollutant	**2012** **Short term (30min) emission level maximum**	**ELV** **(30 min measurement)**
Dust (mg/Nm³)	-	10
NO_x (mg/Nm³)	201 and 219	300
CO (mg/Nm³)	< 9.8	100

- Electricty is produced by two steam turbines (12 MW el.)
- One boiler produces steam for heating the buildings (8 MW)

Limekiln:

For the process of juice-purification a lime-kiln is operated (slake-lime is mixed with raw-juice, heated up to more than 90 °C and mixed with flue-gases (CO_2) from the kiln to precipitate none-sugars together with the lime contained in the raw juice). The capacity of the vertical kiln is aproximately 300 m³/d. There are no emission limits in the actual permit (gases from the kiln are used for carbonation of the juice).

Drying of extracted beets is done in two drum-drying units:

Table 143: Drying of extracted beets (Source: Agrana Zucker GmbH, email 29-7-2014)

Drying of extracted beets	
Type of drying	2 rotary kiln drum drying units, combined with a low-temperature drying facility (upstream)
Type of burner	gas burner
Rated thermal input (MW)	30 MW each
Start of operation	2012: low-temperature drying (LTD) facility; HT-drying: before 1990
Fuel	natural gas
Flue gas cleaning	Cyclone, flue gas scrubbing; waste gas is used in the low-temperature drying process; waste gas from boilers are also used in the LTD
Flue gas temperature (°C)	70-115°C
Operating hours (h/a)	3.360
Energy recovery	Condensation of flumes, use of waste heat in the low-temperature drying process

Emission limit value for dust has been set at 10 mg/m^3 and is measured after the low-temperature drying process. ELV for noise ($L_{A,95}$: 41 db) and odour (1,000 odour units) have been set as well (Frequency of measurement is once every five years).

Low temperature drying

In order to reduce the amount of energy needed during the production of animal feed (as a by-product of sugar production), AGRANA use so-called "low-temperature drying facilities" at its facilities in Tulln and Leopoldsdorf at the start of the campaign season 2012. This enables the de-sugared and pressed beet pulp to be pre-dried in a particularly efficient way before being final-dried in rotary-drum high temperature driers and then turned into dried beet pulp pellets, a popular kind of feed for livestock farming. By harnessing waste heat from upstream production steps, it is possible to cut annual energy consumption of the drying process by around 50 percent. Moreover, the new facilities not only reduce odour and dust emissions but also reduce the burden of CO_2 emissions on the environment by almost 20 percent annually. (Source: Agrana press release; www.agrana.com)

Type of fuels: natural gas, coke (limekiln)

Main energy consumers are sugar production and domestic heating. An Energy management system is implemented since March 2014.

2.4.2.3 Waste management

Table 144: Generation of solid waste (Source: Agrana Zucker GmbH, email 29-7-2014)

Hazardous waste	
Type	Treatment / Disposal
Used sleepers	Licensed disposal company
Batteries	
Cooling appliances	
Used screens	
Lead accumulators	
Fluorescent tubes	
Waste oils	
Content of oil separators	
Oil-water mixtures	
Waste materials containing lipophilic substances	
Laboratory waste	
Paints	
Pressurised gas containers	
Non hazardous waste	
Type	Treatment / Disposal
Domestic waste	Licensed disposal company
Paper	
Plastics	
Green waste	
Excavated soil, sand, stones…	
Wood waste	
Others (e.g. from cleaning)	

By-products:

- Lime is dewatered and stored on site, it is reused in agriculture as fertilizer
- Sewage sludge contains only remanents from the production process (no domestic wastewater included): appr. 1,000 t per year; is pumped to the pre-sedimentation ponds together with sugar beet soil
- Sugar beet soil: accumulates in the pre-sedimentation ponds (appr. 5.5-7% of sugar beet; 60,000 t per year); ponds are emptied after sufficient dewatering, at latest after two years; wastewater is sent to the WWTP
- Molasses: used as feed-stuff (mixture with pressed pulp before drying) and raw material for fermentation-industry. The major part (also molasses from the second site in Tulln) is used internally for production of another sugar-rich juice, that is crystallised in another so called "thick-juice"-campaign, further more a betain-containing fraction is produced, the remaining fraction is used for feed-production (like normal molasses – mixed with pressed pulp before drying) or as fertilizer

2.4.2.4 Odour emissions

Sources of odour emissions are the storage facilities for sugar beets, drying of extracted sugar beets and the pre-sedimentation ponds.

Measures against odour:

- Application of the low-temperature drying process.

2.4.2.5 Noise emissions

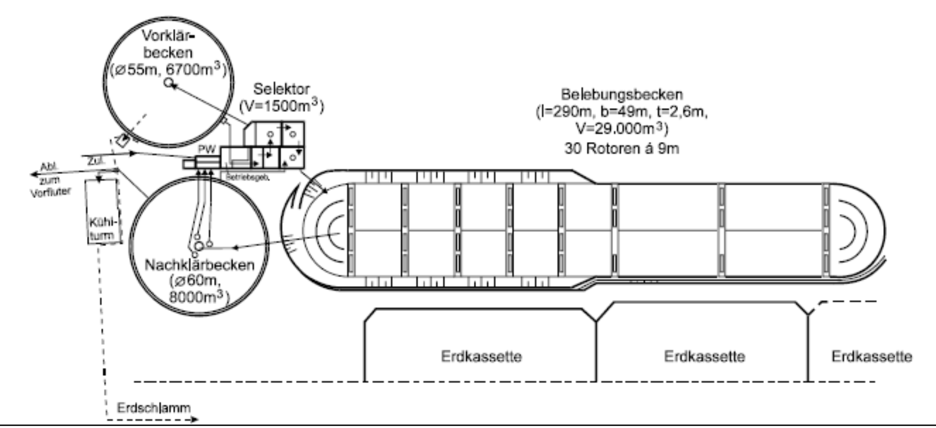
Sources of noise emissions are delivery and handling of sugar beets, boiler house, sugar house, limekiln and stacks.

Measues include encapsulation and installation of silencers, as well as management of the whole delivery process. Periodic noise measurements are carried out at defined spots (installations boundaries).

2.4.2.6 Water and wastewater

Domestic wastewater is discharged into the municipal sewage system, wastewater from the process and surface water is treated in an internal WWTP (aerobic treatment, see Figure 4) and directly discharged into the river Russbach.

Scheme of the WWTP in Leopoldsdorf



Source: Agrana

Figure 6: Scheme of the WWTP in Leopoldsdorf (Source: Agrana, email from 12-11-2014)

The regulated parameters for process wastewater are shown in the following table:

Table 145: Emission limit values for the direct discharge of process wastewater (Source: Agrana Zucker GmbH, email 29-7-2014)

Process wastewater		
Parameter	**ELV – Permit**	**Frequency of self-monitoring (fpdcs)**
Beet processing	15,000 t/d	daily
Wastewater quanties	27,000 m³/d, 15,000 m³/d, average over campaign 5,000 m³/d[1)]	individual wastewater streams:daily
Specific wastewater volume	1.5 m^3/t processed beet	daily
BOD_5 load	32 kg/d	weekly[2)]
COD load	200 kg/d	daily[2)]
total P load	35.2 kg/d	weekly[2)]
total N load	26 kg/d	weekly[2)]
BOD_5	0.04 kg/t processed beet or 20 mg/l	weekly[2)]
COD	0.35 kg/t[3)] 0.5 kg/t[4)] or 300 mg/l[1)]	daily[2)]
COD	75 mg/l	daily[2)]
total P	1 mg/l, 3 mg/l[1)]	daily
NH_4-N	5 mg/l	daily[2)]
total N	> 75%	weekly
pH	6.5-8.5	daily
T	25°C	daily
NO_3-N		daily[5)]

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] outside of the sugar campaign

[2)] up- and downstream sludge digester; upstream activated sludge tank, downstream final clarifier

[3)] without application of the Quentin process; ELVs applies to the period including beet processing, juice processing and processing of wastewater

[4)] if the Quentin process is applied

[5)] downstream final clarifier

External monitoring

Technical inspeciton of the WWTP by independent and qualified experts or institutions during highest possible load conditions

- Control of other wastewater streams (up- and downstream sludge digester; upstream activated sludge tank, downstream final clarifier): COD, NH_4-N, TOC, BOD, TN, TP, Cl, Q
- External monitoring includes in addition:
  - control of wastewater volume,
  - control of operating parameters (log book),
  - control of sludge disposal and several sludge parameters
- In case of exceedances of ELVs: assessment of the causes; description of feasible counter-measures in the operational manual; if applicable, proposals for an more efficient self-monitoring.

Table 146: Emissions into water – data from self-control (Source: Agrana Zucker GmbH, email 29-7-2014).

Process wastewater					
Parameter	**Unit**	**Emission Limit Value**	**Measured values**		
			Daily average min	**Daily average max**	**Average – campaign**
Processed sugar beet	t/d	15,000			
Volume of WW during campaign	m³/d; m^3/h	27,000 daily max.; 15,000 average during campaign; 1,400 m^3/h			
Volume of WW outside of campaign	m³/d	5,000			
Specific wastewater volume	m^3/t processed beet	1.5			1.01
Temperature	°C	25°C	15°C	27°C	
pH	pH	6.0-8.5	7.6	8.1	8.7
COD	kg/t processed sugar beet	with Quentin: 0.35 without Quentin: 0.5			0.034
COD (campaign)	mg/l	75			39
Specific COD load per ton of sugar beet	kg/t	-			0.034
COD (outside of campaign)	mg/l	300	52		
BOD_5 (campaign)	kg/t processed sugar beet	0.04 (daily max); 0.024 (average over campaign)			0.0031
BOD_5 (campaign)	mg/l	20			3.8
specific BOD_5 load per ton of sugar beet	kg/t	-			0.0031
BOD_5 (outside of campaign)	mg/l	20		4	3
N-removal (campaign)	%	>75			98.1
total P (campaign)	mg/l	1		0.57	0.12
total P (outside of campaign)	mg/l	1		0.17	
Total suspended solids	ml/l	-			45
Settleable substances	mg/l	-			6
NH_4-N (as N)	mg/l	5		2.4	0.33
COD removal (campaign)	%	-			94.2
BOD_5 removal (campaign)	%	-			99.3

Assessment of self-control: Wastewater volume was higher than the limit value (one day), on some days also temperature of wastewater exceeded the limit values. All other parameter were within the ELVs.

Table 147: Emissions into water – data from external control (Source: Agrana Zucker GmbH, email 29-7-2014)

Process wastewater – External control (12./13-11-2012)			
Parameter	**Unit**	**Emission Limit Value**	**Daily average**
Processed sugar beet	t/d	15,000	
Volume of WW during campaign	m^3/d; m^3/h	27,000 daily max. 15,000 average during campaign;	
COD	mg/l	75	22
COD[1)]	kg/t processed sugar beet	with Quentin: 0.35 without Quentin: 0.5	0.019
BOD_5 [2)]	mg/l	20	2
BOD_5 (campaign)	kg/t processed sugar beet	0.04	0.0017
NH_4-N (as N)	mg/l	5	0.13
N-removal (campaign)	%	>75	98.7
total P (campaign)[3]	mg/l	1	0.03

[1)] *efficiency of COD removal: 99.5%*

[2)] *efficiency of BOD_5 removal: 99.9%*

[3] *efficiency of total phosphorous removal: 99.3%*

Data from external control show a general compliance with ELVs.

2.5 Production of starch

There are three starch manufacturing IPPC installations in Austria. All off them are owned by the AGRANA group and are located in Gmünd (potato starch), Aschach an der Donau (corn starch) and Pischelsdorf (grain starch).

The principle steps of starch production are cleaning (magnetic separation to remove unwanted materials), steeping (in 0.10% sulphur dioxide at 48-52 °C for 30-40h at a pH level of 4.0), milling (attrition mill) and fraction separation (e.g. the oil containg germ, salts and protein), centrifugation (starch (1.5 g/cm³) is easily separated by centrifugation because Gluten is less dense (1.1 g/cm³) which leads to a final protein content of less than 0.38%) and finally drying (usually by flash drying at 93-127 °C). After a second extraction 20-25% of final product, based on raw potatoes with a moisture content of 17-18% is obtained. The evaporation of water during drying makes the starch production to one of the most energy intensive food industries.

Wastewater from this sector contains high amount of biodegradable organic matter (reduced sugars, volatile acids and aldehydes) but only low contents of solid matter. Nitrogen is present due to the degradation of proteins to e.g. urea and ammonia. Standard wastewater treatments according to the BREF document (2006) are flow and load equalisation, sedimentation and dissolved air flotation (DAF). Secondary techniques are applied if needed and anaerobic processing is mostly preferred when a high amount of organic matter is present. This allows to recover produced methane gas which can be used for heating. This is followed by aerobic treatment and if necessary final biological nitrification/denitrification.

Starch driers also may lead to dust emission between 10-80 mg/Nm³.

The solid output depends on the manufacturing process and can be minimised by the use of anaerobic wastewater treatment. Some by-products may be used in other foodstuff than starch or as animal feed.

(AGRANA 2014, EUROPEAN COMMISSION 2006, ULLMANN 2007)

2.5.1 Agrana Stärke, 3435 Pischelsdorf

Agrana Pischelsdorf is an integrated site which produces bio-ethanol (since 2008) and starch (since end of June 2013).

2.5.1.1 General description

Table 148: General description (Source: BH Tulln, written information from 23-07-2014)

Name of the installation	**Agrana Stärke GmbH, Industriegelände Grundstück Nr. 426/15, 3435 Pischelsdorf**
IPPC activity	6.4 (b) (starch)
Capacity	Input: 250,000 tonnes of wheat per year Final product: 107,000 tonnes of starch 23,500 tonnes of gluten 55,000 tonnes of wheat bran About 69,000 t (B-starch, fibres, pentosane) are further processed in the adjacent bio-ethanol plant.
Operating hours	The plant is operated 7 days a week and 24 hours a day.
Auxiliary materials (2011)	NaOH 50% (144 t/y) HNO_3 53% (26 t/y) NaClO (96 t/a) NaCl (365 t/a) $FeCl_3$ 40% (max 20 t/y) Urea solution 40% (100 t/y) H_3PO_4 50 or 70% (max 50 t/y) Rohalase and Rohament (enzymes, total 150 t/a) Flocstar 216L (flocculant, 10 t/y)

Production process

a. Storage (storage capacity of about 9,000 t)
b. Mill (includes cleaning, milling and bran palletisation)
c. Wet corn stach line: 3-phase decanter (extraction of A-starch and vitalgluten; all other components like B-starch and fibres are sent to the fermentation process in the bio-ethanol plant)
d. Drying plants and finished product silos (separated for A-starch and gluten)
e. Packaging and loading (Big Bags, 25 kg bags or bulk loading to trucks or railway wagons)

Table 149: Design parameters in comparison with the BAT document from 2006 (Source: BH Tulln, written information from 23-07-2014)

Design parameters compared with the BREF 2006		
Description	**Reference value (BREF 2006)**	**Design parameters**
Specific water consumption per ton of raw material	1.7-2.5 m³/t	1.9 m³/t
Air emissions (dust)	10-80 mg/Nm³	10-20 mg/Nm³
Tons of raw material needed for 1 ton of starch	2.35 t_{wheat}/t_{starch}	2.47 t_{wheat}/t_{starch}
Wastewater	2.0 $m^3/t_{product}$	Only 40 m³ per day (washing water). The liquid fraction from starch manufacturing process is used as raw material to produce bio-ethanol in the adjacent bio-ethanol plant.
Electrical energy per ton of raw material	200-500 kWh/t	226 kWh/t
Thermal energy per ton of raw material	800-1,300 kWh/t	431 kWh/t
Stones	1-10 kg/t	4 kg/t
Soil	8-60 kg/t	10 kg/t
Organic matter	0.5-4 kg/t	2 kg/t
Sand	1.5-7 kg/t	3 kg/t

2.5.1.2 Energy generation and use

The existing bio-ethanol plant already operates a 24 MW (35 t/h) steam boiler and in addition covers steam demand via a steam pipeline (85 t/h, 14 bar). 25.15 t/h of steam are needed for the starch production (design parameter). Gas from the digestion tower is also used internally for feedstuff drying.

Table 150: Combustion plant operated on site for starch and bio-ethanol production (Source: BH Tulln, written information from 23-07-2014)

Combustion plant	
Type	**steam boiler**
Rated thermal Input (MW)	24
Start of operation	2007
Fuel	Natural gas
Flue gas cleaning	Low NO_X burner
Flue gas temperature (°C)	118
Operating hours (h/a)	8400 (continuous)
Energy recovery	Economiser
Steam production (t/h)	35
Steam parameter (p, T)	14 bar, 200°C
Fuel use (%)	95
Oxygene content (%)	2.1

Table 151: Emission limit values for both operated combustion plants (Source: BH Tulln, written information from 23-07-2014)

ELV (half-hourly average at 0°C, 1,013mbar, 3% O_2)	
Pollutant	**ELV Steam boiler 1**
NO_x (mg/Nm³; 3% O_2)	100
CO (mg/Nm³; 3% O_2)	80

2.5.1.3 Waste management

Table 152: Projected main types and amounts of waste 2011 – starch production (Source: BH Tulln, written information from 23-07-2014)

Waste Type	**Amount**
Hazardous waste (Design parameter)	
Oil-contaminated operating materials (solid workshop waste)	500 kg
Plastic containers with hazardous residues	200 kg
Batteries	20 kg
Spray cans with residual contents	10 kg
Laboratory waste and chemical residues	35 kg
Waste oils	1,000 kg
Non-hazardous waste (Design parameter)	
Residual waste	15,000 kg
Paper and uncoated cartons	1,000 kg
Biowaste (containing animal substances)	2,000 kg
Biowaste (e.g. grain dust)	60,000 kg
Packaging materials and cadboards	2,000 kg
Light fraction from packaging waste	1,000 kg
Glass	600 kg
Iron packagings (e.g. barrels)	100 kg
Wooden packagings	5,000 kg
Iron and steel waste (contaminated)	10,000 kg

Biological waste is used as base material for bio-ethanol production or for production of high-grade protein animal feed. All other types of waste are disposed by authorised disposal companys.

2.5.1.4 Noise emissions

Noise measurements have been performed during the authorisation phase.

2.5.1.5 Water and wastewater

Both wastewater from the bioethanol plant and the starch production are treated in the internal WWTP before being discharged into the river Danube. The process wastewaters are divided into low and high polluted streams which can be fed individually to the WWTP. High polluted wastewater such as condensates is led to the anaerobic stage followed by treatment in the aerobic stage. Less contaminated wastewater is sent directly to the selector of the aerobic stage (Source: BH Tulln, email 3-9-2014).

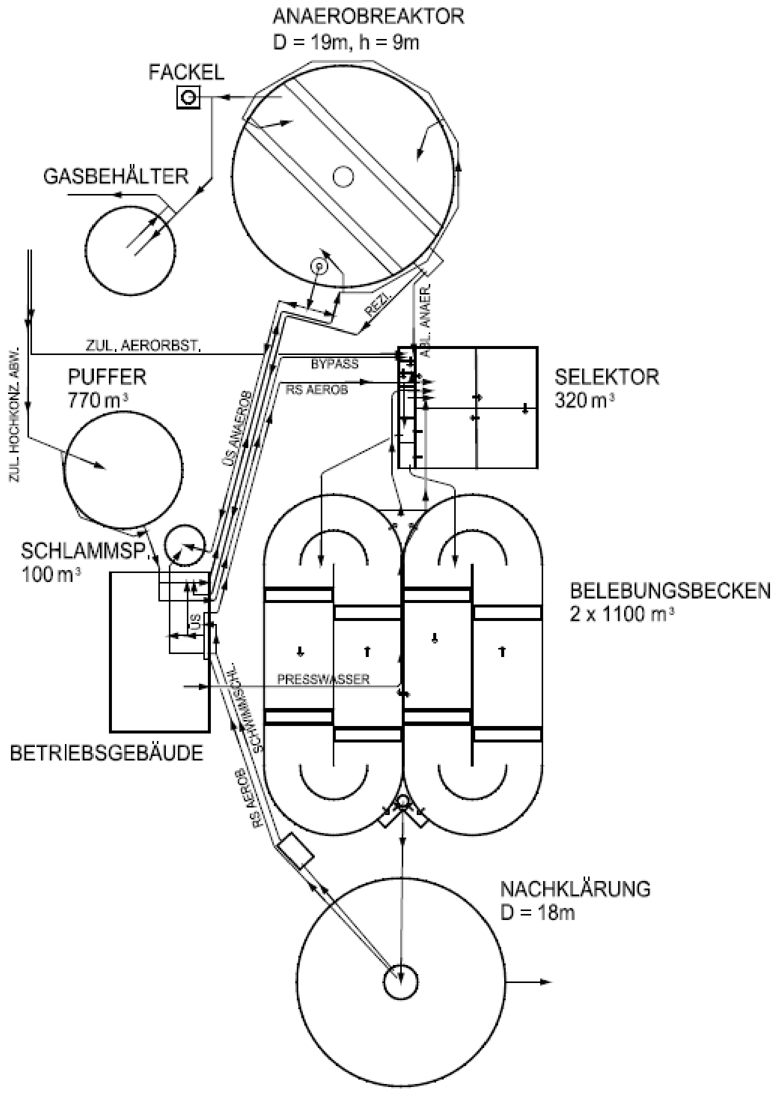
Description of the WWTP

Anaerobic stage: buffer tank (770 m³), anerobic reactor with integrated post-thickener (2,550 m³), biogas tank (200 m³) plus gas flare, phosphorus precipitation, several dosing pumps (urea solution, H_3PO_4, NaOH, $FeCl_3$, lime milk),

Aerobic stage: 4 selector-cascades 5*5m each with 4*15 kW surface aerators (total volume 320 m³), 2 activated sludge basins with two 22.5 kW cage rotor aerators in each basin (total useable volume 2,520 m³), final clarification basin (740 m³)

Figure 7: Sketch of the internal WWTP (Source: AGRANA Bioethanol GmbH. Werk Pischelsdorf – Bericht über die Tagesuntersuchung der betrieblichen Abwasserreinigungsanlage 17/18-3-2014 provided by BH Tulln, email 3-9-2014)

Internal wastewater treatment plant



Source: AGRANA Bioethanol GmbH

umweltbundesamt

Projected values of different wastewater streams						
Parameter	**Unit**	**Conden-sates (bio-ethanol)**	**Washing water (bioethanol)**	**Washing water (starch)**	**Other Wastewater**	**Total**
T	°C	39	20	20	20	
Q average	m³/d	1,400	75	40	672	2,187
COD	kg/d	5,600	1,500	800	368	8,268
BOD	kg/d	3,111	833	444	204	4,593
total N	kg/d	4.2	37.5	2.0	3.0	46.7
total P	kg/d	1.4	7.1	2.0	4.5	6.2

Table 153: Projected values of different wastewater streams treated in the internal WWTP (Source: AGRANA Bioethanol GmbH. Werk Pischelsdorf – Bericht über die Tages-untersuchung der betrieblichen Abwasser-reinigungsanlage 17/18-3-2014 provided by BH Tulln, email 3-9-2014)

The wastewater stream "Washing water (starch)" is the only one which stems from starch production and is directly led to the selector of the aerobic stage.

Maximum inlet loads (ELV)			
Parameter	**Unit**	**Aerobic stage**	**Anaerobic stage**
Q	m³/d	2,187	1,515
N	kg/d	38[1)]	9,1[2)]
COD	kg/d	1,883	7,900
BOD	kg/d	1,046	34,4
total P	kg/d	11	9,1

[1)] NH_4-N

[2)] total N

Table 154: Maximum inlet loads (ELV) for the aerobic and anaerobic stage (Source: AGRANA Bioethanol GmbH. Werk Pischelsdorf – Bericht über die Tagesunter-suchung der betrieb-lichen Abwasser-reinigungsanlage 17/18-3-2014 provided by BH Tulln, email 3-9-2014)

The aerobic stage of the WWTP has been designed to cope with the pollutant load in case of stand still of the anaerobic stage (due to maintenance operations or malfunctions).

Table 155: Emission limit values and minimal frequencies for self- and external monitoring for direct discharged process wastewater (Source: AGRANA Bioethanol GmbH. Werk Pischelsdorf – Bericht über die Tagesuntersuchung der betrieblichen Abwasserreinigungsanlage 17/18-3-2014 provided by BH Tulln, email 3-9-2014; BH Tulln, written information from 23-7-2014)

Process wastewater – ELV and frequencies for self- and external monitoring						
Parameter	**Unit**	ELV **Permit**	**Self-monitoring – type of sample**	**External monitoring – type of sample**	**Min. frequency for self-monitoring (permit)**	**Min. frequency for external monitoring (permit)**
Q (discharge)	m^3/d	2,187	Venturi flume (continuous)	continuous (second systeme)	continuous	1 day per year
	m^3/h	120				
T	°C	35	continuous	spot sample	continuous	1 day per year
pH		6.5-8.5	continuous	spot sample	continuous	1 day per year
COD	mg/l	100	fpdcs	fpdcs	daily	1 day per year
	% removal	90%[1)]				
BOD	mg/l	25 (80 percentile) max. 40	fpdcs	fpdcs	weekly	1 day per year
TOC	mg/l	35	-	fpdcs	-	1 day per year
	% removal	90%[2)]				
NH_4-N	mg/l	5	fpdcs	fpdcs	daily	1 day per year
total N load	% removal	75% as a yearly average	fpdcs	fpdcs	2 times a week	1 day per year
total P	mg/l	2	fpdcs	fpdcs	2 times a week	1 day per year
Conductivity	µS	-	continuous	spot sample	continuous	1 day per year
Settleable substances	mg/l	-	fpdcs	fpdcs	daily	1 day per year
Total suspended solids	ml/l	-	-	fpdcs	-	1 day per year
NO_2-N	mg/l	-	-	fpdcs	-	1 day per year
NO_3-N	mg/l	-	-	fpdcs	-	1 day per year
PO_4-P	mg/l	-	fpdcs	fpdcs	daily	1 day per year

fpdcs = flow proportional unsettled homogenised daily composite sample

1) when the inlet exceeds 1,000 mg/l COD

2) when the inlet exceeds 350 mg/l TOC

Wastewater upstream and downstream of the anaerobic and aerobic stage are monitored as given in Table 156. A total of 3 samplers (for fpdcs) are installed at both inlets and the discharge unit. The quantity of sludge is also measured continuously at the aerobic (surplus and return) and anaerobic stage (surplus sludge only). In addition, oxygene concentration in the Selector and the activated sludge basins, as well as the quantity of produced biogas and pH, and T at the digestion tower are monitored continuously. At the desalination plant Q, pH, T and conductivity have to be monitored continuously.

Table 156: Minimal frequencies for self-monitoring of different internal wastewater streams (Source: written information from 23-07-2014 by BH Tulln)

Minimal frequencies for self-monitoring of different wastewater streams			
Parameter	**Inlet anaerobic stage (fpdcs)**	**Discharge anaerobic stage (spot samples)**	**Inlet aerobic stage (fpdcs)**
Q	continuous	continuous	continuous
T	continuous	continuous	continuous
pH	continuous	continuous	continuous
COD	daily	daily	daily
BOD	weekly	-	weekly
Total suspended solids	daily	daily	daily
total N	2 times per week	-	2 times per week
total P	2 times per week	-	2 times per week
NH_4-N	daily	daily	daily
PO_4-P	-	daily	daily

fpdcs = flow proportional unsettled homogenised daily composite sample

Main wastewater streams (2 inlet, 1 discharge) and different types of sludges are also externally monitored.

The starch processing line and the anaerobic stage have been put into operation at the end of June 2013. Due to operational problems and frequent pollutand peaks emission limit values were frequently exceeded. Currently measures are implemented to establish compliance.

Additional measures include: Filling the anaerobic rector with new sludge from several other WWTP. Upon recommendation of the Vienna University of Technology a stronger NaOH dosing pump as well as a lime pump system has been installed in combination with a sludge circulation pump to be able to regulate the pH in the anaerobic stage faster. A phosphorus removal system started its operation in July 2014. It is also planned to add 4 additional cage rotor aerators to increase oxygen supply in case of peak loads. Nutrient management will be improved. It is recommended by the external expert to perform a comprehensive self-monitoring also during weekend.

Self-monitoring results of a separated wastewater stream from a desalination plant are available for the period 12-6-2014 to 30-6-2014:

Table 157: Summary of results of self-monitoring of a desalination plant (Source: BH Tulln, email 3-9-2014)

Self-Monitoring desalination plant from 12-6-2014 to 30-6-2014 (flow proportional unsettled homogenised daily composite)			
Parameter	**Unit**	**Measured values**	**ELV (daily average)**
Q (discharge)	m³/d	139[1), 2)]	75
T	°C	13-17[2)]	35
pH		7.2-7.4[2)]	6.5-8.5
conductivity	µS/cm	950-1,430[2)]	3000

[1)] 2-week average

[2)] continuous measurement

During these two weeks temperatures, pH and conductivity are in line with the permitted values but the discharged wastewater volume exceeds the limit.

2.5.2 Agrana Stärke, 4082 Aschach an der Donau

2.5.2.1 General description

Table 158: General description (Source: BH Eferding, email 15-07-2014)

Name of the installation	**Agrana Stärke Gmbh, Raiffeisenweg 2-6, 4082 Aschach an der Donau**
IPPC activity	6.4 (b)
Products	Native starch Glucose syrups Derivatives (including drum drying and extrusion)
Production capacity	1,000 t maize per day
Operating hours	Continuous operation
Raw materials	Maize (Yellow, Waxy)
General information	The starch facility in Aschach has a processing capacity of 1,000 t maize per day (360,000 t per year). The production range includes native starch, starch derivatives and glucose syrups.

2.5.2.2 Energy generation and use

Table 159: Gasturbines operated on site (Source: Agrana, email 14-11-2014)

Gasturbines	**2 (HRB1/GT1 and HRB2/GT2)**
Max. fuel power [kW]	15,800
Year of construction	1996
Fuel	Natural Gas
Heat recovery boilers	2
Max. operating pressure [bara]	15
Max. operating temperature [°C]	201
Rated thermal power [MW]	15,1
Additional firing: heat recovery boiler	
Max. fuel power [MW]	Combined operation = 5.2 fresh-air mode = 15.2

Table 160: Boiler operated on site (Source: Agrana, email 14-11-2014)

Boiler HDMRS2000	
Year of construction	1986
Max. operating pressure [bara]	15
Max. operating temperature [°C]	205
Steam quantity [to/h]	18
Rated thermal power [MW]	13.055
Fuel	Natural gas / biogas

EcoDry (CGF-Drier with exhaust air combustion)	
Manufacturer	Swiss Combi
Year of construction	2000
Rated thermal power [MW]	9
Fuel	Natural gas

Table 161: Drier operated on site (Source: Agrana, email 14-11-2014)

Emission limits			
Firing system	CO mg/m³	NO_x mg/m³	Dust mg/m³
HRB1/GT1	80	100	5
HRB2/GT2	80	100	5
HDMRS 2000	80	100	5
EcoDry	100	100	20

Table 162: Emission limit values for operated combustion plants (Source: Agrana, email 14-11-2014)

2.5.2.3 Noise emissions

Noise	
Sources	WWTP, cars, trucks, emergency power unit/generator?
Measures to reduce noise emission	Noise barriers, test runs of the emergency power unit are limited to the period Mo-Fr from 7 am to 6 pm, acoustic decoupling of all pumps and pressure lines, measurements according to ÖNORM S 5004

Table 163: Noise emission and countermeasures (Source: BH Eferding, email 15-07-2014)

2.5.2.4 Odour emissions

Odour	
Sources	Sludge press (WWTP)
Measures to reduce odour emission	Removal by suction with jet fans based on the principle of water suction pumps – the used water is led back to the second biological step

Table 164: Odour emission and countermeasures (Source: BH Eferding, email 15-07-2014)

2.5.2.5 Water and wastewater

Process water is treated in an internal aerobic wastewater treatment plant and discharged into the river Danube. A former anaerobic stage has been replaced by an aerobic cleaning step to handle higher wastwater volume, COD-loads and high variations in wastewater quantity after the increase in production (saccharification products).

The WWTP includes the following parts: weak and high performance biology with 4 activated sludge basins, flotation, biofilter, 2 clarification basins, several buffer basins, anaerobic sludge decomposition/stabilisation, sludge storage and press.

Wastewater from starch production, derivatives and saccharification are first treated in a high performance (high load) step followed by the second biological step (weak performance).

Regeneration wastewater from ion exchangers (high load of chlorides), rain water from the WWTP area, blowdown water from cooling plants, wastewater from the company “Vogtans” and wastewater from the municipal sewer system are led directly to the second biological step (weak performance).

All purified process wastewaters are discharged into the river Danube.

Table 165: Max. wastewater volume and COD load (Source: Permit, WB AGRANA ASCHACH, BH Eferding, email 15-07-2014)

Permitted loads		
	Q (m^3/d)	COD load (kg/d)
High performance step (only Agrana)	1,490	18,680
Condensate polishing (biofilter)	1,200	1,200
Second biological step[1)]	3930	5,560
Total max	4,860 m^3/d and 216 m^3/h	22,100 and 11,100 kg/d in a weekly average

[1)] 40 m^3/d / 200 kg/d COD from Fa.Vogtrans and 1,200 m^3/d / 300 kg/d COD from municipal wastewater are included in these numbers (only treatment in the second biological step)

Surface water, cooling water, wastewater from the steam cycle (steam generator blowdown water, condensate) waters are separately collected and discharged into the river Danube.

Table 166: Emission limit values for direct discharged wastewater from the process (Source: WB AGRANA ASCHACH, BH Eferding, email 15-07-2014)

Process wastewater (direct dircharge)					
Parameter	**Unit**	**ELV (Permit)**	**Type of sample**	**Min. frequency self-,monitoring (Permit)**	**Min. frequency external monitoring (Permit)**
Q (inlet)	m^3/d	4,860 and 216 m^3/h	continuous	continuous	7 consecutive d/y
T	°C	35	continuous	continuous	7 consecutive d/y
pH		6.5-8.5	continuous	continuous	7 consecutive d/y
Minimum efficiency for COD removal		90%	fpdcs	daily	7 consecutive d/y
BOD	mg/l	40	fpdcs	each working day	7 consecutive d/y
Minimum efficiency for BOD_5 removal		97%	fpdcs	each working day	7 consecutive d/y
Minimum efficiency for TOC removal		90%	fpdcs	-	7 consecutive d/y
Minimum efficiency for total N removal	%	75%[1)]	fpdcs	3 times a week	7 consecutive d/y
total P	mg/l	2	fpdcs	3 times a week	7 consecutive d/y

Process wastewater (direct dircharge)					
Parameter	**Unit**	**ELV (Permit)**	**Type of sample**	**Min. frequency self- ,monitoring (Permit)**	**Min. frequency external monitoring (Permit)**
Minimum efficiency for total P removal		85%	fpdcs	3 times a week	7 consecutive d/y
Total suspended solids	mg/l		Spot sample	daily	7 consecutive d/y
Settleable substances	ml/l	0.3	Spot sample	daily	7 consecutive d/y
NH_4-N	mg/l	2.5[2)]	fpdcs	daily	7 consecutive d/y
AOX	kg/d	9 kg/d 0.05 kg/t[2)]	fpdcs	4 times a year	7 consecutive d/y
NO_3-N	mg/l		fpdcs	daily	7 consecutive d/y
Toxicity (luminescent bacteria)		12	fpdcs	-	7 consecutive d/y

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] applies when the water temperature after the biological treatment is higher than 12°C

[2)] per tonne of modified starch

Requirements regarding self-monitoring include:

Several flow rates (at least 7 inlet, 2 discharge points) and pH measurements, oxygen content and temperature in the activated sludge basins and operating hours of key components. Also limits for particular wastewater streams and the total inflow to the WWTP have been set in the permit (volume and COD loads).

To determine the removal efficiency following measurements have to be performed at each of the 7 inlet points:

Table 167: Monitoring frequency at the different inlet points to the WWTP (Source: BH Eferding, email 15-07-2014)

Monitoring frequency at different inlet points			
Parameter	**Unit**	**Type of sample**	**Min. frequency self-monitoring (Permit)**
Q (inlet)	m³/d	continuous	continuous
pH		continuous	continuous
COD	mg/l	fpdcs	daily
BOD		fpdcs	each working day
total N	mg/l	fpdcs	3 times a week
total P	mg/l	fpdcs	3 times a week
NH_4-N	mg/l	fpdcs	daily
AOX	kg/d	fpdcs	4 times a year (only at the high performance stage)

fpdcs. = flow proportional unsettled homogenised daily composite sample

If the parameters BOD, COD or NH_4-N exceed twice the ELV, the competent authority has to be informed immediately.

The laboratory for self-control has to be in line with the ÖWAV-Regelblatt Nr.7 (which describes minimum laboratory equipment (depending on the WWTP population equivalents), analytical methods, legal references, guidelines and literature, automatic measuring and recording equipment).

Table 168: Emission limit values for the direct discharge of cooling water (Source: BH Eferding, email 15-07-2014)

Cooling water	
Parameter	**ELV (Permit)**
Wastewater quantities	1,170 m^3/d, 50 m^3/h
T	30 °C

Self-monitoring

Table 169: Summary of results of self-monitoring 2013 (Source: Amt der Oö. Landesregierung, email 24-7-2014)

Self-monitoring 2013 – based on fpdcs (from 1-1-2013 to 31-12-2013)							
Parameter		**Daily average – min**	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**Yav**	**ELV (daily average)**
% Removal							
total N removal	%	85.0	>99.9	94.2	98.1	96.4	75.0
BOD_5 removal	%	94.4[1)]	99.9	97.9	99.8	99.2	97.0
COD removal	%	90.3	99.8	97.3	99.0	98.3	90.0
total P removal	%	86.1	>99.9	94.5	97.0	96.3	85.0
Effluent							
COD load	kg/d	24	918	164	493	242	-
BOD_5 load	kg/d	2	379	10.3	151.1	40	-
N load	kg/d	0	48	8.7	22.6	15	-
P load	kg/d	1	16	2.8	7.5	5	-
NH_4-N	mg/l	0.0	3.5[2)]	0.2	0.8	0.4	2.5
Settleable substances[3)]	ml/l	0.0	0.4[4)]	0.0	0.2	0.1	0.3
T[5)]	°C	21	36[6)]	24	33	28	35
pH[5)]		7.4	8.4	7.8	8.2	8.0	6.5-8.5

fpdcs = flow proportional unsettled homogenised daily composite sample

1) 4 out of 219 measurements for BOD_5 removal exceeded the ELV in 2013 (without September where only incomplete data is available); one was below 95%

2) 3 out of 364 measurements for NH_4-N exceeded the ELV (2.6 and 3.5 mg/l)

3) based on daily spot samples

4) 1 out of 364 measurements for settleable substances exceeded the ELV

5) based on daily average values (continuous measurement)

6) 2 out of 364 days (2 consecutive days during summer/June)

Data from self-monitoring show a general compliance with ELVs (with small exceptions for settleable substances and NH_4-N in less than 1% of the measurements).

The reason for the high CSB/BSB loads (daily average max) was a defective ball valve in the sacarification plant. BOD_5 removal suffered briefly during replacement and modification of the aeration plates in the activated sludge basins. (Source: Agrana, email 14-11-2014)

External Monitoring

Methods for sampling and analysis are in line with the AEV für Zucker- und Stärkeerzeugung for external monitoring (Source: Amt der Oö. Landesregierung, email 24-07-2014).

Table 170: Summary of the results of external monitoring 2014 (Source: Amt der Oö. Landesregierung, email 24-07-2014)

External Monitoring 2014 (fpdcs from 20-3-2014 to 26-3-2014)					
Parameter	**Unit**	**Daily average – min**	**Daily average – max**	**7 day average**	**ELV**
% Removal					
COD load	%	98.8	99.6	99.1	90
BOD_5 load	%	99.8	100	99.9	97
total P load	%	99.1	99.8	99.6	85
total N load	%	96.8	98.5	97.6	75
Effluent					
pH		8.0	8.3	8.2	6.5-8.5
Settleable substances	ml/l	<0.1	<0.1	<0.1	0.3
NH_4-N	mg/l	0.07	0.29	0.14	2,5
total P	mg/l	0.14	0.45	0.25	2
total N	mg/l	2.5	4.5	3.1	-
COD	mg/l	38	76	58	-
BOD	mg/l	<3	5	<4	40
AOX	mg/l	0.075	0.15	0.10	-
AOX load	kg/d	0.19	0.37	0.27	9
Luminescent bacteria	GL	2	2	2	<12

fpdcs = flow proportional unsettled homogenised daily composite sample

The inflow of wastewater to the high performance (high load) step exceeded the limit on two days. Also the inlet load of COD exceeded the limit at the high performance step (1 day), at the biofilter/condensates (7 days) and at the municipal sewer (2 days). All other values show a general compliance with ELVs.

Data from self-monitoring (April 2013 to March 2014) show that the temperature of discharged cooling water exceeded the ELV on 30 days (mainly in summer). The sample was taken 800m upstream of the point of discharge. A higher level of compliance could be assumed if the sampling point were to be located at the point of discharge.

One possible reason for the reduced BOD_5 and total P values from 2013 to 2014 is the aforementioned adaptations of the aeration plates in the activated sludge basins. (Source: Agrana, email 14-11-2014)

2.5.3 Agrana Stärke, 3950 Gmünd

2.5.3.1 General description

Table 171: General description (Source: BH Gmünd, letter from 21-8-2014 and 7-11-2014, Agrana press release: www.agrana.com)

Name of the installation	**Agrana Stärke Gmbh, Conrathstrasse 7, 3950 Gmünd**
Production capacity	1,950 tons of potatoes per day Main products are 48,000 t/a potato starch and 35,000 t/a modified starch (max. 100 t/d). Modified starch is produced out of potato and maize starch. Additionally the factory produces 20,000 t/a maltodextrins and syrup, long-life potato products like mashed potato (corresponding to 20,000 t/a processed potatoes) and 3,500 t/a baby food.
Operating hours	The campaign lasts for 150 days a year (from the end of August until the end of December). Shift operation in all production areas.
Raw materials (2013/14)	Potatoes, corn starch
Auxiliary materials	HCl 33%, NaOH 50%, H_2SO_4 96% and 37%, HNO_3 53%, CHPTAC[1)] and EPTAC[2)] (cationisation agents), NaClO as liquid bleaching agent 50%, $FeCl_3$ solution 40%, carbolime, propylene oxide
General information	The facility at Gmünd is the only potato starch factory in Austria.

[1)] 3-chloro-2-hydroxypropyltrimethylammonium chloride

[2)] 2,3-epoxypropyltrimethylammonium chloride

Production processes

- Washing process
- Starch derivate production
- Dry derivates
- Drum drying plant
- Agenasol (fertilizer) production

2.5.3.2 Water and wastewater

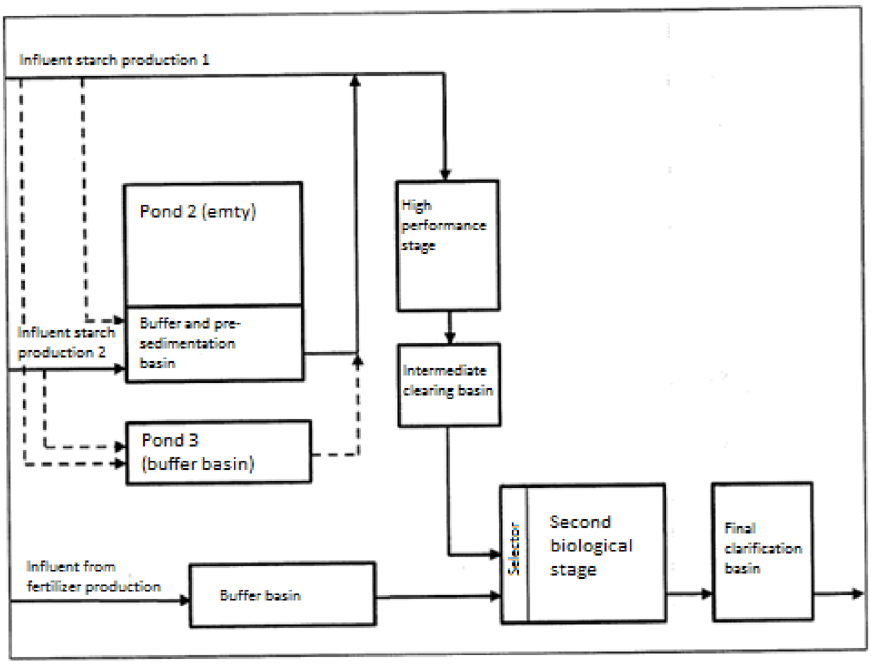
The starch factory in Gmünd operates a wastewater treatment plant and directly discharges wastewater into the river Lainsitz.

Countercurrent water systems have been installed (total need of fresh water: 600 l per ton of processed potatoes in 1992).

Table 172: Summary of wastewater streams (Source: BH Gmünd, letter from 21-8-2014)

Wastewater streams	
Partial wastewater streams	rain/surface water cooling water process wastewater
Description of the wastewater treatment plant (process WW)	Buffer basins, pre-sedimentation basin for washing water (with mechanical scraper and a lime dosing system), Selector (100 m³, description see below), high performance (high load) stage (1,090 m³) with intermediate clearing basin (1,100 m³), second biological (weak performance) stage (2,700 m³) with clarification basin (2,600 m³)
Measures in case of other than normal operating conditions	Separated buffer basins (for 3 different process wastewater streams), emergency basin for rain/surface and cooling water (2000 m³, two-chamber system with redundant pump systems)

Scheme of the WWTP in Gmünd



Source: BH Gmünd umweltbundesamt

Figure 8: Scheme of the WWTP in Gmünd (Source: BH Gmünd, letter from 21-8-2014)

The stream "Influent starch production 2" contains suspended matter and is therefore pre-treated in a pre-sedimentation basin. Both incoming wastewater streams from starch production (high polluted) are led to the high performance stage followed by an intermediate clearing basin before entering the Selector unit (see description below), the second biological stage and the final clarification basin. Less polluted wastewater from fertilizer production is directly led to the Selector followed by the second biological stage and the final clarification basin. Every single stream can be redirected to at least one buffer basin (dotted lines).

Selector: 3 ventilated basins with small volumes (including nitrogen supply in the first basin) to limit the growth of filamentous bacteria and therefore reduce bulking sludge. Principle: Recirculated sludge is mixed with wastewater and gets well ventilated. After discharge into the following activated sludge basin floc-forming bacteria are in preference to the filamentous bacteria due to nutrient shortage (much lower concentration than in the selector).

Filamentous bacteria grow especially well in carbohydrate-containing wastewater. So the pre-treatment by a Selector is advisable for sugar and starch producing installations which have problems with sludge bulking.

Table 173: Emission limit values for direct discharged cooling and rainwater (Source: BH Gmünd, letter from 21-8-2014)

Direct discharged cooling and rainwater					
Parameter	**Unit**	**ELV – dry weather (permit)**	**ELV – rain weather1) (permit)**	**Min. frequency for self-monitoring (permit)**	**Min. frequency for external monitoring (permit)**
Wastewater quantities	m³/h	550 m³/h and 8,000 m³/d	3,400	continuous	5 per year
T	°C	30	30	continuous	5 per year
pH		6.0-8.5	6.0-8.5	continuous	5 per year
Conductivity	µS/cm	300	300 [2)]	continuous	5 per year
Turbidity	FAU (formazine attenuation units)	40 [3)]	100	continuous	5 per year
TOC	mg/l	20	25	daily	5 per year
Sum of hydrocarbons	mg/l	0.5	10	weekly	5 per year

1) rain quantity >5mm/h

2) 1,500 µS/cm fom 1st of November to 31st of March (if de-icing salt has been used)

3) if the receiving water (Lainsitz) shows higher turbidity than 40 this value will be the new ELV

Methods for sampling, sample treatment, and analysis are applied according to the AAEV (FLG. Nr. 186/1996). Conductivity shall be measured according to ÖNORM EN 27888 and turbidity according to ÖNORM EN 27027-3.

If limit values for conductivity or turbidity are exceeded, rain- and cooling water are automatically redirected to an emergency basin (two-chamber system with redundant pump systems) and several parameters have to be measured (BOD, total suspended solids, total N, total P, total Cl, AOX and bacteria toxicity). The retained wastewater is finally led to the internal WWTP.

Cooling wastewater

Parameter		External monitoring 2013 (cooling water)					
		Spot sample (12-03)	Spot sample (22-05)	Spot sample (16-10)	Spot sample (26-11)	Method	ELV (Permit)
T	°C	15.6	19.4	18.5	10.1	ÖNORM M6616	30
pH		7.5	7.7	7.4	7.2	DIN 38404	6.0-8.5
Conductivity	µS/cm	216	230	147	211	EN 27888	300
Turbidity	FAU	4.1	7.1	5.9	2.3	EN ISO 7027	100
TOC	mg/l	5.9	4.9	5.8	4.7	EN 1484	25
Sum of hydrocarbons	mg/l	0.32	< 0.1	< 0.1	< 0.1	ÖNORM M 6608-1	10

Table 174: Results of external monitoring 2013 – discharged cooling water (Source: BH Gmünd, letter from 21-8-2014)

Data of the external monitoring (for cooling water) show a general compliance with ELVs.

Also self-monitoring (continuous measurement of T, pH, conductivity, turbidity and daily fpdcs for TOC as well as weekly fpdcs for the sum of hydrocarbons) show general compliance with the ELV during the year 2013 (1-1-2013 to 27-12-2013).

Process wastewater

Regulated parameters for the direct discharged wastewater are shown in the following table:

ELV for direct discharged process wastewater				
Parameter	Emission Limit Value (Permit)	Type of sample (Permit)	Min. frequency for self-monitoring (Permit)	Min. frequency for external monitoring (Permit)
Wastewater quantities	3.600 m³/d[1)] 5.000 m³/d[2)]	continuous	daily	5 days per year (at least 3 days during the campaign)
BOD_5 load	72 kg/d[1)] 100 kg/d[2)]	fpdcs	once per week	
total P load	7.2 kg/d[1)] 10 kg/d[2)]	fpdcs	daily	
total N load	100 kg/d	fpdcs	daily	
NH_4-N load	18 kg/d[1)] 25 kg/d[2)]	fpdcs	daily	
AOX load	3 kg/d 0.03 kg/t[3)]	fpdcs	daily	
TOC load	126 kg/d[1)] 175 kg/d[2)] 400 kg/d[4)]	fpdcs	daily	

Table 175: Emission limit values for direct discharged process wastewater (Source: BH Gmünd, letter from 21-8-2014)

ELV for direct discharged process wastewater				
Parameter	**Emission Limit Value (Permit)**	**Type of sample (Permit)**	**Min. frequency for self-monitoring (Permit)**	**Min. frequency for external monitoring (Permit)**
Minimum efficiency for TOC removal	90%[4)]	fpdcs	daily	
Minimum efficiency for Nitrogen removal	75%	fpdcs	daily	
TOC	35 mg/l[5)]	fpdcs	daily	
BOD_5	20 mg/l	fpdcs	once per week	
total P	2 mg/l	fpdcs	daily	
NH_4-N	5 mg/l	fpdcs	daily	
Settleable substances	0.3 ml/l[2)]	at least 3 spot samples a day	daily	
pH	6.5-8.5	at least 3 spot samples a day (or continuous)	daily	
T	30 °C	at least 3 spot samples a day (or continuous)	daily	

fpdcs = flow proportional unsettled homogenised daily composite sample

1) outside the campaign

2) during the campaign

3) per tonne of modified starch

4) if the TOC feed concentration exceeds 350 mg/l

5) only if the TOC feed concentration is below 350 mg/l

Methods for sampling, sample treatment and analysis are applied according to the AAEV (FLG. Nr. 186/1996): flow proportional unsettled homogenised daily composite samples for all parameters except pH, T, settleable substances which have to be measured by use of at least 3 spot samples.

Self-monitoring

The frequency of measurements given in Table 175 was maintained during the year 2013. A summary of the results is shown in the following table:

Table 176: Summary of the results of self-monitoring 2013 (Source: BH Gmünd, letter dated 21-8-2014)

Self-Monitoring 2013 (direct discharged process wastewater)					
Parameter	**Unit**	**Daily average max**	**Yearly average**	**ELV (daily average)**	**ELV exceedances**
Q	m³/d		-	3,600/ 5,000	0
pH	-	7,1-8.4	-	6.5-8.5	0
BOD	mg/l	13	-	20	0
TOC	kg/d	325	81	400	0
NH_4-N	mg/l	2.1	< 1	5	0
NH_4-N	kg/d		-	15/25	0
total P	mg/l	2.0	< 1.0	2	0
total N	mg/l	11	< 7.5	-	-
Settleable substances[1)]	ml/l	< 0.05	< 0.05	0.3	0
AOX	mg/l	0.62	0.08	-	-
AOX	kg/d	2.0	0.20	-	-
AOX per ton of modified starch	kg/t	0.023	0.0023	0.03	0
TOC removal	%	91.5[2)]	94.7	90	few[3)]
total N removal	%	75.5[4)]	90.5	75	0

1) average of 3 spot samples per day

2) lowest weekly average during 2013 (weekly max = 97.5%)

3) The removal efficiency was lower than the limit values on some days in one week due to a low inlet load; no exceedance in weekly average values

4) lowest daily average during 2013 (daily max = 97.5%)

Diagrams containing the results of each daily average value are shown in the following graphs:

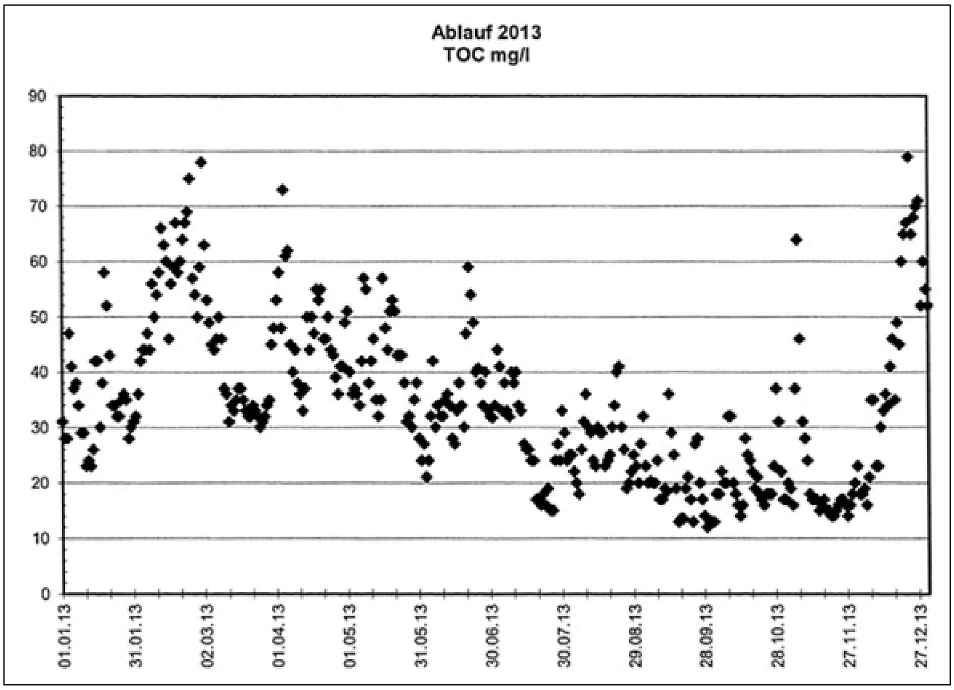


Figure 9: TOC in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

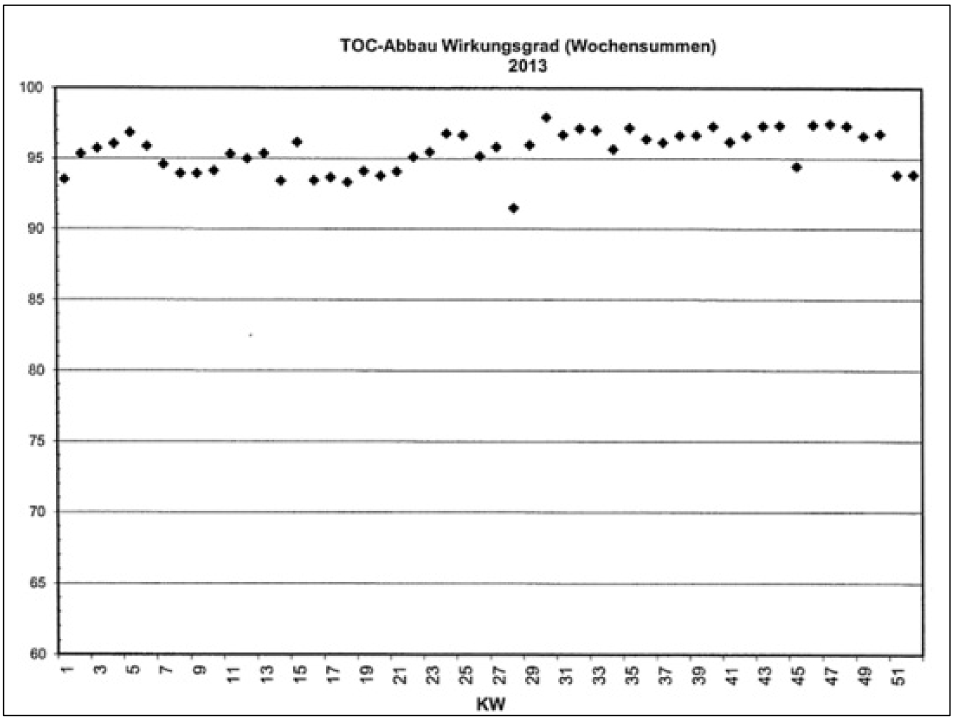


Figure 10: TOC removal 2013 (Source: BH Gmünd, letter from 21-8-2014)

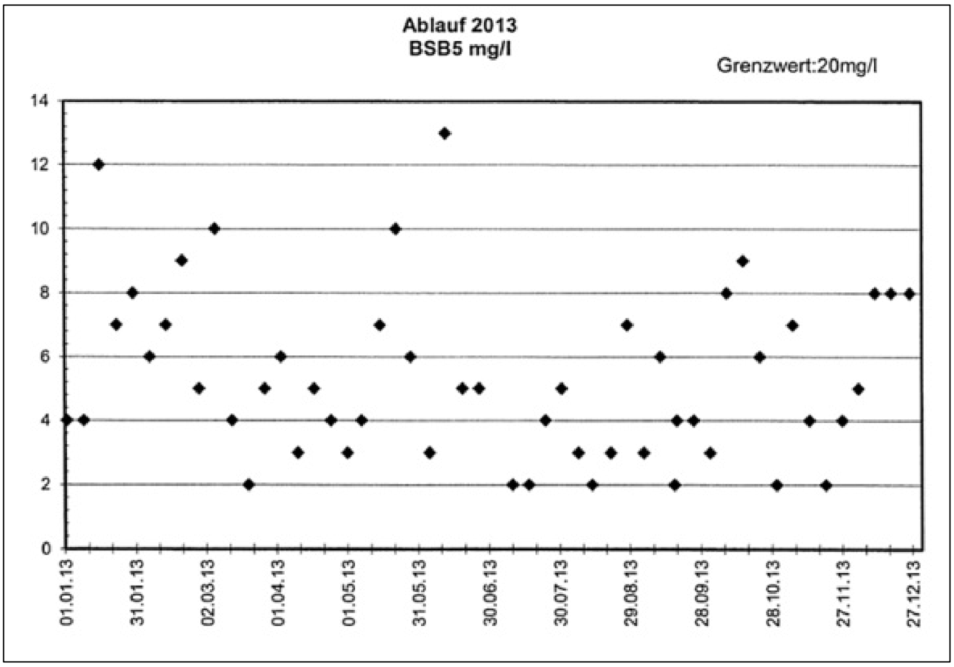


Figure 11: BOD_5 in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

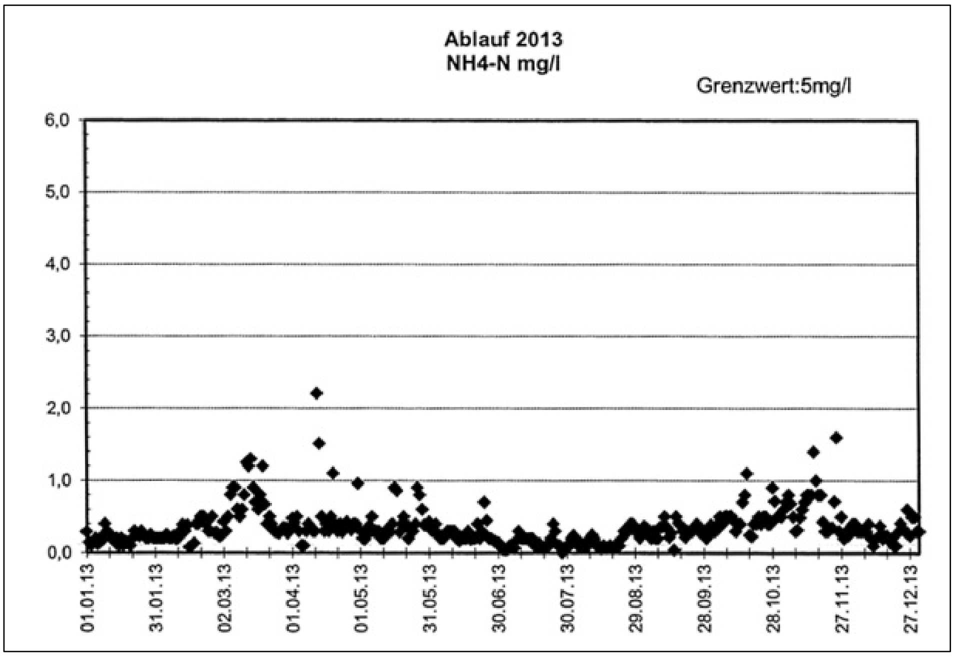


Figure 12: NH_4-N in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

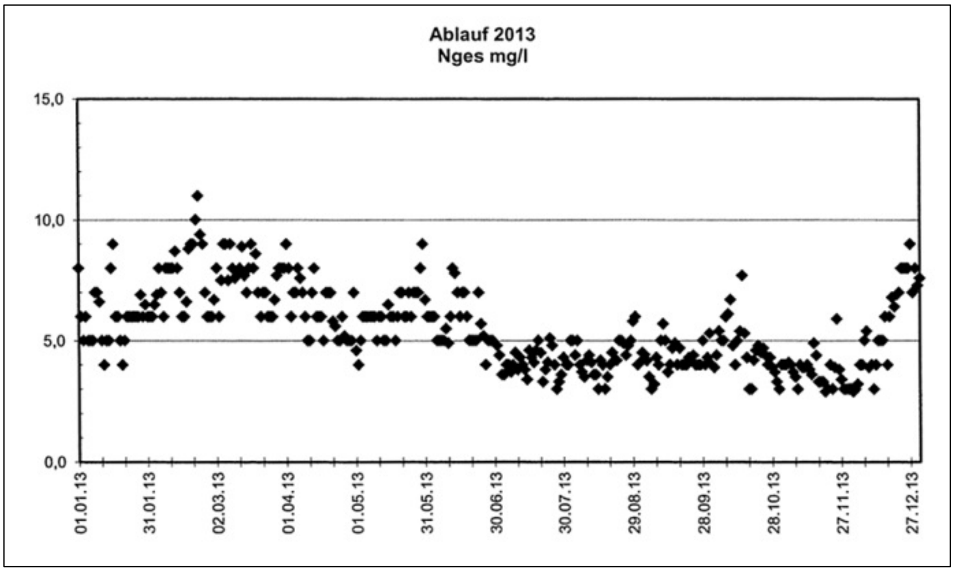


Figure 13: Total N in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

Figure 14: total N removal 2013 (Source: BH Gmünd, letter from 21-8-2014)

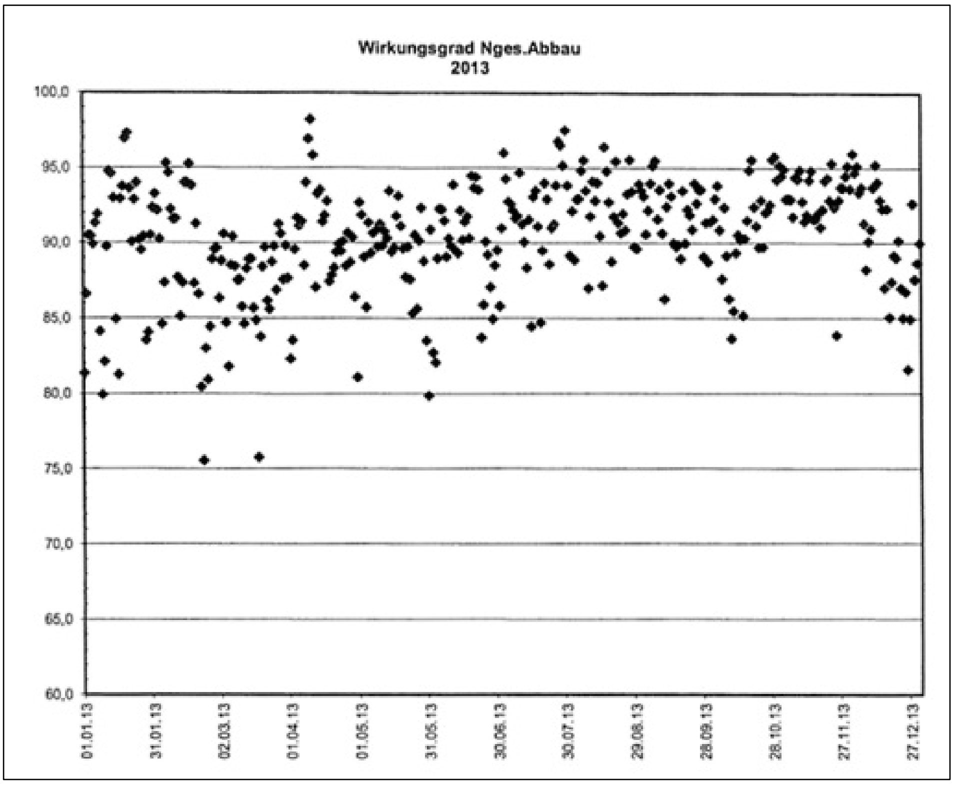
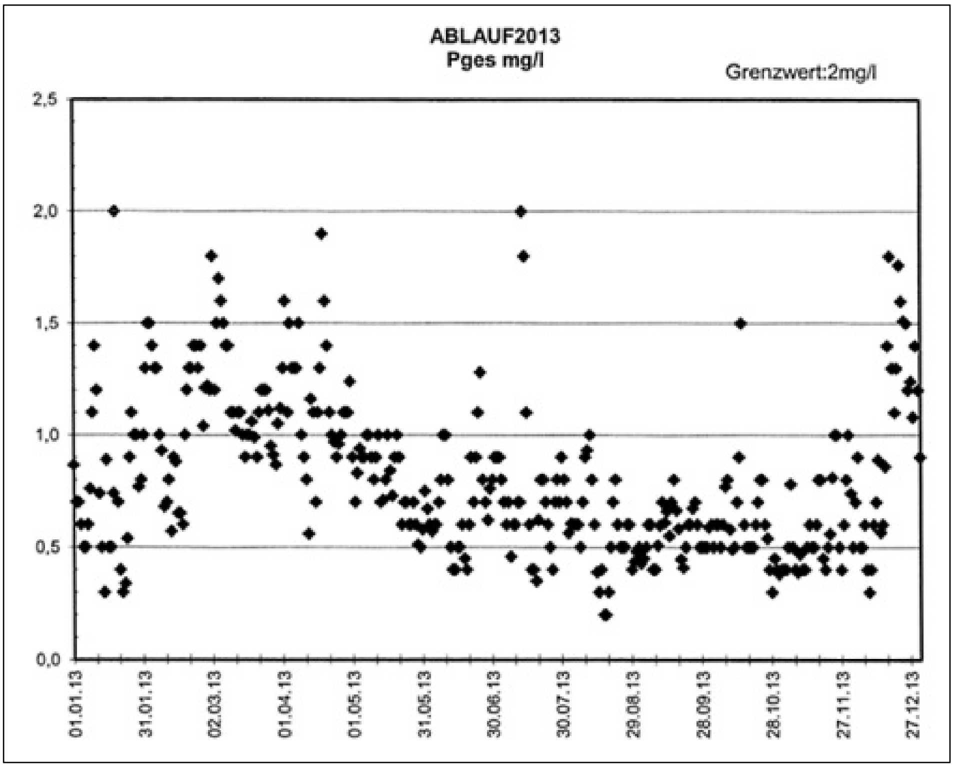


Figure 15: Total P in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)



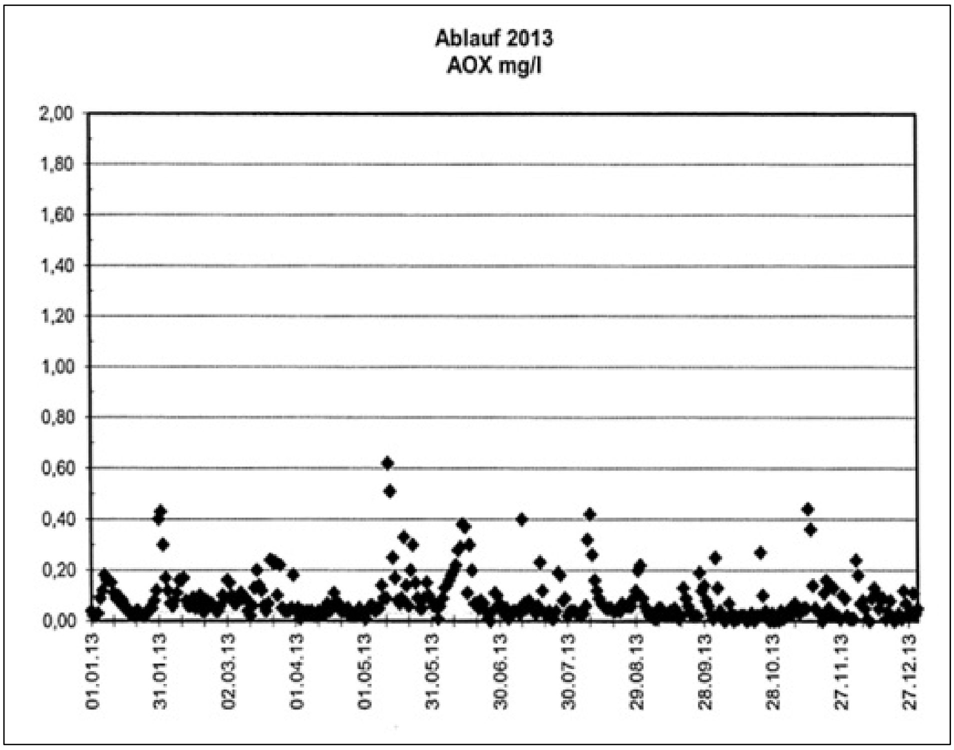


Figure 16: AOX in mg/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

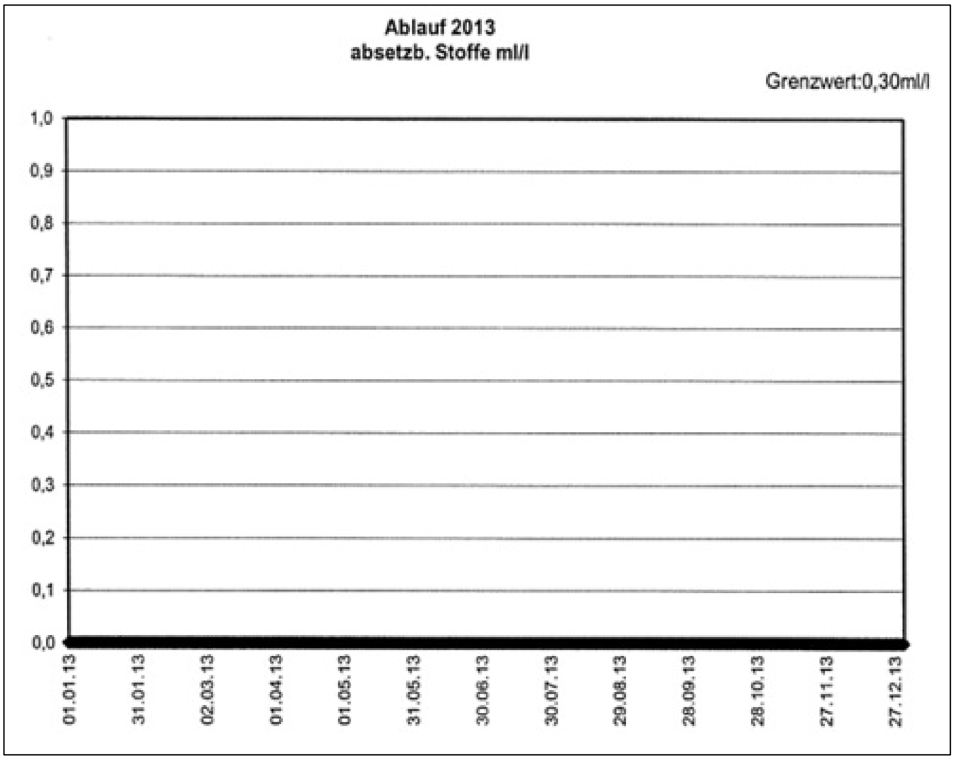


Figure 17: Settleable substances in ml/l in discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

Figure 18: pH value of discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)

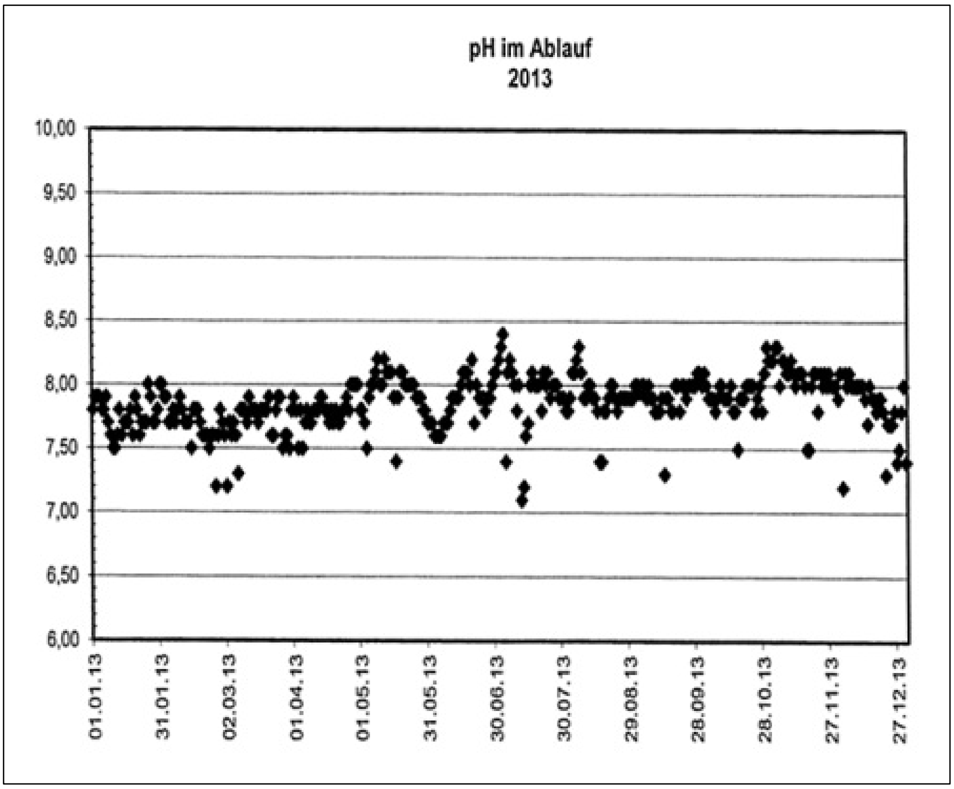
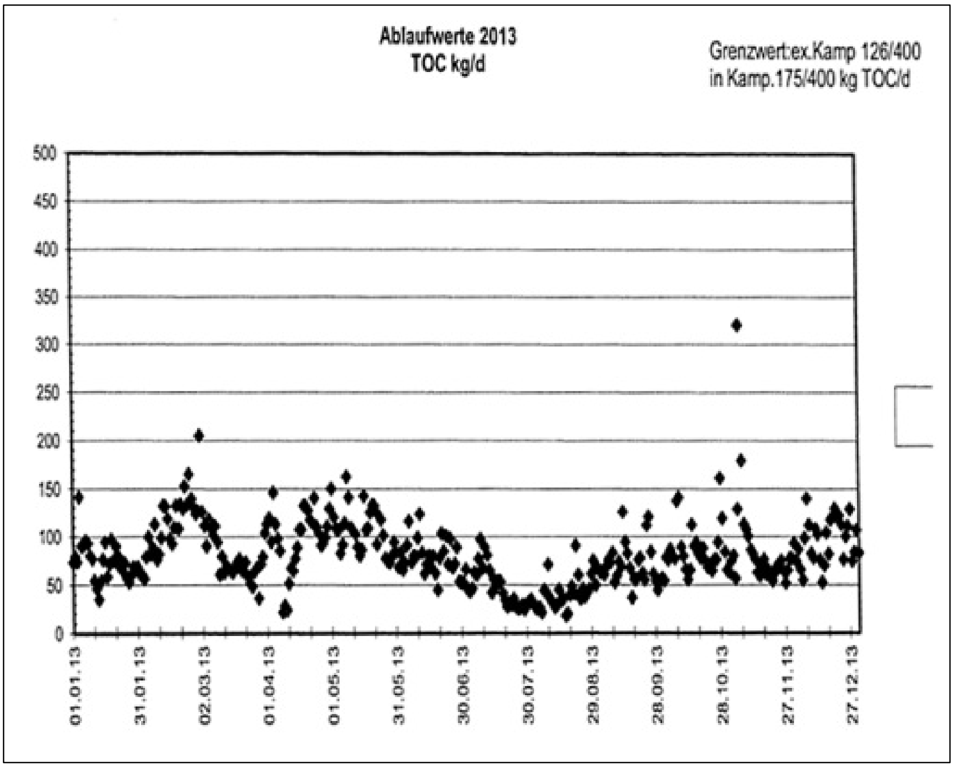


Figure 19: TOC load in the discharged process wastewater 2013 (Source: BH Gmünd, letter from 21-8-2014)



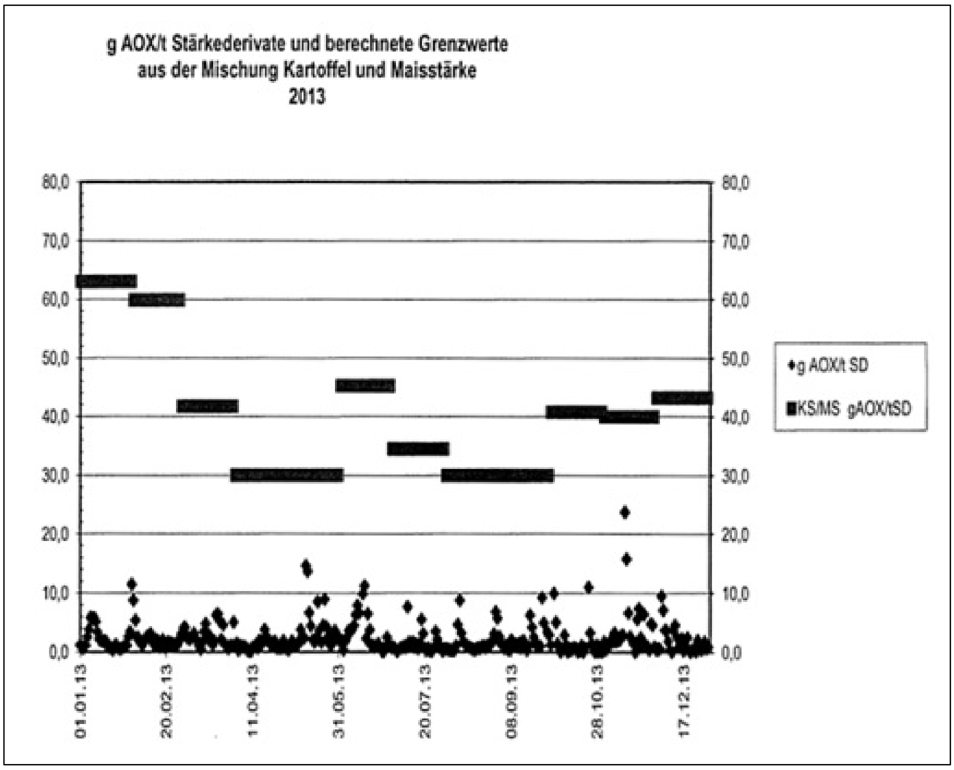


Figure 20: Specific load of AOX per ton of produced starch in the discharged process wastewater 2013 (rhombus) and combined ELV for AOX from potatoe(KS, ELV: 0.03 kg/t) and corn starch(MS, ELV: 0.1 kg/t) production according to FLG. Nr. 1073/1994 (Source: BH Gmünd, letter from 21-8-2014)

The TOC removal efficiency was lower than the limit values on some days due to a low inlet load (no exceedance in weekly average values). Beside that a general compliance with ELVs could be observed for both inlet and discharged wastewater.

External monitoring

Table 177: Applied methods for analysis and type of sample (12-3, 22-5., 16-10 and 26-11-2013) during external monitoring 2013 (Source: BH Gmünd, letter from 21-8-2014)

Methods for analysis and type of sample		
Parameter	**Applied methods**	**Type of sample**
Conductivity	EN 27888	fpdcs
BOD	EN 1899-1	fpdcs
TOC	EN 1484	fpdcs
NH_4-N	DIN 38406-5	fpdcs
total N	EN25663	fpdcs
total P	EN ISO 6878	fpdcs
AOX	DIN EN ISO 9562	fpdcs
T	ÖNORM M6616	3 spot samples per day
pH	DIN 38404	3 spot samples per day
Settleable substances	DIN 38409-9	3 spot samples per day

Table 178: Results of external monitoring 2013 (Source: BH Gmünd, letter from 21-8-2014)

External monitoring 2013 (daily average values – process wastewater)								
Parameter	**Unit**	**12.3.**	**22.5.**	**16.10.**	**19.11.**	**20.11.**	**26.11.**	**ELV (daily average)**
		Outside of the campaign		**During the campaign**				
Discharge								
T[4)]	°C	14.9	20.4	22.4	-	-	15	30
pH[4)]		7.6	7.8	7.9	-	-	7.6	6.5-8.5
Settleable substances[4)]	ml/l	< 0.1	< 0.1	< 0.1	-	-	< 0.1	0.3
Conductivity	µS/cm	1,672	1,391	2,230	-	-	1,719	-
BOD	mg/l	2	7.6	6	10	4.3	5.5	20
TOC	mg/l	29	34	33	16.2	13	16	35
NH_4-N	mg/l	1.2	1.1	0.31	0.9	0.46	0.4	5
total N	mg/l	9.1	5.6	4.6	4.33	3.71	5.1	-
total P	mg/l	0.91	0.58	0.61	0.87	0.43	0.59	2
AOX	mg/l	0.039	0.08	0.43	0.075	0.075	0.066	-
COD load	kg/d	-	-	-	268	210	-	-
BOD_5 load	kg/d	4	26	12	43	18	18	72 / 100[3)]
TOC load	kg/d	58	117	71	70	56	53	400
NH_4-N load	kg/d	2.5	3.7	0.66	3.9	1.97	1.5	18 / 25[3)]
total N load	kg/d	18.3	19	9.9	18.74	15.87	17	100
total P load	kg/d	1.8	2	1.3	3.77	1.84	1.9	7.2 / 10[3)]
AOX per ton of modified starch	kg/t	0.001	0.003	0.01	0.004	0.004	0.003	0.03
Removal efficiencies								
COD removal	%	-	-	-	96.4	98.0	-	-
BOD_5 removal	%	99.8	99.4	99.4	98.2	99.5	99.3	-
TOC removal	%	94.9	95.1	93.6	97.1	98.3	96.3	90
total N removal	%	78.1	87.7	87.1	89.2	92.2	89.9	75
total P removal	%	87.4	80.0	91.9	84.6	94.6	88.8	-

1) inlet tot he high performance step/Selector

2) inlet concentrations were measured at 7 different points

3) during/outside the campagin (measurements from 12.3. and 22.5. are outside the campaign)

4) average of 3 spot samples per day

External Monitoring 2013 (direct discharged process wastewater)					
Parameter	**Unit**	**Daily average min**	**Daily average max**	**Average (based on 6 fpdcs)**	**ELV (daily average)**
BOD	mg/l	2	10	5.9	20
TOC	mg/l	13	34	24	35
NH_4-N	mg/l	0.31	1.2	0.7	5
total N	mg/l	3.71	9.1	5.4	-
total P	mg/l	0.43	0.91	0.7	2
AOX	mg/l	0.039	0.43	0.13	-
AOX per ton of modified starch	kg/t	0.001	0.01	0.004	0.03
Removal efficiencies					
COD removal	%	96.4	98.0	97.2	-
BOD_5 removal	%	98.2	99.8	99.2	-
TOC removal	%	93.6	98.3	95.9	90
total N removal	%	78.1	92.2	87.4	75
total P removal	%	80.0	94.6	87.9	-

Table 179: Summary of the results of external Monitoring 2013: discharged concentrations and removal efficiency (Source: BH Gmünd, letter from 21-8-2014)

Data from external monitoring (for process wastewater) show a general compliance with ELVs during and outside the campaign.

2.6 Production of soft drinks

Soft drinks usually contain water, a sweetener, acid, flavourings and in many cases carbon dioxide. Other common ingredients are fruits, caffeine, preservatives and colours. Some examples of common non-alcoholic (= soft) drinks are spring waters, lemonades, tonic waters, fruit juices, tea as well as cordials and squashes. The main component is always water which therefore has a significant effect to the quality and taste of the final product. The sweetener may be sugar, sugar syrup, fruit juice and in case of diet drinks sugar substitutes or a combination of those. There are many natural flavouring agents used as highly concentrated mixtures of plant extracts such as fruit, flowers, seeds, leaves, bark and root but there are also synthetic flavour enhancers.

The carbon dioxide which is needed for sparkling soft drinks may be obtained as a co-product from other industries or produced on site. For preservation a various number of techniques including heating, chemical preservation and filtration can be used. Combined with low pH levels these methods prevent microbiological growth.

The production process involves the mixing of dry and/or fresh ingredients in the syrup room followed by the addition of water. Heat treatment like pasteurisation or chemical preservation is sometimes applied at this stage. Alternatively an in-pack heat process can be performed with the final packed product. Fruit syrups may need additional homogenisation, filtering and/or pasteurisation steps.

Common sources of wastewater in the soft drink manufacture include the pasteurisation of the product, cleaning of floors, equipment, installation and containers e.g. bottles. Thus cleaning is the largest source of wastewater which is the most ecologically harmful waste product in the soft drink sector. The present pollutants are mainly biologically degradable and contain active microorganisms (EUROPEAN COMMISSION 2006, ULLMANN 2007).

2.6.1 Rauch Fruchtsäfte, 6830 Rankweil

2.6.1.1 General description

Table 180: General description (Source: Rauch, email 25-7-2014 and oral information 28-11-2014)

Name of the installation	Rauch Fruchtsäfte GmbH & Co OG, Langgasse 1, 6830 Rankweil
IPPC activity	6.4 (b)
Capacity	ca. 600t/d
Products	Fruit drinks and concentrate
Operating hours	3-Shifts, 5-7 days per week
Raw materials	Water, several fruits
General Information	Rauch was founded in Rankweil shortly after the first World War as small commission cidery for the surrounding farmers. The company is mainly known for the production of juices and exports products to over 90 countries. Rauch is market leader for fruit juices in Austria since the 1970s and the companies headquarter is located in Rankweil. 13 subsidiaries are located in 11 European countries. (RAUCH FRUCHTSÄFTE 2014)

2.6.1.2 Energy generation and use

Table 181: Energy procurement 2013 (Source: Rauch, email 25-7-2014)

Energy procurement 2013	
Electrical power (external)	ca. 16 GWh
Consumption of natural gas	ca. 45 GWh

The main energy consumers are the steam boilers, the compressor unit and the cooling system. An energy management system is implemented.

Table 182: Combustion plants operated on site (Source: Rauch, email 25-7-2014)

Combustion plants	Steam boiler „Erne“	Steam boiler „Bertsch“
Rated thermal Input (MW)	4.41	8
Start of operation	1970	1978
Fuel	Natural gas: 1,285,410 m³	Natural gas: 2,570,819 m³
Flue gas temperature (°C)	219	226
Operating hours (h/a)	8,652	8,652
Energy recovery	Economiser (for preparation of hot water and feed water pre heating)	Economiser (for preparation of hot water and feed water pre heating)
Steam production (t/h)	6	11
Steam parameter (p, T)	13 bar, 200°C	13 bar, 200°C
Fuel use (%)	75	75
Oxygene content (%)	2.6	2.8

External monitoring 2013 (half hour average values)			
Pollutant	**Short time emission level – Steam boiler "Erne"**	**Short time emission level – Steam Boiler "Bertsch"**	**Emission limit value**
Dust (mg/Nm^3; 3% O_2)	3	3	10
NO_2 (mg/Nm^3; 3% O_2)	123	167	-
CO (mg/Nm^3; 3% O_2)	< 5	< 5	100

Table 183: Results of external monitoring from 2013, short term measurement (Source: Rauch, email 25-7-2014)

Both steam boilers have to be externally monitored once a year.

2.6.1.3 Waste management

Hazardous waste	
Type	**Amount [kg]**
Cooling units	274
Mercury vapour lamps	407
Batteries	30
Waste oil	539
Oil binder	390
Caustic solutions	210
Glue	700
Fat	172
Paints	192
Laboratory waste	112
Electrical waste	4,589
Wire	1,024
Non hazardous waste	
Type	**Amount [t]**
Shredder material	477
Industrial waste	341
Glas	359
Paper packaging	244
Wood packaging	168
Bonded drink cartons	35
Packaging plastics	47
LDPE-foils	35
Waste paper	17
Construction waste	8
Al-capsules	6
HDPE-canister	42
Steel	2
Al-cans	3
Cu-cable	1
Composite packaging	106
PP waste	2.44
Sludge	1,158
Tea waste	917
Pomace	181

Table 184: Different types of waste for the year 2013 (Source: Rauch, email 25-7-2014)

2.6.1.4 Noise and odour emissions

Noise

Table 185: Sources and measures against noise emissions (Source: Rauch, email 25-7-2014)

Noise	
Sources	Production processes, logistics
Measures to reduce noise emission	Internal noise measurements

Odour

Table 186: Sources and measures against odour (Source: Rauch, email 25-7-2014)

Odour	
Sources	vinegar production

2.6.1.5 Water and wastewater

Table 187: Overview of the consumption and treatment of water 2013 (Source: Rauch, email 25-7-2014)

Water and wastewater	
Consumption of fresh water	ca. 1,800,000 m³/y (from the public grid, a small river and own wells)
…thereof cooling water	ca. 1,100,000 m³/y
Partial wastewater streams	Cooling water is infiltrated (88,936 m³/y) or directly discharged (1,094,501 m³/y) process wastewater indirectly discharged to an external wastewater treatment plant domestic wastewater is separated and also indirectly discharged
Measures in case of other than normal operating conditions	Measures according to the Emergency manual of the QM. An alarm system gives a warning if the pH exceeds the given limits to take adequate countermeasures.
Internal treatment of WW from the process	Neutralisation, before discharging to the communal WWTP
Description of the external WWTP	The process at the external wastewater treatment plant Meiningen consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a capacity of 380,000 population equivalents (EW, equates to about 38,000 kg/d COD of which a maximum of 6,000kg/d stem from Fa.Rauch, Rankweil). The treated wastewater is discharged into the river Ehbach. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 188: Cooling water 2013 (Source: Rauch, email 25-7-2014)

Self-monitoring 2013 (Cooling water)							
Parameter		**Daily average – min**	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**Yealy average**	**ELV**
Infiltrated cooling water							
Q	m³	190	307	5,815	9,216	88,936	250,000 m³/y 685 m³/d
T	°C	7,5	19,8	14	16,51	15,58	20
Cooling water discharged to the river Mühlbach							
Q	m³	418	4,000	53,629	112,150	1,094,501	1,000,000 m³/y 4032 m³/d

Table 189: Emission limit values and minimal frequencies for self- and external monitoring for the process wastewater (Source: Rauch, email 25-7-2014)

Process wastewater				
Parameter	**Unit**	**ELV Permit**	**Type of sampling**	**frequency self-monitoring in 2013**
Q (discharge)	m³/d	2000	continuous	continuous
T	°C	35	continuous	continuous
pH		6.5-10	continuous	continuous
COD	mg/l	5,000[1)]	fpdcs	100 per year
BOD	mg/l	2,500[1)]	fpdcs	-
total N	mg/l	-	fpdcs	-
total P	mg/l	40[1)]	fpdcs	-
Total suspended solids	mg/l	750	fpdcs	-
Settleable substances	ml/l	20[1)]	spot sample	100 per year
AOX	mg/l	1.0	fpdcs	-

fpdcs. = flow proportional unsettled homogenised daily composite sample

[1)] target value

Table 190: Summary of results of self- and external monitoring 2013 – whole year (Source: Source: Rauch, email 25-7-2014)

Process wastewater – Monitoring 2013				
Parameter		**Daily average – max**	**Yearly average**	**ELV**
Q (discharge)[1)]	m³/d	2,066	453,657 m³/y 1,243 m³/d	-
pH[1)]		9	7.4	6.5-10
COD[1)]	mg/l	4,528	3,319	5,000[2)]
BOD	mg/l	2,200	1,568	2,500[2)]
total N	mg/l	30	24	-
total P	mg/l	8.7	6.4	40[2)]
Settleable substances	ml/l	30	10	20[2)]
Total suspended solids[1)]	mg/l	640	521	750
AOX	mg/l	0.760	0.476	1.0

data include other than normal operating conditions

[1)] self-monitoring (100 daily average values in 2013)

[2)] target value

Results of external monitoring show a general compliance with all emission limit values (only the target value was exceeded for settleable substances).

2.6.2 Rauch Fruchtsäfte, 6714 Nüziders

2.6.2.1 General description

Table 191: General description (Source: Rauch, email 19-9-2014, 5-11-2014 and oral information 28-11-2014)

Name of the installation	Rauch Fruchtsäfte GmbH & Co OG, Kuhbrückweg 2, 6714 Nüziders
Capacity	ca. 3,200 t/d
Products	Fruit and other soft drinks
Operating hours	4-shift-operation (24h), 7-days a week
Raw materials	Water (Rauch Nüziders is a pure filling site), fruit juice concentrate
General Information	In this installation drinks are produced and filled into cans. The company headquarters are in Rankweil (also in the federal state Vorarlberg) but there are also production facilities in Switzerland, Hungary, Poland and Serbia (RAUCH FRUCHTSÄFTE 2014).

2.6.2.2 Energy generation and use

Table 192: Energy procurement 2013 (Source: Rauch, email 19-9-2014 and 13-4-2015)

Energy data 2013	
Electrical power (external)	ca. 28 GWh
Consumption of natural gas	ca. 70 GWh

The main energy consumers are 2 steam boilers, the compressor unit, the cooling system and the wastewater treatment plant. An energy management system has been implemented. (Source: Rauch, email 19-9-2014)

Table 193: Combustion plants operated on site 2012 (Source: Rauch, email 19-9-2014)

Combustion plants 2012	Steam boiler „Bertsch“	Steam boiler „Hoval“
Rated thermal Input (MW)	10.6	10.5
Start of operation	1995	2004
Fuel	Natural gas (light heating oil as emergency fuel)	Natural gas (extra light heating oil as alternativ fuel)
Operating hours (h/a)	8,640	8,784
Energy recovery	Economiser (for preparation of hot water and feed water pre heating)	Economiser (for preparation of hot water and feed water pre heating)
Steam production (t/h)	15	15
Steam parameter (p, T)	6 bar, 164°C	6 bar, 164°C
Oxygene content (%)	3	3

Table 194: Results of external monitoring from 2013, short term measurement (Source: Rauch, email 19-9-2014)

External monitoring 2013 (half hour average values)			
Pollutant	**Short time emission level – Steam boiler "Bertsch"1**	**Short time emission level – Steam Boiler "Hoval"1**	**Emission limit value**
Dust (mg/Nm^3; 3% O_2)	<3	<3	5
NO_2 (mg/Nm^3; 3% O_2)	78	73	100
CO (mg/Nm^3; 3% O_2)	0	0	80

[1] *based on single measurements*

Results of external monitoring 2013 show general compliance with the ELVs.

2.6.2.3 Waste management

Table 195: Different types of waste for the year 2013 (Source: Rauch, email 19-9-2014)

Hazardous waste		
Type	**Amount [kg]**	**Treatment/Disposal**
Cooling units	382	authorised waste disposal company
Mercury vapour lamps	235	authorised waste disposal company
Batteries	46	authorised waste disposal company
Waste oil	748	authorised waste disposal company
Oil binder	530	authorised waste disposal company
Oil filter	299	authorised waste disposal company
Glue	674	authorised waste disposal company
Workshop waste	826	authorised waste disposal company
Paints	167	authorised waste disposal company
Laboratory waste	161	authorised waste disposal company
Electrical waste	3315	authorised waste disposal company
mercury	2	authorised waste disposal company
Non hazardous waste		
Type	**Amount [t]**	**Treatment/Disposal**
Shredder material	469	authorised waste disposal company
Industrial waste	875	authorised waste disposal company
Wood	299	authorised waste disposal company
Paper packaging	653	authorised waste disposal company
Plastic packaging	370	authorised waste disposal company
Steel and copper	2	authorised waste disposal company
Al-cans	195	authorised waste disposal company
Sludge	4222	External biogas plant

2.6.2.4 Noise and odour emissions

No statutory requirements need to be observed for Odour. The maximum noise level at the stack of the steam boiler is 94 dB (at a distance of 1m).

2.6.2.5 Water and wastewater

Table 196: Overview of the consumption and treatment of water 2012 (Source: Rauch, email 19-9-2014)

Water and wastewater	
Consumption of fresh water	ca. 1,800,000 m³/y (from a small river and own wells)
…thereof cooling water	ca. 530,000 m³/y
Partial wastewater streams	• Wastewater from the process: discharged directly into the river Ill after treatment in the internal WWTP • Sanitary wastewater: indirect discharge into municipal sewage system • Cooling water: infiltration with a max. of 20 °C
Internal treatment of WW from the process	Wastewater is treated in the internal WWTP and discharged into the river Ill.
Measures in case of other than normal operating conditions	Measures according to the Emergency manual of the QM. (e.g. special agreement to discharge wastewater to an external WWTP during maintenance of the internal WWTP)
Description of the wastewater treatment plant	The wastewater treatment plant consists of aerobic biological stage (with additional upstream aeration) followed by a flotation plant. Currently the WWTP gets built out into a two-line plant.

Table 197: Cooling water 2012 (Source: Rauch, email 19-9-2014)

Parameter		**Monitoring 2013 (Cooling water – infiltration)**					
		Daily average – min	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**Yearly average (whole year)**	**ELV**
Q	m³/d	144	2,791	998	1,797	1,450	Grenzwert(e)?

Process wastewater

The installation operates its own wastewater treatment plant which discharges into the nearby river Ill. A separation system is installed to separate process wastewater from faecal wastewater which is discharged into the municipal sewage system of Nüziders.

Table 198: Emission limit values and minimal frequencies for self- and external monitoring for the process wastewater (Source: Rauch, email 19-9-2014 and 21-10-2014)

Process wastewater					
Parameter	**Unit**	**ELV Permit**	**Type of sampling**	**Min. frequency self-monitoring**	**Min. frequency external monitoring**
Q (discharge)	m³/d	-	continuous	continuous	1 day per month (discharge and inlet)
T	°C	30	continuous	continuous	1 day per month (discharge and inlet)
pH		6.5-8.5	continuous	260 per year or continuous (discharge and inlet)	1 day per month (discharge and inlet)
COD	mg/l	90 (target value: 60)	fpdcs	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
COD load	kg/d	150 and 50 t/a	calculated	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
COD removal	%	85	calculated	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
BOD	mg/l	20	fpdcs	52 per year (discharge and inlet)	1 day per month (discharge and inlet)
BOD_5 load	kg/d	30 and 5 t/a	calculated	52 per year (discharge and inlet)	1 day per month (discharge and inlet)
BOD_5 removal	%	90	calculated	52 per year (discharge and inlet)	1 day per month (discharge and inlet)
total P	mg/l	1.0 (target value: 0.5)	fpdcs	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
total P load	kg/d	2.5 and 0.5 t/a	calculated	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
total P removal	%	90 (target value: 95%)	calculated	260 per year (discharge and inlet)	1 day per month (discharge and inlet)
Total suspended solids	mg/l	20	spot sample	52 per year (discharge and inlet)	1 day per month (discharge)
NH_4-N	mg/l	5	fpdcs	260 per year (discharge and inlet)	1 day per month (discharge)
NH_4-N load	kg/d	12.5 and 1 t/a	calculated	260 per year (discharge and inlet)	1 day per month (discharge)
Total Cl	mg/l	0.1	fpdcs	-	1 day per month (discharge)
AOX	mg/l	0.5	fpdcs	-	1 day per month (discharge)
Cu	mg/l	0.5	fpdcs	-	1 day per month (discharge)
Zn	mg/l	1.0	fpdcs	-	1 day per month (discharge)

Process wastewater					
Parameter	**Unit**	**ELV Permit**	**Type of sampling**	**Min. frequency self-monitoring**	**Min. frequency external monitoring**
NO_3^-	mg/l	-	fpdcs	-	1 day per month (discharge)
SO_4^-	mg/l	-	fpdcs	-	1 day per month (discharge)

fpdcs = flow proportional unsettled homogenised daily composite sample

Most permitted emission limit values are more stringent than in the Austrian Ordinance for drinks: no deviation is allowed for the pH value, only 10% for temperature and 50% for NH_4-N (instead of 20 and 100%).

The time and date of sampling has to be agreed with the Vorarlberg provincial government to be able to provide statistically significant information which is comparable with the external monitoring.

Table 199: Summary of results of the external monitoring 2013 fpdcs for untreated wastewater (Source: Source: Rauch, email 6-10-2014)

Self-monitoring 2013 (Process wastewater – direct discharge)							
Parameter		**Daily average – min**	**Daily average – max**	**Monthly average – min**	**Monthly average – max**	**Yearly average (whole year)**	**ELV**
Q	m³/d	-	2,580	1,023	2,552	1,564	-
T	°C	18.7	31.6[1)]	20.1	28.7	23.9	30
COD	mg/l	11	70[2)]	23.4	41.5	32.3	90
BOD	mg/l	0	19	1.2	6.8	3.6	20
total P	mg/l	0	0.99	0.12	0.69	0.43	1.0
NH_4-N	mg/l	0	4.5	0.06	0.91	0.43	5
NO_3	mg/l	0	2.3	0	0.6	0.1	-
COD removal	%	95[3)]	99	92	98	96.6	85%
BOD_5 removal	%	95	100	99	100	99.5	90%

1) the temperature which has been exceeded during one week in summer (August)

2) 9 out of 356 measurements for COD exceeded the ELV

3) some COD removal efficiencies during July and August are quite low (some below 10%) and seem to be either OTNOC or a result of measurement problems at the influent (the highest discharged COD concentration on these days was 62 mg/l)

Besides the temperature which was exceeded during one week in summer (August) and some minor COD exceedances the results of self-monitoring 2013 show general compliance with the ELVs. The measurement frequency was daily (except 23 December – 31 December 2013).

External monitoring is foreseen monthly (one daily average value) for incoming and direct discharged wastewater. The results for 2012 are shown in the following 2 tables:

External monitoring 2012 (untreated process wastewater)				
Parameter		**Daily average – min**	**Daily average – max**	**Yearly average**
Q	m³/d	1,054	2,253	1,614
pH		4	7	5
Conductivity	µS/cm	920	1,884	1,553
COD	mg/l	510	3,600	1,541
COD load	kg/d	588	6,350	2,551
BOD	mg/l	300	1,300	852
total P	mg/l	3	22	10
total N	mg/l	13	85	46
Cu	mg/l	<0.008	0.05	<0.05
Molybdenum	µg/l	<0.01	<0.01	<0.01
Zn	mg/d	0.05	1	0.2

Table 200: Summary of the results of external monitoring for 2012 based on monthly measurements of fpdcs for untreated wastewater (Source: Source: Rauch, email 6-10-2014)

External monitoring 2012 (wastewater after treatment)					
Parameter		**Daily average – min**	**Daily average – max**	**Yearly average**	**ELV (Daily average – Permit)**
Q	m³/d	1,054	2,253	1,614	-
pH		6.7	8.2	7.5	6.5-8.5
Conductivity	µS/cm	1,542	1,850	1,642	-
Total suspended solids	mg/l	1	28	11	-
COD	mg/l	15	51	31	90 (target value: 60)
COD load	kg/d	20	90	50	150
BOD_5	mg/l	<1.0	10	<4	20 (target value: 15)
BOD_5 load	kg/d	2	18	7	30
TOC	mg/l	6	18	9	-
AOX	mg/l	0.034	0.2	0.073	0.5
AOX load	mg/d	38	302	122	-
Total Cl	mg/l	<0.1	<0.1	<0.1	0.1
Free Cl	mg/l	0	0	<0.1	not detectable
Sulphide	mg/l	0	0	<0.03	-
Chloride	mg/l	250	350	296	-
NO_3-N	mg/l	<1.0	17	5	-
Sulphate	mg/l	140	350	288	-
total P	mg/l	0.1	0.8	0.4	1.0 (target value: 0.5)
total P load	kg/d	0.17	1.7	0.7	2.5

Table 201: Summary of results of the external monitoring 2012 based on monthly measurements of fpdcs for direct discharged process wastewater (Source: Source: Rauch, email 6-10-2014 and 21-10-2014)

External monitoring 2012 (wastewater after treatment)					
Parameter		**Daily average – min**	**Daily average – max**	**Yearly average**	**ELV (Daily average – Permit)**
NH_4-N	mg/l	0.1	2.1	<0.5	5
NH_4-N load	kg/d	<0.06	2.71	<0.7	12.5
total N	mg/l	1.1	5.0	<3	-
Cu	mg/l	<0.008	0.08	<0.02	0.5
Zn	mg/l	0.03	0.38	<0.1	1.0

Table 202: Removal efficiency of the WWTP based on monthly measurements of fpdcs for direct discharged process wastewater (Source: own calculation based on results of the external monitoring 2012)

Removal efficiency (selected parameters – External Monitoring 2012)					
Parameter		**Daily average – min**	**Daily average – max**	**Yearly average**	**ELV (Daily average – Permit)**
COD removal	%	97.1	98.6	98.0	85
BOD_5 removal	%	>99.7	99.2	>99.5	90
total N removal	%	91.5	94.1	>93.5	75
total P removal	%	96.5	96.2	95.8	90 (target value: 95%)

Results of external monitoring for 2013 show general compliance with the ELVs.

Table 203: External monitoring 2014 based on a 24h fpdcs for direct discharged process wastewater (Source: Source: Rauch, email 6-11-2014)

External Monitoring 24/25-9-2014 (direct discharged process wastewater)				
Parameter	**Unit**	**Daily average**	**ELV**	**Method of analysis**
Q	m³/d	1284	-	stationary counter
T	°C	29.6	30	DIN 38404 C4-2
pH		7.84	6.5-8.5	DIN EN ISO 10523
Conductivity	µS/cm	1,472	-	DIN EN 27888
Total suspended solids	mg/l	< 5.0	20	DIN 38409 H2
COD	mg/l	23	90	DIN 38409-41
BOD_5	mg/l	2.8	20	DIN EN 1899-1/2
TOC	mg/l	6.0	-	DIN EN 1484
AOX	mg/l	0.18	0.5	ÖNORM EN ISO 9562
Total Cl	mg/l	< 0.1	0.1	EN ISO 7393-1
Free Cl	mg/l	< 0.1	-	EN ISO 7393-1
Sulfide	mg/l	< 0.03	-	DIN 38405 D27
Chloride	mg/l	270	-	DIN EN ISO 10304-1
Sulphate	mg/l	300	-	DIN EN ISO 10304-1
NO_3 (as N)	mg/l	0.86	-	DIN EN ISO 10304-1
total P	mg/l	0.13	1.0	DIN EN ISO 11885
NH_4-N	mg/l	0.49	5	ÖNORM EN ISO 11732

External Monitoring 24/25-9-2014 (direct discharged process wastewater)				
Parameter	**Unit**	**Daily average**	**ELV**	**Method of analysis**
Kjeldahl N	mg/l	2.2	-	DIN EN 25663
total N	mg/l	3.1	-	DIN EN 25663
Cu	mg/l	0.022	0.5	DIN EN ISO 11885
Zn	mg/l	0.018	1.0	DIN EN ISO 11885

Results of the external monitoring 24-9-2014 show general compliance with the ELVs.

2.6.3 Spitz, 4800 Attnang-Puchheim

2.6.3.1 General description

Spitz produces mainly syrups, juices but also spirits, confectionery, mustard, ketchup sauces and jam. The company exports about 30% of the products. (SPITZ GESMBH 2014)

Table 204: General description (Source: Fa.Spitz, email 16-7-2014)

Name of the installation	Spitz GesmbH, Gmundner Staße 27, 4800 Attnang-Puchheim
Products 2013	Mainly drinks but also baked goods, jam, mustard and dressings
	ca. 250,000 t water and soft drinks
	ca. 20,000 t waffles, cake, roulades and toast
	ca. 11,000 t mustard, ketchup, jam and mayonnaise
	ca. 3,500 t alcoholic drinks
Operating hours	670 employees, 5 working days/week with mainly 3-shift-operation
Raw materials	Water, fruit concentrates and mixtures, sugar, four, cacao, hazelnut
Auxiliary materials	PET granulate, foils, bottles, tubes and cartons

Production process (drinks):

Drinks are mainly made of delivered concentrates which are mixed and diluted with filtered, sterile water from drinking-water wells. The liquid product is then filled into PET bottles, cans and (to a lesser extent) in glass bottles. Cans are treated by means of a tunnel pasteuriser, bottles are filled by the use of an aseptic technique (using monochloroacetic acid), UCF (ultra clean filling) or "normal" (e.g. carbonated water). Due to the high number of rinse steps a high amount of low polluted wastewater is emitted.

2.6.3.2 Energy generation and use

Table 205: Energy procurement 2013 (Source: Fa.Spitz, email 16-7-2014)

Energy 2013	
Electrical Power	29.2 GWh (external supply)
Heat	47.271 GWh (external supply)
Consumption of gas	18.83 GWh (1,000-1,900 m³/d)
Sources of energy	Steam (10 bar) and hot water are delivered by a biomass heating plant. Natural gas and electricity from the public grid. Biogas from the anaerobic sludge treatment is also used for heating.
Energy Management System	Energy measurement system with about 170 measuring points for electrical power (15min average values), steam and hot water including automatic adjustment in case of deviations as well as monthly project meetings. Continuous improvements since 1999. EMS allows detailed evaluation of energy consumption per each individual product. About 20% of the total used electrical power is stand-by consumption (wastewater treatment, cooling houses etc).

Examples from the internal Energy Management System

Table 206: Energy consumption for the manufacture of final products – energy need for the input material is not included (Source: Fa.Spitz, email 16-7-2014)

Specific energy consumption 2014 (kWh per l or kg of final product)			
Product or plant	**Electrical power**	**Heat**	**Natural Gas**
Distillery	0.014	4.500	-
Preform production	1.220	-	-
Toasters	0.170	0.100	0.350
Jam	0.100	1.500	-
Ketchup	0.050	0.300	-
Mustard	0.030	-	-
Glass bottle filling	0.065	0.02-0.07[1)]	-
PET filling	0.690	0.03–0.1[1)]	-
Canning line	0.018	0.100	-
Waffle production line	0.260	-	1.020
Cakes	0.090	-	0.450
Sweet rolls	0.150		0.250

1) There is a high variety in the area oft filling because of requirements of the individual types of drinks.

2.6.3.3 Waste management

Table 207: Types and amounts of hazardous waste 2013 (Source: Fa.Spitz, email 16-7-2014)

Hazardous waste		
Type	**Amount (t)**	**Treatment/Disposal[1)]**
Waste oil	4.546	waste incineration
Garage wastes	2.388	waste incineration
Electronical waste	3.132	recycling
Gas discharge lamps	0.355	recycling
Spray cans	0.166	recycling

Hazardous waste		
Type	**Amount (t)**	**Treatment/Disposal[1)]**
Cooling units	0.072	recycling
Solvent mixes free of halogens	0.532	waste incineration
Screens	0.303	recycling
Acids with application-specific impurities	0.04	waste incineration
Inorganic acids	0.358	waste incineration
Batteries	0.103	recycling
Ink residues and toner cartridges	0.305	waste incineration
Solvent-water mixture	0.18	chemical-physical treatment
Oil and air filters	0.248	waste incineration
Alkaline solutions and mixtures	0.44	chemical-physical treatment
Lead accumulators	0.317	recycling
Laboratory waste and chemical residues	0.082	waste incineration
Cooling agent solutions	0.92	chemical-physical treatment
Used oilbinding agents	0.624	waste incineration
Lime mud	0.42	waste incineration
Total	15.5	

[1)] by licensed companies

Table 208: Types and amounts of non-hazardous waste 2013 (Source: Fa.Spitz, email 16-7-2014)

Non-harardous waste 2013		
Type	**Amount (t)**	**Treatment/Disposal[1)]**
Residual waste	306.69	waste incineration
Cardboard	430.38	recycling
Films	86.093	recycling
PET bottles	105.06	recycling
Canisters	24.35	recycling
Bonded drinks cartons (clean)	48.44	recycling
Cans and drums	153.85	recycling
Aluminium packaging	35.77	recycling
Used glass	68.98	recycling
Plastics (mixtures)	169.02	waste incineration
Kitchen waste	4.24	biogas plant
Nirosta V2a	6.7	recycling
Cu cable	0.66	recycling
Old paints (hardened)	0.067	waste incineration
Other waste paints (hardened)	0.068	waste incineration
Total	**1,440.368**	

[1)] by licensed companies

2.6.3.4 Noise emissions

Table 209: Sources and measures against noise emission (Source: Fa.Spitz, email 16-7-2014 and verbal information)

Noise	
Source	primarily ventilation systems next to neighbourhood
Measures to reduce noise levels	several sound absorbers, housings and recurring noise measurements, truck loading section apart from neighboring residental area

2.6.3.5 Water and wastewater

Table 210: Overview about the consumption and treatment of water 2012 (Source: Fa.Spitz, email 16-7-2014 and WB Spitz)

Consumption and treatment of water 2012	
Consumption of fresh water	2,390,192 m³/y
thereof cooling water	1,874,024 m³/y
Partial wastewater streams	surface, cooling, domestic and process wastewater
Internal treatment of WW from the process	surface: seepage basin cooling: infiltration well (max. T diff.: 3°C) process and domestic: discharged directly into the river Ager after internal wastewater treatment plant
Short description of the process wastewater treatment	mechanical treatment, pH neutralisation unit (using NaOH), pre-flotation, aerobic biological treatment in 4 independent basins and 2 pre-aeration basins, activated sludge flotation and anaerobic treatment followed by sludge thickening using a decanter, sand filter
Measures in case of other than normal operating conditions	redundant aerobic basins, proper dimensioning, 2 buffer tanks at the inlet (600 m³ each)

Table 211: Emission limit values and minimal frequencies for self- and external monitoring for the process wastewater (Source: Fa.Spitz, email 16-7-2014)

Process wastewater					
Parameter	**Unit**	**ELV Permit**	**Type of sample**	**Min. frequency self-monitorinig (permit)**	**Min. frequency external monitoring (permit)**
Wastewater quanties		1,800 m³/d, 62.5 m³/h	Continuous (MID)	daily	1 per year
pH		6.5-8.5	Continuous (Hamilton pH probe)	daily	1 per year
T	°C	30	continuous	daily	1 per year
BOD_5 load	kg/d	27	(calculated)	2 times a week	1 per year
COD load	kg/d	135	(calculated)	each working day	1 per year
BOD_5	mg/l	20	fpdcs	2 times a week	1 per year
COD	mg/l	90	fpdcs	each working day	1 per year
total P	mg/l	0.6	fpdcs	each working day	1 per year
NH_4-N	mg/l	2.5[1)]	fpdcs	each working day	1 per year
total N	mg/l	75%	fpdcs	2 times a week	1 per year
Total suspended solids	mg/l	30	fpdcs	2 times a week	1 per year

1) only if the exit temperature of the treated wastewater is > 8°C

fpdcs = flow proportional unsettled homogenised daily composite sample

Methods for sampling and analysis according to the specific AEV and AAEV (see Appendix). Self-monitoring is done by use of Hach-Lange methods (COD, BOD, total N and total P).

Some self-monitoring measurements are performed more frequently than required by permit (e.g. COD and total suspended solids 7 instead of 2 times per week).

Table 212: Summary of results of self-monitoring 2013 (Source: Fa.Spitz, email 16-7-2014)

Parameter		**Self-monitoring 2013**					
		Daily average min	**Daily average max**	**Monthly average min**	**Monthly average max**	**Annual average**	**ELV**
Q (discharge)	m³/d	-[1)]	1,794	713	1,262	995	1.800
T	°C	13.8	26.9	19.1	24.6	21.8	30
pH		7.01	8.54	7.65	8.15	7.9	6.5-8.5
COD	mg/l	15.0	105.0[2)]	35.1	70.5	45.7	90
BOD	mg/l	5.0	17.0	7.0	11.3	9.4	20
total N	mg/l	1.0	2.3	1.2	1.8	1.4	-
NH_4-N	mg/l						2.5
total P	mg/l	0.15	0.78[2)]	0.15	0.26	0.19	0.6
Total suspended solids	mg/l	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	-

[1)] production stop (at weekend)

[2)] exceedence during maintenance of an aerator unit

Table 213: Summary of results of external monitoring 2013 compared with the results of self-monitoring of the same day (Source: Fa.Spitz, email 16-7-2014)

External monitoring 2013 (representative fpdcs from 15-11-2013)				
Parameter	**Unit**	**Daily average**	**Self-monitoring for comparison (15-11-2013)**	**ELV**
Q (discharge)	m³/d	1,161	-	1,800
T	°C	16.1	16.1	30
pH		8	8	6.5-8.5
COD	mg/l	22	24	90
BOD	mg/l	< 3	-	20
NH_4-N	mg/l	< 0.05	0.02	2.5
total P	mg/l	0.09	0.15	0.6
Settleable substances	ml/l	0	< 0.1	0.3

Results of external monitoring show a general compliance with ELVs.

2.6.4 Hermann Pfanner Getränke, 4470 Enns

2.6.4.1 General description

Table 214: General description (Source: BH Linz-Land, letter from 16-9-2014 and Pfanner, email from 6-11-2014)

Name of the installation	**Hermann Pfanner Getränke GmbH** **Fabrikstraße 11, 4470 Enns**
IPPC activity	6.4 (b)
Production capacity	Total filling capacity (final product): max: 2,500 m³/d actually: 1,732 m³/d
Operating hours	Campaign: 75 days (15th of August to 15th of December) Continuous 3-shift-operation during the whole year. A part of the site hasy reduced operation times outside of the campaign (Monday 06:00 to Saturday 15:00).
Products 2013	Concentrated fruit juice, fruit juice drinks and ice tea
Raw materials	Concentrates (own production and purchase), tea and sugar
Auxiliary materials	NaOH, H_2SO_4, HCl, citric acid, enzymes, hibiscus tea, NaCl, nitrogen gas (12,000 l, 6 bar) and carbon dioxide (2,940 l, 12 bar)
General	The installation in Enns was founded 1985/86 for the production of concentrated fruit juice and is currently Pfanners biggest site.

Fruits are washed, treated by means of a grating mill and pressed. The raw juice is further deflavoured, fermented and filtrated. The final concentrate is filled into barrels and stored for further usage. 350 tons per day of concentrate can be processed to yield appr. 2,500 tons final product which is filled in PET bottles or in beverage cartons.

Pomace with originally 80% water content is processed in a rotary dryer (8,000-8,500 kg/h) to reach a residual water content of 15%. Apple pomace is used for pectin production and as food for wildlife animals. Pear pomace is used as solid biomass fuel for drying purposes.

2.6.4.2 Energy generation and use

Table 215: Energy procurement 2013 (Source: Pfanner, email 06-11-2014)

Energy procurement 2013	
Electrical power	15.6 GWh
Consumption of natural gas	3.5 million m³

Table 216: Combustion plants operated on site (Source: BH Linz-Land, letter from 16-9-2014)

Combustion plant	**Steam boiler „Loos“**
Type of combustion plant	gas boiler
Rated thermal Input (MW)	5.2
Start of operation	1985
Fuel	Natural gas:
Flue gas cleaning	Low NO_X firing system (2011)
Flue gas temperature (°C)	90°C

Combustion plant	Steam boiler „Loos“
Operating hours (h/a)	6,000
Energy recovery	Economizer
Steam production (t/h)	8
Steam parameter (p, T)	13 bar
Oxygene content (%)	4-5%

3 cooling towers are operated on site for cooling of the concentrated fruit juice (14,724 kW).

2.6.4.3 Waste management

Table 217: Waste from the WWTP (Source: BH Linz-Land, letter from 16-9-2014)

Waste from the WWTP 2012 and 2013		
Type	2012 (t)	2013 (t)
Tea residues	710	690
Fruit residues, grass, leaves (sieving plant)	354	214
Sludge cake (decanter)	304	296

- Sludge cake and material collected by the sieve (from the WWTP) is disposed to a composting plant and to several farmers as fertiliser.
- Tea residues are disposed to a composting plant.
- Dried apple pomace is used for pectin production and as food for wild animals. Pear pomace is used as solid fuel source for the pomace drying system.

2.6.4.4 Noise emissions

Noise barriers are installed next to a cooling tower to reduce emissions from 37 dB to 31 dB.

Table 218: Sources of noise and countermeasures (Source: BH Linz-Land, letter from 16-9-2014)

Noise	
Sources	Cooling tower, noise by expansion of pressurised steam, truck loading and transport
Measures to reduce noise pullution	Noise barriers, silencer, external monitoring

2.6.4.5 Water and wastewater

Process wastewater is treated in an internal wastewater treatment plant. Surface water is discharged separately by a rain water seepage draining system. Emission limit values for the indirect discharged process wastewater are shown in the following table:

Table 219: Overview of the consumption and treatment of water (Source: BH Linz-Land, letter from 16-9-2014)

Water and wastewater	
Consumption of fresh water 2013	956,331 m³/y (2,620 m³/d) (from own wells)
Partial wastewater streams	Cooling and rooftop waters as well as wastewater from the reverse osmosis system are discharged into the Kristeiner Mühlbach (2013: 492,916 m³/y with a yearly average of 1,350 m³/d). process wastewater is pretreated and indirectly discharged to an external wastewater treatment plant
Internal treatment of WW from the process	Sieve, Sedimentation tank, neutralisation
Wastewater volume 2013 (WWTP)	Total: 210,716 m³ Campaign: 57,868 m³ Outside of the campaign: 152,848 m³
Description of the external WWTP	The process at the external wastewater treatment plant Linz-Asten consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a capacity of 950,000 population equivalents (EW, equates to about 95,000 kg/d COD of which a maximum of 5,000 kg stem from Fa.Pfanner). The treated wastewater is discharged into the river Danube. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 220: Direct discharged cooling, rooftop and reverse osmosis system wastewater is discharged into the Kristeiner Mühlbach (Source: BH Linz-Land, letter from 16-9-2014)

Direct discharged cooling, rooftop and reverse osmosis system wastewater			
Parameter	**ELV (Permit)**	**Type of sampling**	**Min. frequency self-monitoring**
T	22 °C[1)]	spot sample	Once per week
Q (cooling WW)	12.8 l/s 1,108 m³/d	-	Continuous
Q (rooftop WW)	207 l/s	-	Continuous
Q (reverse osmosis)	17.4 l/s 900 m³/d	-	Continuous

1) if the reverse osmosis is not operated the temperature limit is temporarily increased to 30 °C for peak levels

Self-monitoring 2013: The total discharged wastewater volume never exceeded the ELV of 2,008m³/d in 2013 (daily maximum 2013: 1,608 m³/d). Also the weekly measured temperature was always below the ELV of 22 °C.

Process Wastewater

Table 221: Emission limit values and minimal frequencies for self- and external monitoring for the indirect discharged process wastewater (Source: WB Pfanner Enns and BH Linz-Land, letter from 16-9-2014)

Process Wastewater					
Parameter	**Unit**	**ELV (Permit)**	**Type of sampling**	**Min. frequency self-monitoring**	**Min. frequency external monitoring**
COD load	kg/d	no ELV[1)]	fpdcs	1 per week	
Wastewater Quanties	m³/d	1,300, 1,800[2)]	continuous	continuous	1 week per year
Total Cl	mg/l	0.3	spot sample	5 per year	1 week per year
Free Cl	mg/l	0.2	spot sample	5 per year	1 week per year
Settleable substances	ml/l	10	spot sample	5 days per week	1 week per year
AOX	mg/l	1.0	fpdcs	5 per year	1 week per year
pH		6.5-9.5	spot sample	continuous	1 week per year
T	°C	35	spot sample	continuous	1 week per year

1) there is no ELV for COD or BOD_5 loads but COD has to be determined weekly (contract with the external WWTP: COD limit of 5,000 kg/d)

2) during the campaign from 15th August to 15th December

Copper and sulphide are not limited by the permit in contrast to the Ordinance. The detection of free Cl is additional. All other parameters are in line with the Austrian Ordinance for the production of soft drinks (FLG. Nr. 1077/1994). (WB Pfanner Enns)

Self-monitoring

Table 222: Summary of results of self-monitoring during the campaign 2013 (Source: BH Linz-Land, letter from 16-9-2014)

Self-monitoring 2013 (indirect discharged process wastewater) during campaign (75 days)					
Parameter		**Daily average – min**	**Daily average – max**	**campaign average (over 75 days)**	**ELV**
COD load	kg/d	450	5,820	2,767	-
Wastewater quanties[1)]	m³/d	31	1,658	772	1,800
Settleable substances[2)]	ml/l	0.0	8.0	1.4	10
pH[2)]		5.5	12.1[3)]	-	6.5-9.5
T[2)]	°C	-	-	31[4)]	35

1) continuous measurement

2) spot samples

3) exceeded the ELV on 74 of 75 days. The external WWTP supports a maximum pH value of 12.0 which has been exceeded only once. This shall prevent the formation of methane.

4) average of 75 daily maximum values of continuous measurement (including peak values)

Table 223: Summary of results of self-monitoring outside of the campaign 2013 (Source: BH Linz-Land, letter from 16-9-2014)

Self-monitoring 2013 (indirect discharged process wastewater) outside of the campaign (250 days)					
Parameter		**Daily average – min**	**Daily average – max**	**Outside campagin – average (over 250 days)**	**ELV**
COD load	kg/d	9	5,459	2,049	-
Wastewater quanties[1)]	m³/d	7	1,205	566	1,300
Settleable substances[2)]	ml/l	0	25	2.4	10
pH[2)]		5.3	12.0[3)]	-	6.5-9.5
T[2)]	°C	-	-	26[4)]	35

1) continuous measurement

2) spot sample

3) exceeded the permitted ELV almost daily. The external WWTP supports a maximum pH value of 12.0 which has been exceeded only once. This shall prevent the formation of methane.

4) average of 210 daily maximum values of continuous measurement (including peak values)

Table 224: Summary of results of self-monitoring for total Cl, free Cl and AOX (Source: BH Linz-Land, letter from 16-9-2014)

Self-monitoring 2013 (indirect discharged process wastewater) for total Cl, free Cl and AOX on 5 working days[1)]						
Parameter		**Daily average – min**	**Daily average – max**	**average**	**ELV**	**Method**
Total Cl[1)]	mg/l	<0.1	0.1	<0.1	0.3	Merck 1.14801.0001
Free Cl[1)]	mg/l	<0.1	0.1	<0.1	0.2	Merck 1.14801.0001
AOX	mg/l	0.28	0.7	0.43	1.0	-

1) spot sample

Table 225: Results of the external Monitoring 2013 for the indirect discharged process wastewater (Source: WB Pfanner Enns and BH Linz-Land, letter from 16-9-2014)

External Monitoring September 2013 (outside of the campaign)						
Parameter	**Unit**	**method**	**Daily average – min**	**Daily average – max**	**Weekly Average (5 fpdcs)**	**ELV (Permit)**
Wastewater quanties	m³/d	-	659	833	763	1,300, 1,800[1)]
COD	mg/l	DIN 38409-41/44	1333	5284	2832	-
COD load	kg/d	Calculated	2023	6588	3661	-
BOD_5	mg/l	ÖNORM ES 1899-1	1094	2538	1787	-
BOD_5 load	kg/d	Calculated	1660	3165	2327	-
AOX[2)]	mg/l	External (unknown)	-	-	0.81[2)]	1.0
Settleable substances[3)]	ml/l	DIN 38409-9	0.2	0.4	0.26	10
pH		DIN 38404-5	10.5[4)]	12.2[4)]	11.2[4)]	6.5-9.5
T	°C	DIN 38404-4	21.9	27.8	25.5	35
Free Cl[3)]	mg/l	ÖNORM M 6256	<0.1	<0.1	<0.1	0.2
Total Cl[3)]	mg/l	ÖNORM M 6256	<0.1	<0.1	<0.1	0.3

1) during the campaign from 15th of August to 15th of December

2) based on 1 sample

3) spot samples

4) The external WWTP supports a maximum pH value of 12.0 which has been exceeded only once. This should prevent the formation of methane.

2.7 Breweries and malting houses

Beer is an alcoholic drink produced by fermentation of sugar which is gained by the saccharification of starch. The base material is always malted barley grain with or without other unmalted cereal grains and possibly sugar. Furthermore it is always flavoured with hops. There are three main steps in the brewing process which are mashing, fermentation and maturation/conditioning. Further important proceedings are malting, lautering, boiling, filtering and packaging.

Due to malting the starch of the barley grain is released to become ready for brewing. The malted grist is mixed with hot water in a mash tun. After 1-2 hours the starches are converted to sugars by its own naturally occurring enzymes and the sweet wort is separated from the grains. The traditional separation process is called lautering where the grain itself is used as filter.

The sweet wort is put into a kettle, or so called copper, and boiled for usually one hour to evaporate water and also to destroy remaining enzymes from the mashing stage. During this boiling hops or hop extracts may be added at more than one point during the boil which has significant impact on the taste of beer. Generally this stage is most important concerning flavour, colour and aroma of the final product.

After boiling the yeast is added to the clarified and cooled wort to start the fermentation process. This is the point where sugar turns into alcohol, carbon dioxide and other by-products. When the fermentation is has finished the beer is stored in a conditioning tank. During conditioning the beer ages for about 4-6 weeks which means that the flavour becomes smoother. Finally the beer may be filtered, force carbonated and filled into bottles, cans or barrels.

Therefore some breweries have filling stations with much higher capacities than the average daily output of beer. This is needed due to the intermittent beer output based on the brewing process.

Breweries need a large amount of energy, heat and water and produce mainly wastewater but also solid residues. Some residues like the leached brewers grains can be sold as cattle feed. The amount of wastewater can be 4 to 10 times higher than the quantity of produced beer. In Austria typical amounts of 0.26-0.6 m^3 per hectolitre of beer accrue which means that domestic breweries are among the most water-efficient of Europe. Wastewater treatment varies depending on the processes used in the particular brewery. Some sources like a bottle cleaning device produce big amounts of wastewater with only a low organic load while volume from fermentation and filtering is only 3% of the total wastewater but contains 97% of the BOD_5 load. In addition several manufacturing processes, in special the boiling of the wort, may lead to odour pollution. (EUROPEAN COMMISSION 2006, ULLMANN 2007)

2.7.1 Stieglbrauerei zu Salzburg, 5017 Salzburg

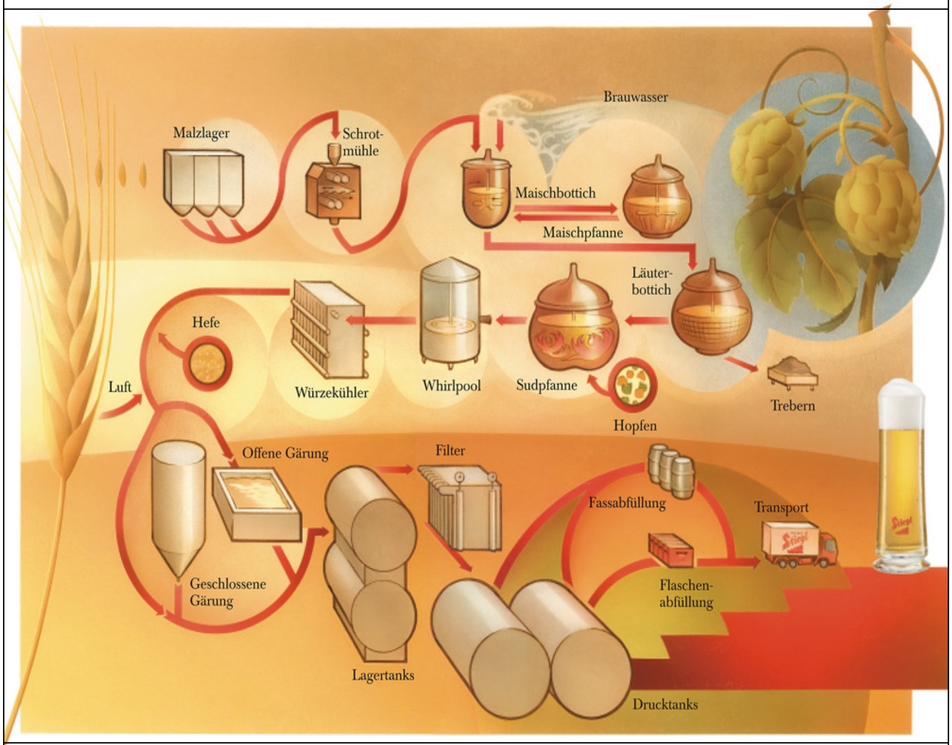
2.7.1.1 General description

Table 226: General description 2013 (Source: Stieglbrauerei, email 14-7-2014 and 6-11-2014)

Name of the Installation	**Stieglbrauerei zu Salzburg GmbH, Kendlerstrasse 1, 5017 Salzburg**
IPPC activity	6.4 (b), brewery
Type and amount of products 2013	101,751 m³ beer in the year 2013
	54,001 m³ in returnable bottles
	4,711 m³ in disposable bottles
	11,468 m³ in cans
	31,457 m³ in barrels
Capacity	125,712 m³/y
Operating hours	5 days a week, 2 to 3-shift operation
Raw materials	Water, malz, hop and yeast
Auxiliary materials	Kieselgur (diatomaceous earth), cleaning- and disinfectant agents, filtration additives

Figure 21: Production process at the Stiegl brewery (Source: Stieglbrauerei, email 6-11-2014)

Production process



Source: Stieglbrauerei

2.7.1.2 Energy generation and use

Energy data 2013	
Electrical power	10.5 GWh
…thereof from public power grid	10 GWh
…own generation	0.5 GWh
Heat demand (own generation)	21.3 GWh
Energy demand for cooling	6.5 GWh
Used fuels:	Natural gas

Table 227: Energy data 2013 (Source: Stieglbrauerei, email 14-7-2014 and 28-7-2014)

The heat demand for production is limited to 106,181 GJ by permit.

There is no Energy Management System implemented, but Stiegl has performed a detailed analysis of the energy consumption and potential for energy savings (AEE – Institut für nachhaltige Technologien; Oktober 2011). Promising Options include use of renewable energy, thermal recovery of biomass residues, use of combined heat and power, replacing motors and engines (in particular in the packaging units), new cooling systems and use of biogas from anaerobic treatment.

In 2011 heat demand was reduced by implementing a new system for keg-filling (less consumption of warm water; appr. 10.1 l/keg) and lowering the temperature of warm water.

Specific Energy consumption 2011	
Specific demand of electrical energy	33.1 MJ per 0.1m³ beer
Specific demand of natural gas	65.9 MJ per 0.1m³ beer
Efficiency for the overall system (heat only)	90.4% (6.2 MJ transformation losses per 0.1 m³ beer)
Specific demand of electrical power for cooling	6.2 MJ per 0.1m³ beer
Specific demand of cooling energy	16.2 MJ per 0.1m³ beer
Annual performance coefficient of the heat pumps	2.61
Specific demand of electrical power for compressed air	2.74 MJ per 0.1m³ beer (1.86 for sterile and 0.89 MJ for working air)
Specific demand of electrical power for the brewhouse	1.8 MJ per 0.1m³ beer
Specific demand of electrical power for fermention-, storage-, filter- and yeast cellar	4,0 MJ per 0.1m³ beer
Specific demand of electrical power for bottle filling and loading hall	11.8 MJ per 0.1m³ beer
Specific energy for bottle washers 2009 (3 units)	29.5-31.3 kJ per bottle

Table 228: Specific Energy consumption 2011 (Source: Stieglbrauerei, email 28-7-2014)

Table 229: Combustion plant operated on site 2013 (Source: Stieglbrauerei, email 14-7-2014, 28-7-2014 and 6-11-2014)

Combustion plant	
Type	Shell boiler
Rated thermal Input (MW)	11.1 MW
Fuel	natural gas
Flue gas volume (Nm^3/h) – max	15,791
Operating hours (h/a)	5,365
Energy recovery	Economiser
Steam parameter (p, T)	p = 10,8 bar; T = 147 °C
Fuel use (%)	91 (2009)
Oxygene content (%)	3.0

Table 230: Emission limit values and short term measurements for the steam boiler (Source: Stieglbrauerei, email 14-7-2014)

External monitoring 17-05-2013		
Pollutant	**Half hour average values**	**Emission limit value**
Dust (mg/Nm^3; 3% O_2)	3	5
NO_x (mg/Nm^3; 3% O_2)	94	100
CO (mg/Nm^3; 3% O_2)	46	80

2.7.1.3 Waste management

Table 231: Excerpt: Main types and amounts of waste 2013 (Source: Stieglbrauerei, email 14-7-2014)

Waste management	
Type	**Amount (kg/y)**
Paper	14,470
Cardboard	89,940
Glass	727,500
Kieselgur (diatomaceous earth)	446,390
Good labels	173,260
Household type industrial waste	153,640

Waste is sent to licensed waste treatment/disposal companies.

2.7.1.4 Noise and odour emissions

Table 232: Sources and measures against noise emission (Source: Stieglbrauerei, email 14-7-2014)

Noise	
Sources	production noise
Measures to reduce noise emission	monitoring by the competent authorities

Dust from malt processing is limited to 17mg/m³ and is monitored by external experts.

2.7.1.5 Water and wastewater

Table 233: Water consumption and wastewater streams (Source: Wasserbuch-auszug 8-4-2014, Stieglbrauerei, email 28-7-2014 and 6-11-2014)

Fresh and Wastewater	
Consumption of fresh water 2013	373,532 m³/y
Partial wastewater streams	Process wastewater (205,475 m³/y) Surface water Washing water Water Treatment (14,464 m³/y) Domestic wastewater

Table 234: Wastewater treatment (Source: Stieglbrauerei, email 14-7-2014 and 28-7-2014)

Wastewater treatment	
Treatment of wastewater	Separation of all partial wastewater streams. Pre-treatment of the different wastewater streams Discharge to external wastewater treatment plant
Description of internal wastewater treatment	Oil separator for surface and washing water Neutralisation unit for wastewater from bottle filling machines (process wastewater) Continuous measurement of T, pH and wastewater volume
Description of external wastewater treatment plant	The process at the external wastewater treatment plant Siggerwiesen includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capacity of 680,000 population equivalents (EW, of which a maximum of 72,000 EW come from the Stieglbrauerei). The treated wastewater is discharged into the river Salzach. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014 and Wasserbuchauszug 19.08.2014)

Table 235: Emission limit values and monitoring frequency for the indirect discharge of process wastewater (Source: Stieglbrauerei, email 14-7-2014 and 28-7-2014)

Indirect discharge of process wastewater						
Parameter	**Unit**	**ELV Permit**	**Self-control – type of sample**	**External control – type of sample**	**Self-control – frequency (permit)**	**External monitoring – frequency (permit)**
Q (discharge)		200 m³/h 1800 m³/d	Ultrasonic flow measurement	see self-control	continuous[1)]	3 per year
T	°C	35	continuous	fpdcs	continuous[1)]	3 per year
pH		6.5-10.5	continuous	fpdcs	continuous[1)]	3 per year
COD load	kg/d	7,200	fpdcs	fpdcs	3 per year	3 per year
BOD_5 load	kg/d	4,500	fpdcs	fpdcs	3 per year	3 per year
total P	kg/d	100		fpdcs	-	3 per year
total N	kg/d	200		fpdcs	-	3 per year
Sulphate	mg/l	200		fpdcs	-	3 per year
AOX (as Cl)	mg/l	0.5 (900 g/d)		fpdcs	-	3 per year
Settleable substances	ml/l	20		spot sample	-	3 per year
Settleable substances	l/d	36,000		calculated		3 per year

fpdcs = flow proportional unsettled homogenised daily composite sample

[1)] *required under the contract for indirect discharge: wastewater volume, pH and Temperature are measured continuously during self-monitoring.*

External monitoring has to be carried out at representative production days and has to be done on different days of the week.

Table 236: Results from external monitoring from 16-06-2014 for the process wastewater (Source: Stieglbrauerei, email 28-7-2014)

External Monitoring from 16-06-2014				
Parameter	**Unit**	**Daily average**	**Method**	**ELV**
Q (discharge)	m³/d	1,090	Stationary permanent measurement system	1,800
T	°C	-	(control of the internal measurements)	35
pH		9.50	DIN EN ISO 10523	6.5-10.5
COD load	kg/d	6,300	ISO 15705	7,200
BOD_5 load	kg/d	4,360	analogous to DIN EN 1899-2	4,500
total P	mg/l	58.6	ÖNORM EN ISO 6878	100
total N	kg/d	123.2	Analogous DIN EN 26777	200
Sulphate	mg/l	< 2.5	analogous EPA 375.4*, turbidimetric	200
AOX	mg/l	0.01	DIN EN 1485	0.5
Settleable sub-stances	ml/l	7	DIN 38409-9	20
Total suspen-ded solids	mg/l	1,095	DIN 38409-2	-

Results of self-monitoring show full compliance with all ELVs.

Table 237: Wastewater loads discharged 2013 (Source: Stieglbrauerei, email 18-7-2014 – EMREG)

Wastewater loads 2013	
Wastewater volume 2013	205,475 m³/y (process wastewater); 14,464 m³/y (water treatment)
BOD	665,078 kg/y (process wastewater)
Chloride	7.0 kg/y (process wastewater)
Total suspended solids	155,956 kg/y (process wastewater)
total P	13.8 kg/y (process wastewater)
total N	16.7 kg/y (process wastewater)

Table 238: Specific wastewater loads 2013 per litre of produced beer (Source: own calculation based on data from Stieglbrauerei, email 18-7-2014 – EMREG)

Specific wastewater loads 2013 per litre of produced beer	
Specific wastewater volume	2.16 l/l
BOD	6.54 g/l
Chloride	0.07 mg/l
Total suspended solids	1.53 g/l
total P	0.14 mg/l
total N	0.16 mg/l

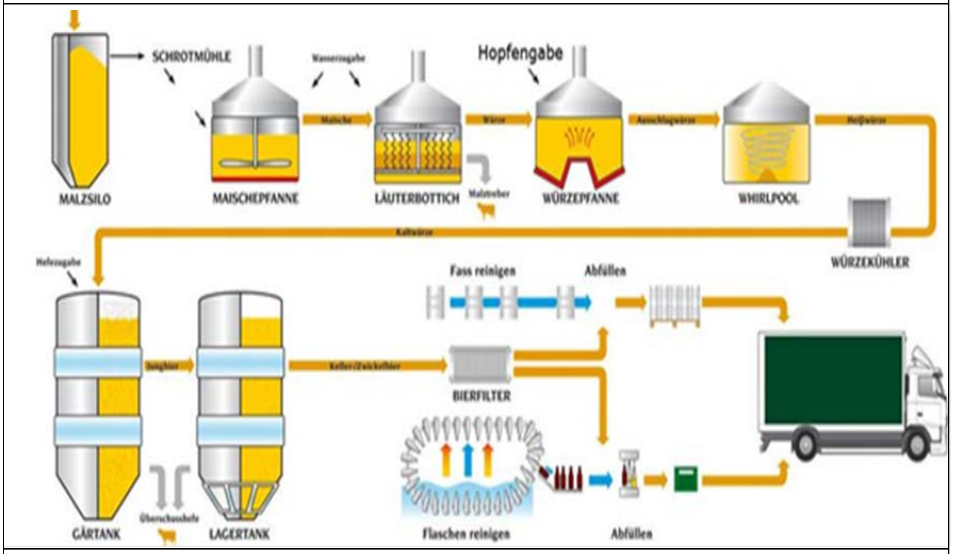
2.7.2 Brauerei Wieselburg (Brau Union), 3250 Wieselburg

2.7.2.1 General description

Name of the Installation	**Brau Union Österreich AG, Brauerei Wieselburg, Dr. Beurle-Straße 1, 3250 Wieselburg**
Products	Beer, shandy, soft drinks, mineral water
Capacity	Generally no limited capacity by permission.
Type and amount of products	204 t per day Beer in barrels: 28,347,800 l Bottled beer: 58,947,200 l
Operating hours	5d per week, 2 to 3 shifts
Raw materials	Water, malts, hops
Auxiliary materials	Filter auxiliary materials

Table 239: General description 2012 (Source: Brau Union, email 14-8-2014)

Production process



Source: Brau Union

Figure 22: Principle production process at the breweries Wieselburg and Göss (Source: Brau Union, email 24-11-2014)

2.7.2.2 Energy generation and use

Energy data 2012	
Electrical power	5.73 GWh
…thereof from public power grid	4.56 GWh
…own generation	1.17 GWh
Heat demand (own generation)	15.06 GWh
Used fuels:	Natural gas: 1,505,976 Nm³

Table 240: Energy data 2012 (Source: Brau Union, email 14-8-2014)

Table 241: Main energy consumers 2012 (Source: Brau Union, email 14-8-2014)

Main energy consumers 2013	
Cooling	1.268 GWh (electrical power)
Carbonation	0.407 GWh (electrical power)
Brew house	20,223 GJ (heat demand)
Filling of bottles	16,204 GJ (heat demand)
Filling of barrels	5,415 GJ (heat demand)

Table 242: Combustion plant operated on site 2012 (Source: Brau Union, email 14-8-2014)

Combustion plant 2012	
Type	Steam boiler
Rated thermal Input (MW)	9.83
Start of operation	1990
Fuel	natural gas
Flue gas volume (Nm^3/h) – max	11,320
Flue gas temperature (°C)	<130
Operating hours (h/a)	6,001
Energy recovery	Economiser
Steam production (t/h)	15
Steam parameter (p, T)	8 bar, 175.4 °C
Fuel use (%)	90
Oxygene content (%)	3.0

Table 243: Emission limit values and half hour average values for the steam boiler (Source: Brau Union, email 14-8-2014)

Emission data for the steam boiler		
Pollutant	**Half hour average value (2012)**	**Emission limit value (mg/Nm^3)**
Dust (mg/Nm^3; 3% O_2)	1.3	10
NO_x (mg/Nm^3; 3% O_2)	105	200
CO (mg/Nm^3; 3% O_2)	4	100

2.7.2.3 Waste management

Table 244: Main types and amounts of waste 2012 (Source: Brau Union, email 14-8-2014)

Waste management 2012			
Type	**Source**	**Amount (kg/y)**	**Treatment/Disposal**
Non hazardous waste			
Brewers grains	brew house	15,601,100	Animal feed
Yeast, tank bottoms	Fermentating room	1,363,700	Animal feed
Pallets	-	41,030	external waste disposal company
Cardboard and paper	Package material	41,110	external waste disposal company
Glass	Bottle-washing machine	606,400	external waste disposal company
Kieselgur (diatomaceous earth)	Filtration	318,600	External/Used for soil improvement

Waste management 2012			
Type	**Source**	**Amount (kg/y)**	**Treatment/Disposal**
Crown caps	Bottle-washing machine	400	external waste disposal company
Good labels	Bottle-washing machine	178,340	external waste disposal company
Household type industrial waste	-	102,070	external waste disposal company
Hazardous waste			
Refrigeration and air-conditioning equipment with CFCs	Process units	6,480	external waste disposal company
Fluorescent lamps	Room lighting	2,700	external waste disposal company
Sand filter content	Workshop	1,660	external waste disposal company

2.7.2.4 Noise and odour emissions

Table 245: Sources and measures against noise emission (Source: Brau Union, email 14-8-2014)

Noise	
Sources	Filling of bottles, individual machines
Measures to reduce noise emission	Noise-insulated housing, self-monitoring and monitoring by the competent authorities (working inspectorate)

As only closed systems are used there is no odour emission.

2.7.2.5 Water and wastewater

Table 246: Water consumption and wastewater streams (Source: Brau Union, email 14-8-2014)

Water consumption 2012	
Consumption of fresh water	776,793 m³/y
thereof cooling water	465,439 m³/y
Partial wastewater streams	Process wastewater Cooling water Surface water Roof runoff Domestic wastewater

Table 247: Wastewater treatment (Source: Brau Union, email 14-8-2014)

Wastewater	
Treatment of wastewater	Separation of all partial wastewater streams. Pre-treatment of process wastewater, the surface and domestic wastewater. Cooling water and water from roofs is discharged directly.
Description of the internal wastewater treatment	Neutralisation Puffer tank discharge to external WWTP
Description of external wastewater treatment plant	The process at the external wastewater treatment plant Wieselburg includes a biological treat-ment step, a nitrification plus denitrification stage and phosphorus removal with a treatment capacity of 64,500 population equivalents (EW, of which a maximum of 52,000 EW stem from the brewery Wieselburg). The treated wastewater is discharged into the river Erlauf. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014 and Wasserbuchauszug 19.08.2014)

Table 248: Emission limit values and monitoring frequency for the indirect discharge of process wastewater (Source: Brau Union, email 14-8-2014 and 24-11-2014 and Wasserbuchauszug 19-8-2014)

Indirect discharge of process wastewater					
Parameter	**Unit**	**ELV Permit**	**Self-control – type of sample**	**External monitoring – type of sample**	**External monitoring frequency**
Q (discharge)		70 l/s 250 m³/h 3,600 m³/d	ultra sonic (continuous)	continuous	daily
T	°C	35	continuous	continuous	daily
pH		6.5-9.5	continuous	continuous	daily
COD load	kg/d	7,340 6,240 on a weekly average		fpdcs	daily
BOD_5 load	kg/d	3,670 3,120 on a weekly average		fpdcs	daily
total P	mg/l	-		fpdcs	daily
total N	kg/d	-		fpdcs	daily (calculated)
NH_4-N	mg/l	5.05		fpdcs	daily
NO_3-N	mg/l	1.4		fpdcs	daily
AOX (as Cl)	mg/l	0.5		fpdcs	
Settleable substances	ml/l			spot sample	daily
Free Cl	mg/l	0.2		fpdcs	
Total Cl	mg/l	0.4		spot sample	
Cu	mg/l	0.5		fpdcs	
Zn	mg/l	2		fpdcs	

fpdcs = flow proportional unsettled homogenised daily composite sample

Wastewater is externally monitored by the external WWTP (the brewery has a separated feed line).

Table 249: Results of external monitoring July 2012 for the process wastewater (Source: Brau Union, email 14-8-2014, COD, BOD_5 and total N load by own calculation)

External Monitoring July 2012					
Parameter	**Unit**	**Daily min1)**	**Daily max**	**Daily average July 2012**	**ELV**
Q (discharge)	m³/d	151	1,485	786	3,600
pH		5.5	11.3	8.4	6.5-9.5 (fpdcs)
COD load	kg/d	37.4	3,611	1,349	7,340
BOD_5 load	kg/d	18.1	2,432	983	3,670
total P	mg/l	3.2	22.2	12.03	
total N	kg/d	4	74	29	
NH_4-N	mg/l	0.2	19	5.75	
NO_3-N	mg/l	0.4	2.4	1.1	
Settleable substances	ml/l	0.2	30	2.81	

1) lower values occur on days with no or low production

All parameters were within the ELVs, some pH-peaks occured which were above the ELV. However, pH of the fpdcs were within ELV as well.

2.7.3 Brauerei Göss (Brau Union), 8700 Leoben

2.7.3.1 General description

Table 250: General description (Source: Brauunion, email 25-7-2014)

Name of the installation	**Brau Union Österreich AG, Brauerei Göss, Brauhausgasse 1, 8700 Leoben**
IPPC activity	Below threshold value
Products	Beer, shandy, soft drinks
Capacity	No limited capacity by permission.Approved capacity by official notification: 275,000 l/d.
Type and amount of products	Beer in barrels: 422,265 l bottled beer: 373,842 l
Raw materials	Water, malt, hops
Auxiliary materials	Filter auxiliary materials
Operating hours	4 days per week, 3 shift operation

The main production process is shown in Figure 22.

2.7.3.2 Energy generation and use

Table 251: Energy data 2013 (Source: Brauunion, email 25-7-2014)

Energy data 2013	
Electrical power (public grid)	6.54 GWh
Heat demand	65.09 TJ
…thereof from distance heating	24.19 TJ
…self-generation	40.9 TJ
Other fuels:	40.90 GWh
Used fuels:	Natural gas: 919,403 Nm³ Biogas: 259,924 Nm³

Natural and biogas are used to produce low pressure steam. Hot water is provided by distance heating and solar heating.

Table 252: Main energy consumers 2013 (Source: Brauunion, email 25-7-2014)

Main energy consumers 2013	
Cooling	1.584 GWh (electrical power)
Carbonation	0.505 GWh (electrical power)
Brewhouse	6.782 GWh (heat demand)
Filling of bottles	3.406 GWh (heat demand)
Filling of kegs	1.337 GWh (heat demand)

An energy management system has been implemented.

It is planned to install a solar-thermal system at the malting house ("Solar Brew"; http://www.aee.at/aee/index.php?option=com_content&view=article&id=160&Itemid=113)

Table 253: Combustion plants operated on site 2013 (Source: Brauunion, email 25-7-2014)

Combustion plants 2013	Steam boiler „Loos“	Steam boiler „Hoval“	Steam boiler „Schmid“
Rated thermal Input (MW)	10.5	11.58	2.8
Start of operation	1998	1998	2002
Fuel	Natural gas (848,760 m³/y) biogas (259,920 m³/y)	Natural gas	Brewers grains (gas burner for ignition process)
Flue gas cleaning	-	-	Cyclone, electrostatic precipitator
Flue gas volume (Nm³/h) – max	12,090	13,334	13,000
Flue gas temperature (°C)	<130	<130	190
Operating hours (h/a)	4,916	0 (reserve plant)	0 since 2007 (reserve plant)
Steam production (t/h)	15	16	3.6
Steam parameter (p, T)	10 bar, 184.1 °C	10 bar, 184.1 °C	
Fuel use (%)	90	90	
Oxygene content (%)	<3.0	3	13

Short term measurements for steam boiler Loos		
Pollutant	Half hour average value (2013)	Emission limit value
Dust (mg/Nm³; 3% O_2)	1	5
NO_x (mg/Nm³; 3% O_2)	74	100
CO (mg/Nm³; 3% O_2)	10	80

Table 254: Emission limit values and short term measurements for the steam boiler Loos (Source: Brauunion, email 25-7-2014)

Short term measurements for steam boiler Hoval		
Pollutant	**Half hour average value (2013)**	**Emission limit value**
Dust (mg/Nm³; 3% O_2)	1	10
NO_x (mg/Nm³; 3% O_2)	145	200
CO (mg/Nm³; 3% O_2)	10	100

Table 255: Emission limit values and short term measurements for the emergency steam boiler Hoval (Source: Brauunion, email 25-7-2014)

2.7.3.3 Waste management

Waste management			
Type	**Source**	**Amount (kg)**	**Treatment/Disposal**
Brewers grains	Brewhouse	19,043,800	animal feed
Yeast, tank bottoms	Fermentating room	1,212,500	animal feed
Pallets	-	35,800	external waste disposal company
Cardboard and paper	Package material	29,624	external waste disposal company
Glass	Bottle-washing machine	502,680	external waste disposal company
Kieselgur (diatomaceous earth)	Filtration	689,066	used for soil improvement
Crown caps	Bottle-washing machine	680	external waste disposal company
Good labels	Bottle-washing machine	118,360	external waste disposal company
Householf type industrial waste	-	59,240	external waste disposal company
Primary sludge	Wastewater treatment	29.34 m³	external waste disposal company
Sewage sludge	Wastewater treatment	1,430 m³	external waste disposal company
Lime	Wastewater treatment	38,360	used for soil improvement

Table 256: Main types and amounts of waste 2013 (Source: Brauunion, email 25-7-2014)

2.7.3.4 Noise and odour emissions

Table 257: Sources and measures against noise emission (Source: Brauunion, email 25-7-2014)

Noise	
Sources	Filling of bottles, individual machines
Measures to reduce noise	Noise-insulated housing, self-monitoring and monitoring by the competent authorities (working inspectorate)

Table 258: Sources and measures against odour emission (Source: Brauunion, email 25-7-2014)

Odour	
Sources	Anaerobic wastewater treatment plant
Implemented measures to reduce odour emissions	Exhaust air washer
Permit conditions	Emission limit values: max 5 mg/m³ hydrogen sulfide and 5 mg/m³ amines
Control and surveillance	external control by accredited institutions, interval 5 years , H_2S, Amins, Mercaptane

2.7.3.5 Water and wastewater

Table 259: Water consumption and wastewater streams (Source: Brauunion, email 25-7-2014)

Fresh and wastewater 2013	
Consumption of fresh water	426,173 m³/y
thereof cooling water	121,794 m³/y
Partial wastewater streams	Process wastewater Cooling water Surface water Roof runoff Fecal wastewater

Table 260: Wastewater treatment (Source: Brauunion, email 25-7-2014)

Wastewater treatment	
Treatment of wastewater	Separation of all partial wastewater streams. Pre-treatment of process wastewater, the surface and domestic wastewater. Cooling and water from roofs is discharged directly into the river Mur.
Description ot the internal wastewater treatment	Mechanically cleaning preliminary acidification Anaerobic treatment Aerobic treatment Discharge to external WWTP
Description of external wastewater treatment plant	The process at the external wastewater treatment plant Leoben consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a capacity of 90,000 population equivalents (EW_{60}, of which a max. of ~32,000 stem from the brewery Göss). The treated wastewater is discharged into the river Mur. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 261: Emission limit values and monitoring frequency for the indirect discharge of process wastewater (Source: Brauunion, email 25-7-2014 and 24-11-2014)

Indirect discharge of process wastewater				
Parameter	**Unit**	**ELV Permit**	**Self-control – frequency**	**External monitoring – frequency**
Q (discharge)	m³	2,600	continuous	yearly
T	°C	35	continuous	yearly
pH		6.5-9.5	continuous	yearly
COD	mg/l	5,175	daily	yearly
BOD	mg/l	2,087	daily	yearly
AOX	mg/l	0.5	-	yearly
Settleable substances	ml/l	20	daily	yearly
Free Cl	mg/l	0.2	-	yearly
Total Cl	mg/l	0.4	-	yearly
Cu	mg/l	0.5	-	yearly
Zn	mg/l	2	-	yearly

fpdcs = flow proportional unsettled homogenised daily composite sample

Methods for sampling and analysis are applied according to the general Ordinance on wastewater discharges and the Ordinance on wastewater emissions from the meat industry (Brau Union, email 24-11-2014). Q is measures by magnetic induction flow measurement.

Table 262: Results of monitoring 2013 for the process wastewater (Source: Brauunion, email 25-7-2014)

Process wastewater – monitoring 2013							
Parameter		**Daily average min**	**Daily average max**	**Monthly average min**	**Monthly average max**	**Yearly average 2013**	**ELV**
Q (discharge)	m³/d	0	1,200	250	550	400	2,600
T	°C	12	30	19	28	23	35
pH		6.9	8.2	7.6	8.0	7.8	6.5-9.5
COD (as O_2)	mg/l	87	648	162	296	233	5,175
BOD_5 (as O_2)	mg/l	10	130	57	35	74	2,087
total N (as N)	mg/l	34	129	71	90	81	
total P (as P)	mg/l	17	48	25	32	28	
NH_4-N (as N)	mg/l	-	-	-	-	85	
AOX	mg/l	-	-	-	-	0.05	0.5
Settleable substances	ml/l	0	3.5	0.1	0.7	0.4	20
Total suspended solids	mg/l	0	220	26	60	46	
Free Cl (as Cl_2)	mg/l	-	-	-	-	< 0.05	0.2
Total Cl (as Cl_2)	mg/l	-	-	-	-	< 0.05	0.4
Sulphate (as S)	mg/l	43	69	48	70	54	
Cu	mg/l	-	-	-	-	< 0.05	0.5
Zn	mg/l	-	-	-	-	0.044	2

The removal efficiency for COD was 96.6% and 99.6% for BOD_5 during external monitoring 2013 (before being discharged to the external WWTP). All parameters were within the ELVs.

2.8 Petfood industries

There are two distinct sectors in the animal feed industry. Animal feed is usually dry and made of vegetable ingredients (e.g. cereals for farm animals). Petfood, on the other hand, consists mainly of animal matter and has a significant moisture content (e.g. for cats and dogs).

The production of petfood is quite similar to the meat and poultry sector and therefore the same Ordinances for wastewater treatment are valid in Austria. Vegan animal feed however is described in the Ordinance for feedstuff production (BGBl. Nr. 894/1995). (EUROPEAN COMMISSION 2006)

2.8.1 Austria Pet Food,7023 Pöttelsdorf

2.8.1.1 General description

Table 263: General description (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits)

Name of the installation	**Austria Pet Food GmbH, Mach-Allee 2, 7023 Pöttelsdorf**
IPPC activity	6.4 (b)
Products	canned wet pet food (for cats and dogs)
Production capacity	> 75 t/d
General	The company site was founded in 2012; currently working in two shifts with 40-50 employees; production: 50-60 t/d. It is planned to expand production to three-shift operation in 2014 with a production of at least 90 t/d. Markets are Germany, Austria, Hungary and eastern Europe (within a distance of 800 km). The planned turnover for 2014 is about 10 million Euros.
Process	chopping of the delivered frozen meat into small pieces, adding of flour and probably vitamins, cooking and autoclaving (batch processing), labeling and storage/shipping

2.8.1.2 Energy generation and use

Table 264: Energy generation and use – Overview (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits)

Energy generation and use	
Discription	A steam generator is in place and powered by natural gas. Electrical power is supplied via the public grid.

Table 265: Combustion plant operated on site (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits, verbal descriptions and internal analyses)

Combustion plant	
Year	2014
Type of combustion plant	steam boiler
Fuel	natural gas
Oxygene content (%)	7.4
Short time emission level (half hourly mean value on 3-3-2014)	
NO_x (mg/Nm^3)	104
CO (mg/Nm^3)	< 13

2.8.1.3 Odour and Noise emissions

Table 266: Odour emission (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits)

Odour emission	
Source	production (meat processing)
Reduction measures	waste air is collected and discharged over the roof; monitoring of NH_3 and total carbon takes place

Table 267: Noise emission (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits)

Noise emission	
Sources	several fans, truck loading area
Measures to reduce noise pullution	silencers, distance to residential buildings

2.8.1.4 Waste management

Table 268: Disposed of waste 2013 (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits, verbal descriptions and internal analyses)

Waste management 2013	
Type	**Amount**
Slaughterhouse waste	232.66 t
Residue from grease interceptor	101.04 t
Paper and cardboard boxes	4.46 t
Commercial waste	1.75 t
Cans (packaging)	12.15 t
Expired feedstuff	24.10 t

2.8.1.5 Water and wastewater

Table 269: Wastewater streams and treatment (Source: Austria Pet Food, information given 15-7-14 including measurement reports, permits)

Waste and wastewater	
Partial wastewater streams	sanitary wastewater is separately discharged from process wastewater
Internal treatment of WW from the process	oil/grease separator (including: sludge trap, grease interceptor, buffer tank, 2 aeration basins, 2 seconday sedimentation basins)
Measures in case of other than normal operating conditions	buffer tank (as part of the grease interceptor)
Description of the external WWTP	The process at the external wastewater treatment plant in Schattendorf consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a capacity of 7,400 population equivalents. The treated wastewater is discharged into the river Tauscherbach. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 270: Emission limit values and minimal frequencies for external monitoring for the process wastewater (Source: Austria Pet Food, information given 15-7-14: permit from 06-12-2012)

ELV and minimal frequencies for external monitoring (process wastewater)			
Parameter	**Unit**	**ELV Permit**	**External monitoring – frequency**
pH		6.5-9.5	1 per year
Low volatile lipophilic substances	mg/l	150	1 per year
Total Cl	mg/l	0.4	1 per year

Table 271: Results of External Monitoring 2013 (Source: Austria Pet Food, information given 15-7-14: measurement report "Abwassertechnische Untersuchung ", Ing.Hubert Ofner)

Process wastewater – External monitoring 2013				
Parameter		**External Monitoring 2013 (spot sample 30-04-2013)**		**ELV Permit**
Q (discharge)	l/s	0.3	Stationary flow measurement	-
T	°C	25.8	DIN 38404-C4	-
pH		7.42	DIN 38404-C5	6.5-9.5
COD	mg/l	289	DIN 38409-H 41	-
BOD	mg/l	73	DIN 38409-H 52	-
Low volatile lipophilic substances	mg/l	20	DIN 38409-H 17	150
Settleable substances	ml/l	< 0.1	DIN 38409-H 9-2	-

2.8.2 Mars Austria, 2460 Bruck an der Leitha

2.8.2.1 General description

Table 272: General description (Source: Mars Austria, email 14-8-2014 and verbal information)

Name of the installation	**Mars Austria OG, Industriestraße 20, 2460 Bruck an der Leitha**
IPPC activity	6.4 (b)
Products	Pet food (for cats and dogs) in cans and pouch packs including diet food and medical nutrition
Capacity	75,000 t/y
Products	56,000 t in the year 2013
Operating hours	3 to 4-shift-operation depending on demand normally 6 working days followed by cleaning from Saturday night until Sunday evening 300-350 employees (incl. an international marketing department)
Raw materials	23,139 tons of frozen meat
Auxiliary materials	Neutralisation unit at the WWTP: NaOH Cleaning agents: P3-Topax (~6t/y) and Oxoform VF5L(~13 t/y)
Description	Mars Austria runs an animal feed plant in Bruck an der Leitha since 1985 including the first production line for petfood in pouches (since 2001) and production of organic petfood (since 2002). In the year 2013 an investment of 33 million Euros took place to operate a new pouch production line. The capacity has increased five times from 1985 to today. (MARS AUSTRIA 2014)

Process:

- chopping of the mainly frozen meat into small pieces
- adding of flour and probably vitamins
- cooking and autoclaving (batch processing)
- packaging, labeling and storage/shipping

2.8.2.2 Energy generation and use

Energy consumption 2013	
Electrical power (all external)	11.9246 GWh
Heat demand (self-generation)	about 26 GWh
Natural gas	30.6 GWh

Table 273: Energy consumption 2013 (Source: Mars Austria, email 14-8-2014)

Specific energy consumption per ton of produced pet food	
2013 (actual figures)	2.86 GJ/t
2014 (projected)	2.75 GJ/t

Table 274: Specific energy consumption per ton of produced pet food 2013 (Source: Mars Austria, verbal information/ internal statistic)

An energy management system with about 100 measuring points has been established (compressed air, electrical power and heat demand).

2.8.2.3 Air emissions

Combustion plants operated on site (2014)		
	Steam boiler 1	**Steam boiler 2**
Type of combustion plant	steam boiler	steam boiler
Rated thermal Input (MW)	3.28	6.55
Start of operation	1985	1987
Fuel	natural gas	natural gas
Flue gas cleaning	Low NO_x Burner (since 2011)	Low NO_x Burner (since 2011)
Flue gas volume (Nm^3/h) max	3,450	6,900
Flue gas temperature (°C)	217 [1)]	205 [1)]
Operating hours (h/y)	continuous	continuous
Energy recovery	Economizer [2)]	Economizer and flue gas cooler
Steam production (t/h)	5	10
Steam parameter (p, T)	9.5 bar / 178 °C	9.5 bar / 178 °C
Fuel use (%)	91.2	91.8
Oxygene content (%)	2.2	2.7
Emission limit values (30 min average)		
Dust (mg/Nm^3; 3% O_2)	10	10
NO_x (mg/Nm^3; 3% O_2)	200	200
CO (mg/Nm^3; 3% O_2)	100	100

[1)] *temperature measurement directly after the boiler, before passing the Economizer*

[2)] *flue gas cooler projected for 2016*

Table 275: Combustion plants operated on site (Source: Mars Austria, email 14-8-2014 and oral information)

Table 276: Results of external monitoring for both steam boilers operated on site (Source: Mars Austria, email 14-8-2014)

External monitoring 2014 (half hourly mean value on 19-05-2014)					
Pollutant	**Steam boiler 1**		**Steam boiler 2**		**ELV (30 min average)**
	min	**max**	**min**	**max**	
Dust (mg/Nm^3)	< 3		< 3		10
NO_x (mg/Nm^3)	77	80	73	75	200
CO (mg/Nm^3)	3	4	< 3	23	100

Odour

Table 277: Odour emission 2013 (Source: Mars Austria, email 14-8-2014)

Odour emission 2013	
Sources	Waste collection, wastewater treatment plant
Measures to reduce odour pullu-tion	• Raw material is delivered frozen and processed immediately • Cooling of no more useable meat wastes • Housing of the WWTP to reduce odour emission
Control	Odour control by employees

Noise

The site is located in an industrial area and there are no complaints from local residents.

2.8.2.4 Waste management

Table 278: Waste from production processes 2014 (Source: Mars Austria, email 14-8-2014)

Waste resulting from production processes 2014 (excerpt)			
Type	**Source**	**Quantity (t/y)**	**Treatment / disposal**
Cans (packaging)	production	933	External waste disposal
Expired feedstuff	production	1,707	External waste disposal (ren-dering)
Flotation sludge	Wastewater treatment	2,568	external biogas production
Bone sludge (sediment from the flotation unit)	Wastewater treatment	217	external biogas production

2.8.2.5 Water and wastewater

The process wastewater is discharged indirectly into the municipal sewer system after internal treatment (including a retention basin, drum sieve, neutralisation and dissolved-air-flotation). Rain-, surface as well as cooling waters are separated and discharged directly.

Description of the external WWTP

The process at the external wastewater treatment plant ARA AV Großraum Bruck/Leitha – Neusiedl/See consists of biological treatment, a nitrification plus denitrification stage and phosphorus removal with a maximum of 140,500 population equivalents (EW_{60}, of which a maximum of 4000 PEs come from Mars Austria). The treated wastewater is discharged into the river Leitha. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 279: Permitted indirect discharged process wastewater emission limitation parameters (WB MARS AUSTRIA, Source: Mars Austria, email 14-8-2014)

Process wastewater						
Parameter	**ELV – permit**	**ELV (contract with external WWTP)**	**Self-control frequency**	**Self-control Type of sample**	**External monitoring – frequency**	**External monitoring – type of sample**
Wastewater quanty (total)	600 m^3/d 25 m^3/h 7 l/s	-	cont.	spot sample	1 per year	-
BOD_5 load	240 kg/d	-	-	-	1 per year	fpdcs
COD load	400 kg/d	-	-[1)]	-[1)]	5 per year	fpdcs
TOC load	-	-	workdays	fpdcs	5 per year	fpdcs
Settleable substances	-	4[2)] and max. 10 ml/l	workdays	-	1 per year	spot sample
pH	6.5-9.5	6.0 - 9.5	cont.	spot sample	1 per year	spot sample
T	30[2)] and max. 40°C	35 °C	cont.	spot sample	1 per year	spot sample
Low volatile lipophilic substances	20 mg/l	150 mg/l	-	-	5 per year	fpdcs
Total suspended solids	-	150 mg/l	-	-	1 per year	spot sample
AOX (as Cl)		1 mg/l	-	-	1 per year	fpdcs

fpdcs = flow proportional unsettled homogenised daily composite sample

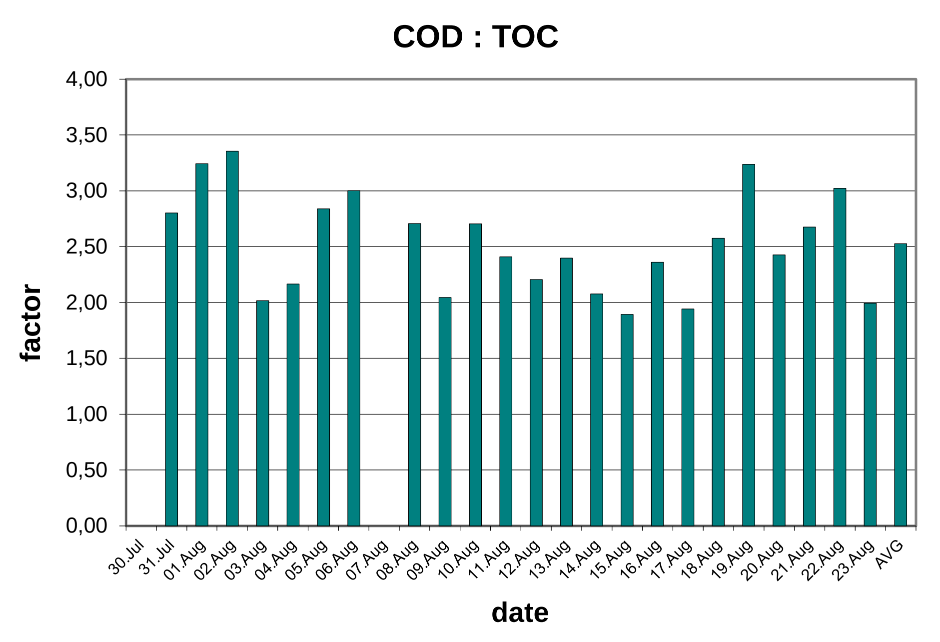
1) the COD is calculated from TOC measurements (calculated factor 2.53)

2) 85th percentile

TOC as a replacement for COD

TOC is measured instead of COD during self-monitoring. Therefore 23 tests have been made between 30-7-2007 and 23-8-2007 measuring both parameters and determining an appropriate conversion factor (= 2.53) which is also confirmed by permit.

Figure 23: Tests for the determination of an appropriate conversion factor between COD and TOC (Source: Mars Austria, email 14-8-2014, verbal information and own calculation)



Source: Mars Austria

During external monitoring both parameters are measured 5 times per year.

Table 280: Summary of results of self- and external monitoring 2013 (WB Mars Austria, Source: Mars Austria, email 14-8-2014, verbal information and own calculation (loads and TOC for self-monitoring))

Monitoring results of the process wastewater						
Parameter	**Unit**	**Method**	**Self-monitoring – yearly average 2013**	**External monitoring 16-10-2013**	**External monitoring 29-1-2013**	**ELV (permit/external WWTP)**
Q (discharge)	m³/d	venture flume	235	223	179	600
BOD_5	mg/l	ÖNORM M 6277	-	756	544	-
BOD_5 load	kg/d	(calculated)	-	169	97	240
COD	mg/l	ÖNORM M 6265	(1064)[1)]	1450	1050	-
COD load	kg/d	(calculated)	(250)[1)]	323	188	400
Settleable substances	ml/l	ÖNORM M 6271	2.6	15.6[2)]	4.5	- / 4[3)] (max 10)
pH		ÖNORM M 6244	6.7	6.5	6.36[4)]	6.5-9.5 / 6.0-9.5
T	°C	ÖNORM M 6616	27	31.1	27.4	30[3)] (max 40) / 35
Low volatile lipophilic substances	mg/l	DIN 38409-Teil 17	-	23	14	40 / 150
Total suspended solids	mg/l	ÖNORM M 6274	-	414	192	- / 150
AOX (as Cl)	mg/l	EN ISO 9562	-	0.016	< 0.01	- / 1

Monitoring results of the process wastewater						
Parameter	**Unit**	**Method**	**Self-monitoring – yearly average 2013**	**External monitoring 16-10-2013**	**External monitoring 29-1-2013**	**ELV (permit/external WWTP)**
Sulphate (as SO_4)	mg/l	ÖN EN ISO 10304-1	-	44.8	43	-
NO_2^- (as N)	mg/l	ÖN EN 26777	-	< 0.01	< 0.01	-
NH_4-N	mg/l	ÖN ISO 7150-1	-	94.1	18.5	-
total P	mg/l	ÖN EN ISO 6878	-	0.75	4.77	-
Chloride	mg/l	ÖN EN ISO 10304-1	-	412	330	-
TOC (as C)	mg/l	ÖNORM EN 1484	421	420	294	-

1) *calculated from TOC measurements with the factor 2.53*

2) *exceedance during peak loads – after improvements and refurbishment of the wastewater plant (January 2014) settleable substances are continuously between 0-1 ml/l (interim results of self-monitoring 2014)*

3) *85^{th} percentile*

4) *the pH value is kept at the lower limit upon request of the external WWTP*

Several exceedances occurred of the ELV for the parameter settleable substances in the year 2013 (particularly during peak loads). Several improvement measures of the internal WWTP were implemented by January 2014, including:

- a new sieving plant
- new fully automated NaOH injection system with optimised injection points
- new aeration system for the flotation unit
- speed-controlled pumps to achieve continuous supply of the flotation unit

Acording to the operator these measures led to major improvements (reducing settleable substances to 0-1 ml/l, according to recent measurements from 2014). Besides that a general compliance with ELVs could be observed in 2013.

Table 281: Specific need of fresh and wastewater 2013 (Source: Mars Austria, verbal information 14-10-2014)

Specific water consumption per ton of produced and packed petfood 2013		
Parameter	**Unit**	**Specific load**
Water consumption	m³/t	4.88
Process wastewater	m³/t	1.4

2.9 Oilseed processing and refining

Vegetable oil from oilseeds is produced by two steps. First cleaning, preparation, flaking, conditioning and pressing takes place which already results in crude pressed oil and a residual cake with an oil content of 12-25%. If the oil content of the cake is reduced to 6-12% per pressing no further extraction takes place. Extraction of the remaining oil from the pressed cake with hexane in countercurrent flow is the second step which is followed by a distillation process to recover the hexane from the vegetable oil. Residues of hexane in the cake are recovered by a stripping process using steam. Both, the oil and the cake, have to be free of hexane as they are further used as food for human and animal consumption. Large quantities of oil from rapeseed and sunflower oil are also used as base product for biodiesel. (ULLMANN 2007, EUROPEAN COMMISSION 2006)

2.9.1 Bunge Austria, 2460 Bruck an der Leitha

2.9.1.1 General description

The oil mill was put in operation in 1989 and the capacity was increased significantly in the years 1992 (+ 50%) and 1998 (further 30%). Today the plant has a processsing capacity of up to 380,000 tons per year. The single processing line is used alternately for rapeseed and sunflower seeds. The refining capacity is 100,000 t per year. The range of products includes rape and sunflower oil for human consumption as well as vegetable oil, rapeseed and sunflower meal for feeding purposes. Besides that the plant also produces about 95,000 tons of biodiesel per year. The biodiesel plant is operated by NOVAOL Austria GmbH, which is a daughter company of BUNGE AUSTRIA GmbH. Vegetable oil and steam is transported by pipelines directly from Bunge. In the following data sheets the biofuel plant is not included. An environmental management system has been implemented. (Source: Bunge, email 6-11-2014)

Table 282: General description (Source: Bunge, 7-7-2014)

Name of the installation	**BUNGE Austria GmbH. Industriegelände West 3; 2460 Bruck / Leitha**
IPPC activity	Treatment and processing of vegetable raw materials with a finished product production capacity greater than 300 tonnes per day: production of oil and fats
Products	Oil for human consumption (sunflower seed, rapeseed), meal and by-products (Lecithine)
Production capacity (t/d)	1.150 t/d of seed in crush, corresponding to 600 t/d oil production – thereof 300 t/d for human consumption and 300 t/d for technical purposes mainly for biodiesel production
Operating hours	Continuous operation
Auxiliary materials	Hexane, clay

Production process:

- Cleaning and preparation of seeds
- Pressing (removal of appr. 60% of oil)
- Extraction with hexane
- Separation of oil and hexane (distillation)
- Separation of hexane and cake (steam stripping)
- Oil-refining (physical refining): degumming, bleaching, steam stripping, neutralisation
- Storage of oil for human consumption

Seeds, lecithin and used clay are partly used as auxiliary material in the toasting process or sent to composting.

2.9.1.2 Energy generation and air emissions

Table 283: Combustion plants operated on the location (Source: Bunge; email 6-11-2014)

Combustion plants 1		
Type of combustion plants	2 Steam Boilers	
Combustion Technology	gas firing	
Rated thermal Input (MW)	24.9	
Start of operation	1998 and 2009	
Fuel	natural gas	
Flue gas cleaning	low NO_x Burner	
Flue gas temperature (°C)	135	
Operating hours (h/a)	continuous	
Energy recovery	condensate recovery: appr. 50%, Economizer	
Steam production (t/h)	36 max	
Steam parameter (p, T)	15 bar, 200°C	
Emissions	**Half hour average value (mg/Nm3; 3% O2)**	**Emission Limit Value – Half hour average value (mg/Nm3; 3% O2)**
Dust	< 5	5
NO_x	57	100
CO	0	80

Table 284: Combustion plants operated on the location (Source: Bunge; 7-7-2014)

Combustion plants 2		
Type of combustion plant	2 steam boilers (oil refining)	
Combustion Technology	gas firing	
Rated thermal Input (MW)	2 x 0,7	
Start of operation	2001, 2008	
Fuel	natural gas	
Flue gas temperature (°C)	130	
Operating hours (h/a)	Continuous (appr. 6,000 hours each)	
Steam parameter (p, T)	max 80 bar, 296°C	
Fuel use (%)	87	
Emissions	**Half hour average value (mg/Nm3; 3% O2)**	**Emission Limit Value – Half hour average value (mg/Nm3; 3% O2)**
Dust	< 5	5
NO_x	95	100
CO	13	80

2.9.1.3 Noise and odour emissions

Table 285: Odour and noise emissions (Source: Bunge, 7-7-2014)

Odour	
Sources	Warming up of seeds; extraction process using hexane
Implemented measures to reduce odour emissions	Plants for warming-up of seeds and presses are closed units; exhaust air is collected and treated via biofilter (see permit conditions); Extraction: exhaust air is collected and treated via thermal post-combustion
Permit conditions	Crush: outlet of biological filter max. 500 odor units (GE)/m³; total org.C 20mg/m³, solid particles and aerosols 10 mg/m³ (half hourly mean value at 0°C and 1,013mbar, dry air) (BH-Bruck / Lth. 12-B-873/120 from 24-6-1997) Extraction: 150 mg/m³ total org.C (0°C, 1,013 mbar) during an hexane flow of 3 kg/h (BH-Bruck / Lth. 12-B-873/7 from 12-5-1987)
Control and surveillance	Continuous recording of operating parameters (temperature) external control by accredited institutions every 3 years(unburned organic compounds)
Noise	
Sources	Engines, cooling towers
Implemented measures	Closed units (exception: extraction process is designed as open device due to explosion risks); sound absorbers at air inlets and outlets; low-noise ventilation at the cooling towers

2.9.1.4 Waste management

Table 286: Waste management (Source: Bunge, 7-7-2014)

Hazardous waste (2013)			
Type	**Source**	**Quantity (kg/a)**	**Treatment / disposal**
Mixtures of solvent-water, including halogenated sovents		750	authorized company for waste disposal
Plastic container, incl. hazardous residues	Containers for chemicals	1,580	authorized company for waste disposal
Used chemicals	Laboratory	40	authorized company for waste disposal
Aerosol cans (incl. residues)	Maintenance	62	authorized company for waste disposal
Oil-water mixtures	Maintenance	560	authorized company for waste disposal
Waste oil	Maintenance	590	authorized company for waste disposal
Non hazardos waste (2013)			
Type	**Source**	**Quantity (kg/a)**	**Treatment / disposal**
Animal feed, organic waste, not feasible for huan consumption or processing	Oilproduction, leakages	500,700	waste disposal / composting /biogasproduction
Residues of oil seeds	Refinery, sludges from de-gumming	6,405,510	waste disposal / biogas
Emulsions of oil, fat and waxes	Öl/Wassergemisch Ex-Becken	2,494,570	waste disposal / wastewater treatment
Sludges from oil-production for human consumption	Flotation	40,340	waste disposal / wastewater treatment
Clay containing oil	Bleaching step	681,050	waste disposal / biogas

2.9.1.5 Water and wastewater

A complex collection system is installed for the treatment and discharge of wastewater coming from different sources, such as: oil refining, oil production plus exhaust air purification, biodiesel production, desludging, rainwater (from roofs, the fuel depot and roads), surface water from the loading areas for rapsmethylester and methanol/glycerine, domestic wastewater, cooling water, biofilter seepage water, water from regeneration of the ion-exchanger and steam generator blowdown water.

Surface and cooling water is discharged directly, whereas wastewater from the production line is discharged indirectly after internal treatment.

Table 287: Water and wastewater (Source: Bunge, 7-7-2014)

Water and Wastewater – General description	
Water consumption	360,000 m^3/y (2013)
thereof cooling water	320,452 m^3/y (2013)
Volume of wastewater	39,420 m^3/y (2013) – wastewater from the process
Partial streams	a) Surface and cooling water: Direct discharge to "Leithawerkskanal"; cooling system: once through system; source: river Leitha; heat exchanger, retention basin (puffer system), discharge into river Leitha; T of river Leitha is recorded up- and downstream as well as T of discharged cooling water; in addition: 3 cooling towers; b) wastewater from process exclude extraction (wastewater from extraction is evaporated inside and used for live steam at the toaster) and sanitary wastewater: Indirect discharge to WWTP "Abwasserverband Großraum Bruck an der Leitha, Neusiedl am See"
Internal treatment of WW from the process (partial stream b)	Oil production and exhaust gas cleaning: flotation (1 step); Oil refining: 2-step flotation (acidification-flotation, neutralisation-fat removal); common discharge including sanitary wastewater into sewage system. skimmed foam and removed sludge is sent to authorised third party for disposal
Measures in case of other than normal operating conditions	Direct discharge: retention basin with oil separation, cont. monitoring of T and oil content (Laser); Indirect discharge: cont. monitoring of pH, temperature and volume; puffertanks with a capacity of 12 hour normal production
Description of the external WWTP	The process at the external wastewater treatment plant ARA AV Großraum Bruck/Leitha – Neusiedl/See includes a biological treatment step, a nitrification plus denitrification stage and phosphorus removal with a capacity of 140,500 population equivalents (EW_{60}, ~of which a max. of 5,100 stem from Bunge Austria). The treated wastewater is discharged into the river Leitha. (Source: Kommunales Abwasser Österreichischer Bericht, BMLFUW 2014)

Table 288: Requirements to wastewater sampling (Source: Bunge, 07-7-2014)

Type of Wastewater	**Wastewater from the process (indirect discharge)**	**Surface and cooling water (direct discharge)**
Sampling point	after process, before discharge into sewage system (common sampling point); sampling point with automated, quantity based sampling device including continuous recording of pH, T and volume (self-control)	retention basin
General requirement	external inspection: once a year, including: checking relevant production data, checking the status of WWTP including technical inspeciton, checking the status of sampling points, assessing applied sampling methods and data from self-control, measurement of parameters (see tables) and compliance check based on a flow proportional unsettled homogenised daily composite sample	external inspection: once a year; qualified spot sample

Table 289: Applied methods for wastewater analysis (Source: Reports from Measurement, Büro DI Hofeneder Wasser&Bau Consulting GmbH, 4-1-2013 and 28-10-2013; provided by Bunge)

Methods for wastewater analysis		
Parameter	**Applied methods for analysis: Indirect discharge – external control[1)]**	**Applied methods for analysis: Direct discharge – external control[2)]**
Temperature	ÖNORM M 6616	
pH	ÖNORM M 6244	ÖNORM M 6244
COD	ÖNORM M6265	ÖNORM M 6265
BOD	ÖNORM M 6277	
Sum C	ÖNORM M 6608-1	
Ammonium (as N)	ÖNORM ISO 7150-1	ÖNORM ISO 7150-1
Nitrite (as N)	ÖNORM EN 26777	ÖNORM EN 26777
Nitrate (as N)	ÖN EN ISO 10403-1	
total Kjeldahl N (as N)	ÖNORM EN 25663	
total P (as P)	ÖN EN ISO 6878	ÖNORM EN ISO 6878
Low volatile lipophilic substances	DIN 38409 - H17	DIN 38409-Teil 17
Total suspended solids (0.45 µm)	ÖNORM M 6274	ÖNORM M 6274
Settleable substances (2 hours)	ÖNORM M 6271	ÖNORM M 6271 (2 hours)
Chloride (as Cl)	ÖN EN ISO 10304-1	ÖN EN ISO 10304-1
Free chlorine (as Cl_2)	rapid test (DPD)	
Total chlorine (as Cl_2)	rapid test (DPD)	
AOX	EN ISO 9562	
Sulfate (as SO_4)	ÖN EN ISO 10304-1	
Sulfide (as S)	rapid test (MB)	
Cr	ÖN EN ISO 15586	
Ni	ÖN EN ISO 15586	
Hg	ÖNORM EN 1483	
Toxicity GF – fish		IFUM/MA 39 Wien
Toxicity GL – bacteria		Holzforschung Austria
Hexane		GC/MS Headspace
Conductivity		ÖNORM EN 27888

[1)] *Frequency of external control: once a year (flow proportional unsettled homogenised daily composite sample)*

[2)] *Frequency of external control: once a year (qualified spot sample)*

Table 290: External Monitoring of pretreated wastewater (Source: Report from Measurement, Büro DI Hofeneder Wasser&Bau Consulting GmbH, 4-1-2013; provided by Bunge)

Pretreated wastewater			
Parameter (indirect discharge)	**Unit**	**Emission Limit Value (daily average)**	**Emission level (fpdcs = daily average value, 22-10-2013)1)**
Volume	m^3/h	total: 10 m^3/h, 220 m^3/d; oilproduction, exhaust-gas cleaning: 4 m^3/h; 88 m^3/d; oil-refining: 6 m^3/h; 132 m^3/d	108 m^3/d; 4.5 m^3/h^2
Temperature	°C	35	17.8-22.4[2)]
pH		6.5-10	7.1-9.2[2)]
COD	kg/d, mg/l	total: 612 kg/d; oilproduction, exhaust-gas cleaning: 242 kg/d; oil-refining: 370 kg/d	233.3 kg/d; 2,160 mg/l
BOD	kg/d, mg/l	total: 306 kg/d; oilproduction, exhaust-gas cleaning: 121 kg/d; oil-refining: 185 kg/d	119.9 kg/d; 1,110 mg/l
Sum C	mg/l	20	3.6
Ammonium (as N)	mg/l	no ELV	35.7 mg/l
Nitrite (as N)	mg/l	10	< 0.02
Nitrate (as N)	mg/l	no ELV	< 0.5
Total Kjeldahl N (as N)	mg/l	no ELV	55.7
total N (as N)	mg/l	no ELV	55.7
total P (as P)	mg/l	no ELV	0.74
Low volatile lipophilic substances	mg/l	100 mg/l; 22.0 kg/d	10.6 kg/d; 98 mg/l
Total suspended solids	mg/l	150	133
Settleable substances (2 hours)	ml/l	10	2.0
Chloride (as Cl)	mg Cl/l	no ELV	284
Free chlorine (as Cl_2)	mg Cl_2/l	0.2	< 0.1[3)]
Total chlorine (as Cl_2)	mg Cl_2/l	0.4	< 0.1[3)]
AOX	mg/l	0.5	0.061
Sulfate (as SO_4)	mg SO_4/l	200	39.6
Sulfide (as S)	mg S/l	2.0	< 0.1[3)]
Cr	mg/l	0.5	< 0.05
Ni	mg/l	0.5	< 0.05
Hg	mg/l	0.005	< 0.001

fpdcs: flow proportional unsettled homogenised daily composite sample

[1)] *production on the day of measurement: 579 t oil production (55% of total capacity) and 550 t oil refining (92% of capacity)*

[2)] *continuous measurement*

[3)] *spot sample*

Data from self- and external monitoring show a general compliance with all ELVs.

Table 291: External monitoring of cooling water (Source: Report from Measurement, Büro DI Hofeneder Wasser&Bau Consulting GmbH, 28-10-2013; provided by Bunge)

Cooling water			
Parameter (surface and cooling water – direct discharge)	**Unit**	**Emission Limit Value**	**Emission level (7-10-2013, qualified spot sample)**
Volume – intake	m^3/h	355	41.7
Volume – discharge	m^3/h	> 337	
Temperature – Delta T cooling water	°C	10	
Temperature – cooling water	°C	30	12,8
Temperature – Delta T river Leitha	°C	3	
pH		6,5-8,5	7.95
COD	mg/l	75	29
total P	mg/l	2.0	0.37
Low volatile lipophilic substances	mg/l	20	< 5
Total suspended solids	mg/l	30	< 5
Settleable substances	ml/l	0.3	< 0.1
Conductivity	µS/cm	no ELV	1,468
Ammonium (as N)	mg/l	10	0,15
Chlorid (as Cl)	mg/l	no ELV	274
Nitrite (as N)	mg/l	10	0.15
Nitrite (as N)	mg/l	0.1	0.055
Hexane	mg/l	no ELV	< 0.01
Sum C	mg/l	0.5	< 0.1
Toxizity GF – fish	GF	2	< 2
Toxicity GL – bacteria	LID	10	1

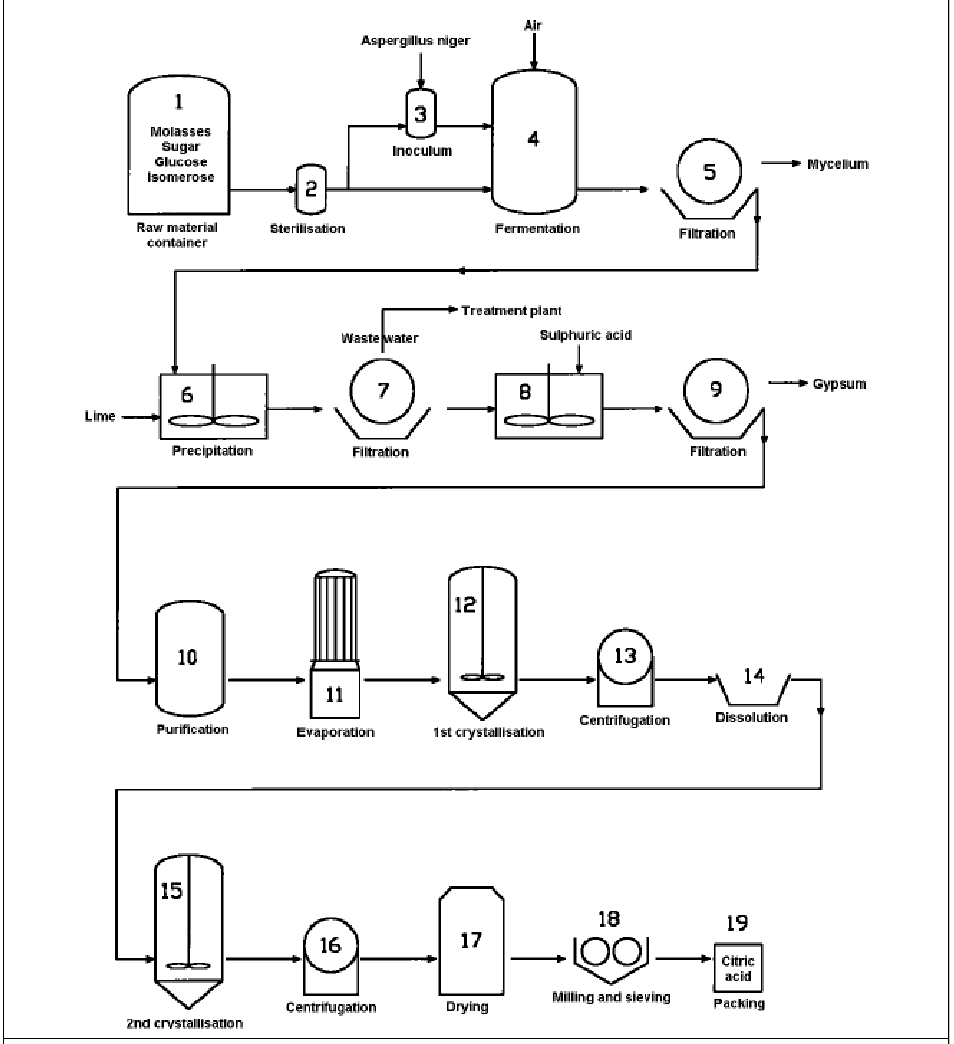
Data from self- and external monitoring show a general compliance with all ELVs.

2.10 Production of citric acid

The most economical method to produce citric acid is fermentation, which employs a strain of Aspergillus niger as an inoculum, to convert sugar, molasses or different sources of glucose to citric acid. Fermentation consists of three main phases, i.e. fermentation, recovery, and purification of citric acid. During fermentation a high content of nutrients and oxygen is needed. Further advantages are low concentrations of Fe^{2+} ions and a low pH level which both inhibits the enzyme aconitase that is responsible for the catalysis of citrate to isovitrate. After 3-14 days lime is added to precipitate calcium citrate which is filtered. After mixing with sulphuric acid the citric acid gets solved again and calcium sulphate or gypsum can be filtered from the slurry. Later, the citric acid solution is purified by ion exchange and carbon adsorption. The citric acid solution is evaporated and crystallised from the solution (first crystallisation). The citric acid crystals are centrifuged. In the last step, citric acid is dissolved in water and crystallised again. The crystals are centrifuged again and are dried, milled, sieved and packed (see Figure 24).

Figure 24: Citric acid fermentation process (EUROPEAN COMMISSION 2006, p.111)

Citric acid fermentation process



Source: EUROPEAN COMMISSION (2006)

The overall process requires large amounts of water (40 m³ per metric ton of citric acid) and produces wastewater with high chemical oxygen demand (COD) and high concentrations of nitrogen which results of the growing medium. Furthermore there are large quantities of solid waste mainly gypsum and to a lesser degree residues of the mycelium. (EUROPEAN COMMISSION 2006, ULLMANN 2007)

2.10.1 Jungbunzlauer Austria, 2064 Wulzeshofen

2.10.1.1 General description

Table 292: General description (Source: Jungbunzlauer HP and email 6-11-2014 and Wasserbuchauszug 7-8-2014)

Name of the installation	**Jungbunzlauer Autria AG Pernhofen 1, 2064 Wulzeshofen**
IPPC activity	6.4 (b)
Products	Citric acid, xanthan, gluconate.
Production capacity	>300 t per day
Operating hours	Continuous
Raw materials	Sugar, glucose, molasses, maize (for processing of glucose on site)
Description	Jungunzlauer is the only producer of citric acid in Austria. Jungbunzlauer also produces gluconate, xanthan and sweeteners for the food, beverage, pharmaceutical and cosmetic industry and operates plants in Austria, Canada, France and Germany.
History	2003: Extension of the existing WWTP by 2 anaerobic sedimentation tanks, 3 activated sludge tanks and sedimentation tank, incl. Pumps and equipment 2007: New production system for producing glucose syrup from maize

Production Process

Fermentation:

1. The substrate (carbohydrates like molasses, sugar, glucose or isomerose and certain inorganic nutrients) for the fermentation process is prepared in a specific tank.
2. The substrate is sterilized.
3. Mould spores of Aspergillus niger (the inoculum) are produced under controlled aseptic conditions.
4. The inoculum and the substrate are transferred aseptically to the production fermenter. The fermentation process (conversion of sugar into citric acid) requires 3 to 14 days.
5. The biological solids (mycelium) are removed by filtration.

Recovery:

1. The dissolved citric acid is separated from residual sugars, proteins and other soluble impurities by addition of lime precipitating calcium citrate.
2. The slurry containing calcium citrate is filtered and washed free of soluble impurities. The wastewater is released to a purification plant.

3. The calcium citrate is acidified with sulphuric acid. This reaction converts the calcium citrate to calcium sulfate and citric acid.
4. The citric acid solution is separated from the calcium sulfate (gypsum) by filtration.

Purification:

1. The citric acid solution is purified by ion exchange and carbon adsorption.
2. The citric acid solution is evaporated.
3. Citric acid is crystallized from solution (1st crystallization).
4. The citric acid crystals are centrifuged.
5. Citric acid is dissolved in water.
6. Citric acid is crystallized from solution (2nd crystallization).
7. The citric acid crystals are centrifuged.
8. The citric acid crystals are dried.
9. The citric acid crystals are milled and sieved.
10. Citric acid is packaged.

(Source: Austrian contribution to BREF FDM, 2002)

2.10.1.2 Waste and by-products

Table 293: Types of waste and by-products from the production process and disposal (Source: Jungbunzlauer, 1-8-2014 and 6-11-2014)

Waste and by-products		
Type	**Amount**	**Treatment and disposal**
Gypsum	1,000 kg/t citric acid	Building material industry (after cleaning)
Mycelium	100 kg/t citric acid	Base material for animal feedstuff
Sludge from wastewater treatment	50 kg/t citric acid	-
Sulphur	2-4 kg/t citric acid	Sulphur is gained from biogas and used for the production of sulphuric acid
Filtering aids derived from polishing filtration	Not quantified	-

2.10.1.3 Water and wastewater

Specific water consumption is around 40 m³ per ton of installed citric acid production capacity. 25% of the crude wastewater volume are highly polluted and include 90% of COD.

The high COD load, the calcium and sulphate compounds from precipitation and decomposition, as well as the high concentration of NH_4-N from molasses and fermentation, qualify the wastewater for an anaerobic pretreatment step.

The biological part is designed as activated sludge tanks with circulating flow and surface aeration (3 tanks with a volume of 5,000 m^3 each), including nitrification/denitrification, stabilisation of sludge and P-precipitation with $FeCl_3$. Post sedimentation consists of 4 basins with a volume of 2,100 m^3 each.

The biological part of the WWTP treats wastewater coming from the neutralisation, xanthan-production, boiler feedwater preparation, and processing of molasses or production of glucose. Also, losses from the cooling system and rain water are treated in the internal WWTP. (Source: WB JUNGBUNZLAUER, Jungbunzlauer, email 1-8-2014, 6-11-2014 and 21-4-2015). Regulated parameters are shown in Table 294 (process wastewater).

Table 294: Emission limit values for direct discharged process wastewater (Source: Wasserbuchauszug 7-8-2014, and Jungbunzlauer 1-8-2014)

Direct discharged process wastewater			
Parameter	**ELV – Permit**	**Self-monitoring – type of sample[1)]**	**Self-monitoring – freqency**
Wastewater quanty (total)	27,500 m³/d	cont.	cont.
T	30 °C	cont.	cont.
pH	6.5-8.5	cont.	cont.
COD load	7.5 t/d (daily); 6.5 t/d (yearly average)	fpdcs	daily
COD specific load	19 kg/t[2)]	fpdcs	daily
BOD_5	25 mg/l	fpdcs	daily
BOD_5 load	0.690 t/d	fpdcs	daily
total N	25% from the incoming N load (=75% removal)	fpdcs	weekly
PO_4-P	1 mg/l; 0.028 t/d	fpdcs	daily
Settleable substances	0.3 ml/l; 8.3 m³/d	fpdcs	daily
NH_4-N	5 mg/l; 0.140 t/d (daily), 0.069 t/d (yearly average)	fpdcs	daily
NO_2-N	2 mg/l; 0.055 t/d (daily); 0.0275 t/d (yearly average)	fpdcs	daily
NO_3-N	-	fpdcs	daily
Total cyanide	1.5 mg/l; 0.042 t/d	fpdcs	-
Cu	0.5 mg/l; 0.014 t/d (daily); 0.0069 t/d (yearly average)	fpdcs	weekly
Zn	2 mg/l; 0.055 t/d (daily); 0.0275 t/d (yav)	fpmcs	weekly
Fish toxicity	< 2		-

fpdcs: flow proportional unsettled homogenised daily composite sample

1) methods according to the General Ordinance on wastewater discharges (FLG 186/1996)

2) based on tonnes of processed sugar

Table 295: Emission from citric acid production (Source: Jungbunzlauer, 1-8-2014)

Process wastewater					
Parameter	**Unit**	**Emission level**			**ELV**
		Daily average min	**Daily average max**	**Yearly average**	**Daily average max**
pH		6.5	8.5		6.5-8.5
COD	t/d		7.2 t/d; 22 kg/t citric acid	275 mg/l; 13.4 kg/t citric acid	7.5 t/d (daily), 6.5 t/d (yearly)
BOD_5	mg/l	<3	25	12	25
total N removal	%			80%	75%
PO_4-P (mg/l)	mg/l	<0.1	1	0.44	1
Settleable substances	ml/l	<0.1	0.3		0.3
NH_4-N	mg/l	<0.1	5	1	5
NO_2-N	mg/l	<0.1	1.9	0.4	2
Total cyanide	mg/l	<0.1	1.5	0.9	1.5
Cr-tot.	mg/l	<0.1	0.14		-
Cu	mg/l	<0.1	0.29	0.1	0.5
Ni	mg/l	<0.1	0.5		-
Zn	mg/l	<0.1	0.8	0.3	2

Results show a general compliance with ELVs. The treated wastewater is discharged into the river Pulkau. (WB JUNGBUNZLAUER)

3 STATE OF THE ART (BAT)

3.1 General BAT conclusions for the food industry

Based on real emission and consumption data of the Austrian FDM industry, the following techniques and emission values can be described as state of the art. The term "state of the art" is synonymous with the term "best available techniques".

The techniques listed and described in this section are neither prescriptive nor exhaustive. Other techniques may be used that ensure at least an equivalent level of environmental protection.

In the tables presenting BAT-AELs the lower values refer to the maximum (daily average) values reported. The higher values refer to the sector specific Austrian wastewater Ordinances except for total phosphorous which is recommended not to exceed 1 mg/l at all FDM sub-sectors if discharged directly into receiving water bodies.

A daily average value is defined as: Average over a sampling period of 24 hours taken as a flow-proportional composite sample or, provided that sufficient flow stability is demonstrated, from a time-proportional sample. (Source: BATC PP 2014)

3.1.1 General BAT for energy consumption and energy efficiency

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for reducing energy consumption and increasing energy efficiency:

- use of high-efficient steam boilers (including economiser for preheating of water and/or air)
- implement an Energy Management System or an audit every 4 years
- recover heat from waste- or cooling water by heat exchangers and/or heat pumps
- use of renewable energy sources like on-site photovoltaic and/or solar heat and biogas from anaerobic wastewater treatment
- use of fuels with low carbon intensity
- use pre-cooling of products/intermediate products via river water, if applicable
- to use frequency-controlled air compressors with heat recovery (except for base load coverage)

3.1.2 General BAT for water consumption and wastewater emissions

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for reducing water consumption and emission of pollutants:

- separate collection and treatment of polluted and non-polluted wastewater (e.g. wastewater from the process, cooling water, run-off water, sanitary wastewater)
- to provide sufficient aeration capacity at the activated sludge basin to cope with designed capacity and higher loads in periods of increased production
- to take measures in storage areas and warehouses so that large amounts of wastewater are not discharged directly to the sewer system in case of accidents (e.g. buffer systems, throttling devices)
- to prevent by technical and operational precautionary measures that chemicals or extinguishing water is directly discharged into the sewer systems in case of an accident or fire
- use of rainwater retention bassins and buffer tanks to balance hydraulic, thermal and pollution peaks
- to provide for redundancies at critical process units (e.g. aeration systems, pump systems, buffer tanks, an emergency overflow in combination with an appropriate contract with the external WWTP)
- to use surface condensers instead of injection condensers (indirect cooling)
- to reduce water consumption and wastewater generation by e.g.
  - recirculation of process- and cleaning water and of cleaning/disinfection solutions, if required: appropriate pre-treatment (e.g. settling tank)
  - reuse of cooling water or condensates for cleaning purposes, boiler feed water preparation or as process water
  - apply industrial automation in processing, filling and cleaning steps
- to implement internal measures to avoid product losses over the wastewater
- to use water saving-fittings and devices for the production process
- to use a CIP cleaning system if applicable (including recirculation system based on conductivity measurements)
- to use CIP also for cleaning of containers
- to clean trucks and vehicles in dedicated areas only
- apply dry cleaning before wet cleaning of workspaces and facility components
- use of halogen-free disinfectants and cleaning agents (e.g. peracetic acid)
- if the use of chloroorganic cleaning agents cannot be avoided: demand-orientated use of chloroorganic cleaning agents
- record consumption of disinfectant/cleaning agents
- to store chemicals (e.g. nitric acid and caustic soda) in containers, which are placed in a retention basin to enable internal or external proper treatment and disposal
- to perform leakage tests at the wastewater system or regular camera inspection of the sewage and wastewater treatment system (e.g. every 5-10 years)
- to avoid the use of poorly degradable complexing agents (e.g. EDTA)

It is BAT

- to nominate a person responsible for operating and maintaining the WWTP and the sewage system
- to educate and train staff responsible for operating and maintaining the WWTP
- to develop and regular update an operating manual, which includes a description of functions of the whole WWTP and it`s units and of control and maintenance operations
- to maintain a log book on the operation of the WWTP (eg. according to OEWAV-Regelblatt 13), including all relevant measurements, checks, calibration, maintenance and repair actions, disposal of waste/residues from wastewater treatment, observations, malfunctions and change of operation as well as change of staff and standard operating conditions for putting the WWTP into operation and for operation of the WWTP under certain operating conditions
- to keep records of all relevant parameters in the log book
- to install alarm systems and alarm plans for critical units/key parameters
- to implement an information system to provide for immediate response in case of malfunctions (e.g. to immediately inform the external wastewater treatment plant, if relevant)

3.1.2.1 General BAT for Monitoring

General BAT is to implement a system for self- and external control at least for the following parameters:

- Direct discharge: Volume, temperature, pH, ammonium, TOC and/or COD, BOD_5 total nitrogen and total phosphorus as well as AOX (AOX: except sugar production)
- Indirect discharge: Volume, temperature, COD and/or TOC and AOX

BAT is to implement a self monitoring system in order to optimize the production process and to control the functioning of the wastewater (pre-)treatment plant; this includes monitoring of additional parameters (e.g. emission parameters up- and downstream of process units, volume, temperature, oxygen content in the activated sludge basin, sludge volume and sludge index plus dry matter, conductivity…), to introduce shorter monitoring intervals or to monitor the same parameter upstream and downstream in the process in particular cases (e.g. online monitoring of N and P dosage, if applicable).

Averaging periods for BAT-AEL

For the majority of parameters it is BAT to implement a monitoring regime that allows for the expression of emission parameters as **daily average values**. A daily average value is defined as an average over a sampling period of 24 hours taken as a flow proportional unsettled homogenised daily composite sample.

Certain parameters are **continuously measured** (such as Q, T and pH), whereas some parameters are monitored (for analytical reasons) as **spot samples** (such as total suspended solids, total Cl)

Standards for sampling and analyses

BAT is to apply international or national standards for sampling, sample treatment, and analysis; applied methods are given in Table 296 and

Table 297.

Table 296: Methods used for sampling, conservation and homogenisation

	Method
Sample taking	ÖNORM EN ISO 5667-16
	ÖNORM M 5891
	ÖNORM M 5892
	ÖNORM M 5893
	ÖNORM M 5894
Conservation	ÖNORM EN ISO 5667-3
Homogenisation	DIN 38402 A30

Table 297: Applied methods for chemical analyses

Parameter	Applied methods for chemical analyses
Q	IDIN 19559
	ÖNORM B 2402
	ÖNORM M 5880
T	DIN 38404-C4
	ÖNORM M 6616
pH	ÖNORM EN ISO 10523
COD	ÖNORM M 6265
	DIN 38409-41 (DEV H 41)
	ÖNORM ISO 15705 e)
TOC (reported as C)	ÖNORM EN 1484
BOD_5	EN 27888
	EN 1899-1
NH_4-N	DIN 38406-5 (DEV E 5)
	ÖNORM ISO 5664
	ÖNORM ISO 7150-1
	ÖNORM EN ISO 14911
	ÖNORM EN ISO 11732
total N	ÖNORM EN 12260
	ÖNORM EN ISO 11905-1
total P	ÖNORM EN ISO 6878
	ÖNORM EN ISO 15681-1
	ÖNORM EN ISO 15681-2
	ÖNORM EN ISO 11885
	ÖNORM EN ISO 17294-2
Total suspended solids	ÖNORM EN 872
	DIN 38409-2
Settleable substances	DIN 38409-9

Parameter	Applied methods for chemical analyses
	ÖNORM M 6271
Free Cl	ÖNORM EN ISO 7393-1 ÖNORM EN ISO 7393-2
Total Cl	ÖNORM EN ISO 7393-1 ÖNORM EN ISO 7393-2 ÖNORM EN ISO 7393-3
AOX (reported as Cl)	ÖNORM EN ISO 9562 DIN 38409-22
Sulfide (reported as S)	DIN 38405-D26 ÖNORM M 6615
Sulfite (reported as SO_3)	ÖNORM EN ISO 10304-3
Sulphate (reported as SO_4)	ÖN EN ISO 10304-1
Nitrate (reported as N)	ÖNORM EN ISO 10304-1 ÖNORM EN ISO 13395
Nitrite (reported as N)	ÖNORM EN 26777 ÖNORM EN ISO 10304-1 ÖNORM EN ISO 13395
Total cyanide (reported as CN)	ÖNORM M 6285 d) DIN 38405-13 (DEV D 13) ÖNORM EN ISO 14403-1 ÖNORM EN ISO 14403-2
Chromium (reported as Cr)	ÖNORM EN ISO 15586 ÖNORM EN ISO 11885 ÖNORM EN ISO 17294-2
Iron	ÖNORM EN ISO 15586 ÖNORM EN ISO 11885
Copper (reported as Cu)	ÖNORM ISO 8288 ÖNORM EN ISO 15586 ÖNORM EN ISO 11885 ÖNORM EN ISO 17294-2
Nickel (reported as Ni)	ÖNORM ISO 8288 ÖNORM EN ISO 15586 ÖNORM EN ISO 11885 ÖNORM EN ISO 17294-2
Zinc (reported as Zn)	ÖNORM ISO 8288 ÖNORM EN ISO 15586 ÖNORM EN ISO 11885 ÖNORM EN ISO 17294-2
Mercury (reported as Hg)	ÖNORM EN ISO 12846 ÖNORM EN ISO 17852
Anionic and non-ionic surfactants	Anionic: ÖNORM EN 903 and ÖNORM EN ISO 16265

Parameter	Applied methods for chemical analyses
	Non-ionic: DIN 38409-23 and ÖNORM M 6253-2
Hydrocarbon Index	DIN 38407-F9 ÖNORM EN ISO 9377-2
Low volatile lipophilic sub-stances	DIN 38409-56
Separable lipophilic sub-stances	DIN 38409-19[1)]

[1)] *deviating to DIN 38409-19 n-Heptane should be used as extraction agent in favour of 1,1,2-trichloro-1,2,2-trifluoroethane and only 3 samples are required to form the arithmetic mean value*

It is highly recommended to permit TOC measurements as additional option to COD. Therefore BAT-AELs for both parameters should be available for every FDM sector.

External monitoring

BAT is to perform external monitoring by authorised experts, institutions or companies.

BAT for external control includes:

- monitoring of emission parameters
- control of operating parameters (log book)
- evaluation of the wastewater treatment plant including the sampling device for self-monitoring and the wastewater discharge measurement
- comparison between results from self- and external control
- comparison of monitoring results with Emission Limit Values
- assessment of operating conditions and production figures during the monitoring campaign
- monitoring of additional parameters

3.1.2.2 General BAT for the indirect discharge of wastewater

BAT for the indirect release of wastewater (before final treatment in an external WWTP) is to pre-treat wastewater from the process by physical-chemical water treatment, including a combination of the following:

- Sedimentation
- Sieving
- Precipitation
- Flocculation
- Flotation
- Adsorption
- Filtration
- Neutralisation in a buffer tank

It is BAT to immediately inform operators of the external wastewater treatment plant and the competent authority in case of malfunctions or incidents.

3.1.2.3 General BAT for the direct discharge of wastewater

In case of direct discharge of wastewater from the process it is BAT to apply physical-chemical water treatment (see above) and additional biological wastewater treatment including biodegradation of organic components, removal of nitrogen and phosphor.

Low emission levels are usually achieved even at high inlet concentrations due to the readily biodegradable wastewater. The following removal rates are associated with BAT:

Table 298: Removal rates associated with BAT

Parameter (direct discharge)	Unit	Reported values
COD removal[1)]	%	90%-97%
TOC removal[1)]	%	90%-97%
BOD_5 removal	%	95%-99%
total N removal[2)]	%	75%-85%

[1)] it is sufficient to regulate either COD or TOC

[2)] if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient

3.1.2.4 General BAT for frequency of sampling

It is best practice to establish a system for self-control with at least the frequencies of sample taking as given in Table 299.

Table 299: Frequency of sample taking for self-control (direct discharge of wastewater) associated with best practice according to the Austrian Water and Waste Management Association (ÖWAV Arbeitsbehelf Nr. 14)

Frequency of sampling		
Parameter (direct)	**up to 3,000 kg/d COD or 1,000 kg/d TOC**	**> 3,000 kg/d COD or 1,000 kg/d TOC**
Q	continuous	continuous
T	continuous	continuous
pH	continuous	continuous
COD[1)]	3 times a week	daily[2)]
TOC (reported as C)[1)]	3 times a week	daily[2)]
BOD	once a week	2 times a week
total N	3 times a week	daily[2)]
total P	5 times a week	daily[2)]
NH_4-N	5 times a week	daily[2)]

fpdcs: flow proportional unsettled homogenised daily composite sample

[1)] it is sufficient to regulate either COD or TOC

[2)] during operating days

Monitoring has to be carried out at representative production days and has to be done on different days of the week if not performed daily.

3.1.3 General BAT for waste management

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for the prevention or reduction of waste production:

- to avoid wrapping of (goods) pallets in plastic foils
- to use reusable pallets (cleaned in-house)
- to reuse cartons as far as possible
- to separately collect and recycle paper, cartons and plastics
- to use standardized packaging material to simplify recycling
- to treat expired foodstuff in a biogas plant

3.1.4 General BAT for noise

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for reducing noise emissions:

- to ban night-time delivery of goods
- to implement controls by external noise measurements (e.g. at neighbour-sites to identify sources of noise)
- to install noise barriers
- to house wastewater tanks to reduce noise emissions
- to install silencers at exhaust air tubes
- to use fans designed for low noise emissions

3.1.5 General BAT for odour emissions

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for reducing odour:

- to apply cooling, housing and install exhaust air filter (e.g. biological filter) against odour emissions from wastewater treatment and/or production

3.1.6 General BAT for groundwater protection

The following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT for the prevention of emissions to soil and groundwater:

- load and unload raw and auxiliary materials only in designated areas, which are protected against leakage run-off
- collect all materials and store them in designated areas protected against leakage run-off, whilst awaiting disposal
- equip all pump sumps or other intermediary storage facilities from which spillages might occur with alarms activated by high levels of liquid

- establish and implement a programme for testing and inspection of tanks and pipelines carrying raw materials, additives and other substances (leakage tests)
- carry out inspections for leaks on all flanges and valves on pipes used to transport materials other than water and maintain a log of these inspections
- provide a catchment system to collect any leaks from flanges and valves on pipes used to transport materials other than water and except when the construction of flanges or valves are technical tightly
- provide an adequate supply of containment booms and suitable absorbent material
- avoid underground piping for transporting substances other than water
- collect and safely dispose of all water from fire fighting
- construct impermeable bottoms in basins or other containment for surface run-off water from outdoor areas or other wastewater sources, to prevent leaching

3.2 Specific BAT for meat processing

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT

3.2.1 Water consumption and wastewater emissions

- to introduce internal measures to prevent disposal of blood, solid waste as well as fat over the wastewater system

3.2.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters:

- Direct discharge: Volume, temperature, total suspended solids, pH, total chlorine, ammonium, total nitrogen, total phosphorus, TOC and/or COD, BOD, AOX, low volatile lipophilic substances
- Indirect discharge: Volume, temperature, settleable substances , pH, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), AOX, low volatile lipophilic substances

3.2.1.2 BAT for the indirect discharge of wastewater

Table 300: BAT associated emission levels and BAT for sample taking for the indirect discharge of pre-treated wastewater from the meat industry

Parameter (indirect release)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.0-9.5	continuous
low volatile lipophilic substances	mg/l	150	fpdcs
Settleable substances	ml/l	10	spot sample
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	1.0	fpdcs
NH_4-N	mg/l	-[1)]	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1] an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system

3.2.1.3 BAT for the direct discharge of wastewater

Table 301: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from the meat industry

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD	mg/l	90	fpdcs
TOC (reported as C)	mg/l	30	fpdcs
BOD	mg/l	16[1]-20	fpdcs
total N removal[2]	%	75	fpdcs
total P	mg/l	1.0	fpdcs
low volatile lipophilic substances	mg/l	5[1]-20	fpdcs
Total suspended solids	mg/l	20[1]-30	spot sample
NH_4-N	mg/l	5.0	fpdcs
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	0.1	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1] Spar TANN (external monitoring 2013/2014)

[2] if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient

3.3 Specific BAT for diaries

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.3.1 Energy consumption and energy efficiency

- apply computer-controlled setting of temperature and humidity during cheese-curing
- use filtration for ESL-milk production where product specifications and market needs are met
- produce UHT milk directly (“on-line”) from raw milk
- apply reverse osmosis system, membrane distillation or vacuum evaporation for whey thickening (savings of electrical power and steam)

3.3.2 Water consumption and wastewater emissions

- to reduce water consumption and wastewater generation by reducing flow paths and mixing phases between product residuals and the cleaning solution

- introduce internal measures to prevent disposal of whey and cheese curd over the wastewater system
- to measure continuously conductivity or turbidity of washing water which allows separation of high concentrated wastewater (and further use eg. as feedstuff) and discharge of low polluted rinsing water
- to prevent spillages (e.g. at salt baths) by technical and operational measures
- (integrated measure): to use liquid raw material (e.g. acid whey), production residues and highly concentrated partial effluent streams for the production of biogas followed by energy recovery
- (integrated measure): to dewater whey which cannot be sold for human consumption and use it as feedstuff
- (integrated measure): to reuse the permeate from whey thickening for cleaning purposes

3.3.2.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters:

- Direct discharge: Volume, temperature, total suspended solids, pH, total chlorine, ammonium, total nitrogen, total phosphorus, TOC and/or COD, BOD, AOX, separable lipophilic substances.
- Indirect discharge: Volume, temperature, total suspended solids, pH, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), AOX, separable lipophilic substances

3.3.2.2 BAT for the indirect discharge of wastewater

Table 302: BAT associated emission levels and BAT for sample taking for the indirect discharge of pretreated wastewater from diaries

Parameter (indirect)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.5-10.5	continuous
separable lipophilic substances	mg/l	100[1)]	fpdcs
settleable substances	ml/l	10	spot sample
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	1.0	fpdcs
NH_4-N	mg/l	-[2)]	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

1) the parameter may be replaced by low volatile lipophilic substances where applicable

2) an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system

3.3.2.3 BAT for the direct discharge of wastewater

Table 303: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from diaries

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD[1)]	mg/l	452); 513) - 75	fpdcs
TOC (reported as C)[1)]	mg/l	142); 154) - 25	fpdcs
BOD	mg/l	123) - 20	fpdcs
total N removal[5)]	%	75 - 853)	fpdcs
total P	mg/l	0.46) - 1.0	fpdcs
separable lipophilic substances	mg/l	107)	fpdcs
settleable substances	ml/l	0.3	spot sample
NH_4-N	mg/l	32) - 5.0	fpdcs
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	0.1	fpdcs

fpdcs:flow proportional unsettled homogenised daily composite sample

[1)] *it is sufficient to regulate either COD or TOC*

[2)] *Berglandmilch Aschbach (Permit)*

[3)] *Berglandmilch Wels (self-monitoring 2013)*

[4)] *Berglandmilch Wels (external monitoring 2013)*

[5)] *if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient*

[6)] *Berglandmilch Aschbach (external monitoring 2013)*

[7)] *the parameter may be replaced by low volatile lipophilic substances where applicable*

3.3.3 Waste management

In addition to the general BAT conclusions for food industry these measures shall be considered to prevent or reduce waste:

- whey and non-sellable products are heat treated and used as feedstuff in pig farms or as substrate in a biogas plant

3.4 Specific BAT for sugar production

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.4.1 Energy consumption and energy efficiency

- use of renewable energy sources like on-site photovoltaic and/or solar heat and biogas from anaerobic wastewater treatment
- use of so-called “low-temperature drying facilities”

3.4.2 Water consumption and wastewater emissions

- to use anaerobic wastewater treatment if technically and economically available
- in case of aerobic biological wastewater treatment, to use a selector to avoid sludge bulking (a description can be found in the chapter "Agrana Gmünd", a similar unit is installed at "Agrana Leopoldsdorf")

3.4.2.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (direct discharge):

- Volume, temperature, settleable substances, pH, ammonium, total nitrogen, total phosphorus, TOC and/or COD, BOD

3.4.2.2 BAT for the direct discharge of wastewater

Table 304: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from the production of sugar

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD[1)]	mg/l	75	fpdcs
COD load[1)]	kg/t sugar beet	0.35[2)] or 0.5[3)]	fpdcs
TOC (reported as C)[1)]	mg/l	35	fpdcs
BOD[4)]	mg/l	4[5)]; 8[6)] - 20	fpdcs
BOD_5 load[7)]	kg/t sugar beet	0.024[6)] - 0.04	
total N removal[8)]	%	75	fpdcs
total P	mg/l	0.6[5)] - 1.0	fpdcs
settleable substances	ml/l	0.3	spot sample
NH_4-N	mg/l	2.4[5)] - 5.0	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

1) it is sufficient to regulate either COD or TOC

2) if the Quentin process is applied (refers to the ton of incoming sugar beet)

3) without application of the Quentin process (refers to the ton of incoming sugar beet)

4) outside of the sugar campaign

5) Agrana Leopoldsdorf (self-monitoring 2013)

6) Agrana Tulln (self-monitoring 2013)

7) during the sugar campaign (refers to the ton of incoming sugar beet)

8) if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient

3.4.3 Odour emissions

- to use cold river water or groundwater to wash the beets if available. Thus microbiological activity and odour nuisance are reduced.

3.5 Specific BAT for the production of starch

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.5.1 Water consumption and wastewater emissions

- to use anaerobic wastewater treatment if technically and economically available
- to use the liquid fraction from starch manufacturing process as raw material to produce bio-ethanol if applicable
- in case of aerobic biological wastewater treatment to use a Selector to avoid sludge bulking (a description can be found in the chapter "Agrana Gmünd")

3.5.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (direct discharge):

- Volume, temperature, settleable substances, pH, ammonium, total nitrogen, total phosphorus, TOC and/or COD, BOD, AOX

3.5.1.2 BAT for the direct discharge of wastewater

Table 305: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from the production of starch

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD[1), 2)]	mg/l	75[4)]-100	fpdcs
TOC (reported as C)[1), 3)]	mg/l	35	fpdcs
BOD	mg/l	20-40[5)]	fpdcs
total N removal[6)]	%	75-85[7)]	fpdcs
total P	mg/l	0.45[4)]-1.0	fpdcs
settleable substances	ml/l	0.3	spot sample
NH_4-N	mg/l	3.5[4)]-5.0	fpdcs
AOX (reported as Cl)	kg/t	0.03 kg/t[8)] 0.1 kg/t[9)]	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

1) it is sufficient to regulate either COD or TOC

2) If the COD feed concentration exceeds 1,000 mg/l a removal efficiency of at least 90% is also applicable

3) if the TOC feed concentration exceeds 350 mg/l a removal efficiency of at least 90% is also applicable

4) Agrana Aschach (external monitoring 2014)

5) 40 mg/l for maize starch if the minimum removal is at least 97% and the BOD_5 feed concentration exceeds 850 mg/l

6) if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient

7) Agrana Aschach (self-monitoring 2013)

8) per ton of potato starch produced

9) per ton of maize starch produced

3.5.2 Waste management

- to use solid residues as base material for bio-ethanol production or for high-grade protein animal feed

3.6 Specific BAT for the production soft drinks

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.6.1 Energy consumption and energy efficiency

- use of measures like UCF (Ultra Clean Filling) instead of a tunnel pasteuriser (less energy consumption and higher product quality)

3.6.2 Water consumption and wastewater emissions

- use of heavy metal free labels and letterings on containers bottles and crates

3.6.2.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters:

- Direct discharge: Volume, temperature, pH, total chlorine, ammonium, total nitrogen, total phosphorus, TOC and/or COD, BOD, AOX, iron, copper, zinc, anionic and non-ionic surfactants
- Indirect discharge: Volume, temperature, settleable substances, pH, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), AOX, sulphide, copper

3.6.2.2 BAT for the indirect discharge of wastewater

Table 306: BAT associated emission levels and BAT for sample taking for the indirect discharge of pre-treated wastewater from the production of soft drinks

Parameter (indirect release)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.0-9.5	continuous
settleable substances	ml/l	10	spot sample
total Cl	mg/l	0.3	spot sample
AOX (reported as Cl)	mg/l	1.0	fpdcs
NH_4-N	mg/l	-[1]	fpdcs
sulphide	mg/l	1.0	spot sample
copper	mg/l	0.5	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1] an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system

3.6.2.3 BAT for the direct discharge of wastewater

Table 307: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from the production of soft drinks

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD	mg/l	70[1)]-90	fpdcs
TOC (reported as C)	mg/l	18[2)]-30	fpdcs
BOD	mg/l	20	fpdcs
total N removal[3)]	%	75	fpdcs
total P	mg/l	1.0	fpdcs
NH_4-N	mg/l	5.0	fpdcs
total Cl	mg/l	0.1[2)]-0.4	spot sample
AOX (reported as Cl)	mg/l	0.2[2)]-0.5	fpdcs
sulphide	mg/l	0.1	spot sample
iron	mg/l	2	fpdcs
copper	mg/l	0.08[2)]-0.5	fpdcs
anionic and non-ionic surfactants	mg/l	1.0	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1)] *Rauch Nüziders (self-monitoring 2013)*

[2)] *Rauch Nüziders (external monitoring 2012)*

[3)] *if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient*

3.6.3 Waste management

- use of sludge cake and material collected by the sieve (from the WWTP) as fertiliser or to be disposed to a composting plant
- use of fruit pomace for pectin production and as animal feed

3.7 Specific BAT for breweries and malting houses

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.7.1 Water consumption and wastewater emissions

- use of heavy metal free labels and letterings on containers bottles and crates
- dry cleaning of the grain
- separate disposal of glumes, germ bud, brewers grains, lees, surplus yeast, tank bottoms, diatomaceous earth, glass shards, labels and solid residues from the wastewater treatment as far as possible

3.7.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (indirect discharge):

- Volume, temperature, settleable substances, pH, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), AOX, copper, zinc

3.7.1.2 BAT for the indirect discharge of wastewater

Table 308: BAT associated emission levels and BAT for sample taking for the indirect discharge of pre-treated wastewater from breweries

Parameter (indirect release)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.0-9.5	continuous
settleable substances	ml/l	20	spot sample
total Cl	mg/l	0.3	spot sample
AOX (reported as Cl)	mg/l	1.0	fpdcs
NH_4-N	mg/l	-[1)]	fpdcs
copper	mg/l	0.5	fpdcs
zinc	mg/l	2.0	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1] *an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system*

3.7.2 Waste management

- use of yeast, tank bottoms and brewers grains as animal feed or as material for co-fermentation in biogas production

3.8 Specific BAT for Petfood industries

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.8.1 Water consumption and wastewater emissions

- introduce internal measures to prevent disposal of blood, solid waste as well as large amounts of fat over the wastewater system

3.8.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (indirect discharge):

- Volume, temperature, settleable substances, pH, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), AOX, low volatile lipophilic substances

3.8.1.2 BAT for the indirect discharge of wastewater

Table 309: BAT associated emission levels and BAT for sample taking for the indirect discharge of pre-treated wastewater from petfood industries

Parameter (indirect release)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.0-9.5	continuous
low volatile lipophilic substances	mg/l	150	fpdcs
Settleable substances	ml/l	10	spot sample
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	1.0	fpdcs
NH_4-N	mg/l	-[1)]	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1)] an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system

3.9 Specific BAT for oilseed processing and refining

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.9.1 Water consumption and wastewater emissions

- use of oilseeds with reduced mucilage and pesticide content (where market conditions permit)
- to avoid the use of fat-splitting enzymes or micro-organisms for cleaning purposes

3.9.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (indirect discharge):

- Indirect discharge: Volume, temperature, settleable substances, pH, chromium, nickel, mercury, free chlorine, total chlorine, ammonium (to reduce odour emissions or the risk of corrosion of the public sewer system), sulphide, AOX, low volatile lipophilic substances, total hydrocarbons

3.9.1.2 BAT for the indirect discharge of wastewater

Table 310: BAT associated emission levels and BAT for sample taking for the indirect discharge of pre-treated wastewater from oilseed processing and refining

Parameter (indirect release)	Unit	BAT-AEL	BAT – type of sample
T	°C	35	continuous
pH		6.5-10	continuous
low volatile lipophilic substances	mg/l	100	fpdcs
settleable substances	ml/l	10	spot sample
NH_4-N	mg/l	-[1)]	fpdcs
free Cl	mg/l	0.2	spot sample
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	0.5	fpdcs
sulphide	mg/l	2.0	spot sample
chromium	mg/l	0.5	fpdcs
nickel	mg/l	0.5	fpdcs
mercury	mg/l	0.005	fpdcs
Hydrocarbon index	mg/l	20	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

[1)] an ELV can be set if there is the need to reduce odour emissions or the risk of corrosion of the public sewer system

3.9.2 Odour emissions

- reduction of smell from extraction by the use of a thermal afterburning system for hexane vapour from absorption

3.10 Specific BAT for the production of citric acid

In addition to the techniques described in 3.1 the following techniques (used either individually or in a suitable combination under economically and technically viable conditions) are considered to be BAT:

3.10.1 Water consumption and wastewater emissions

- use of high quality molasses (if accessible at the market)
- to use concentrated stock solutions to reduce generation of high polluted wastewater
- to use anaerobic wastewater treatment if technically and economically available

3.10.1.1 BAT for Monitoring

BAT is to implement a system for self- and external control at least for the following parameters (direct discharge):

- Volume, temperature, settleable substances, pH, ammonium, total nitrogen, PO_4-P, TOC and/or COD, BOD, nitrite, total cyanide, copper, zinc

3.10.1.2 BAT for the direct discharge of wastewater

Table 311: BAT associated emission levels and BAT for sample taking for the direct discharge of wastewater from production of citric acid

Parameter (direct)	Unit	BAT-AEL	BAT – type of sample
T	°C	30	continuous
pH		6.5-8.5	continuous
COD load[1), 2)]	kg/t	22[3)]-34	fpdcs
BOD	mg/l	25	fpdcs
total N removal[4)]	%	75	fpdcs
PO_4-P	mg/l	1.0	fpdcs
settleable substances	ml/l	0.3	spot sample
NH_4-N	mg/l	5.0	fpdcs
total Cl	mg/l	0.4	spot sample
AOX (reported as Cl)	mg/l	0.5	fpdcs
sulphide	mg/l	0.1	spot sample
sulphite	mg/l	1.0	spot sample
nitrite	mg/l	2.0	spot sample
total cyanide	mg/l	1.5	spot sample
copper	mg/l	0.3[3)]-0.5	fpdcs
zinc	mg/l	0.8[3)]-2.0	fpdcs

fpdcs: flow proportional unsettled homogenised daily composite sample

1) it is sufficient to regulate either COD or TOC

2) if beet molasses or other sugar sources are used to produce citric acid (refers to the ton of processed sugar)

3) Jungbunzlauer (monitoring 2013)

4) if the water temperature is above 12°C and the BOD_5 feed load is higher than 150 kg per day and nitrogen is not added as nutrient

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Gewerbeordnung (GewO 1994; BGBl. Nr. 194/1994, zuletzt geändert durch BGBl. I Nr. 212/2013)

Wasserrechtsgesetz (WRG 1959; BGBl 215/1959, zuletzt geändert durch BGBl I 24/2012 (VfGH))

5 APPENDIX

5.1 Standards and directives to be followed for sampling and the determination of emission limit values

(Allgemeine Abwasseremissionsverordnung (AAEV; BGBl. Nr. 186/1996)

ANLAGE C

Methodenvorschriften gemäß § 7

1. Die Entnahme einer Abwasserprobe aus einem Abwasserstrom hat an einer Stelle zu erfolgen, an der die entnommene Probe repräsentativ ist für die Beschaffenheit des Gesamtabwassers oder an der durch äußere technische Maßnahmen die Repräsentativität der Probe für den Gesamtabwasserstrom sichergestellt werden kann. Für einen rasch veränderlichen Parameter, der nicht unmittelbar nach der Probenahme untersucht wird, sind Probenkonservierungsmaßnahmen vorzusehen. Die gemäß § 1 Abs. 3 Z 6 erforderliche Messung des zu beprobenden Abwasservolumenstromes sowie die Probenahme und Probenbehandlung (Konservierung, Homogenisierung) sind entsprechend den nachstehend genannten Methodenvorschriften durchzuführen:

Abwassermengenmessung	DIN 19559, Juli 1983
	ÖNORM B 2402, Juli 1987
	ÖNORM M 5880, Juli 1981
Probenahme von Abwasser	ÖNORM EN 25667 T.1/2, Jan.1994
	ÖNORM M 6258, Jan.1992
Probenkonservierung	ÖNORM EN ISO 5667-3, Febr.1996
Homogenisierung von Wasserproben für jene Parameter, bei denen der Gesamtgehalt bestimmt wird.	DIN 38402 A30, Juli 1986

2. Konzentrationen und Frachten von Abwasserinhaltsstoffen (Eigenschaften) der Anlage A sind an Hand mengenproportionaler nicht abgesetzter homogenisierter Tagesmischproben zu bestimmen.

3. Ausgenommen von Z 2 sind die Parameter Nr. 1, 3, 4, 5, 12, 21, 22, 25, 28, 31, 32, 39 und 42 der Anlage A; bei diesen Abwasserinhaltsstoffen (Eigenschaften) sind Stichproben zu ziehen. Tägliche Häufigkeit und Intervalle der Stichprobenahmen sind in Abhängigkeit vom Abflußverhalten der Abwasserinhaltsstoffe (Eigenschaften) festzulegen. Konzentrationen und Frachten sind gleichfalls mengenproportional (in Ausnahmefällen zeitproportional) zu ermitteln.

4. Die Parameter Nr. 3 und 4, Nr. 6 bis 11, Nr. 13 bis 20, Nr. 29 sowie Nr. 33 bis 40 und 42 der Anlage A beziehen sich auf den Gehalt in der unfiltrierten Originalprobe (Gesamtgehalt).

5. Der BSB5 (Par. Nr. 35 der Anlage A) ist mit Nitrifikationshemmung zu bestimmen.

6. Bei der Durchführung einer Prüfung auf Beeinträchtigung biologischer Abbauvorgänge durch eine Abwassereinleitung [Anlage A Fußnote c) Z 1 und 2] ist auf das Mischungsverhältnis in der öffentlichen Kanalisation bzw. der öffentlichen Abwasserreinigungsanlage sowie auf die Leistungsfähigkeit, das Adaptionsvermögen und das Abbauvermögen für Hemmstoffe der von der Abwassereinleitung betroffenen Biozönose der öffentlichen Abwasserreinigungsanlage Bedacht zu nehmen.

7. Qualitätssicherung

7.1 Zur Sicherung einer gleichbleibend guten Qualität der Eigenüberwachung hat der Wasserberechtigte oder sein Beauftragter (§ 1 Abs. 3 Z 7) sicherzustellen, daß die Messungen im Rahmen der Eigenüberwachung von einer verantwortlichen Person durchgeführt werden, die verwendeten Meßmethoden dokumentiert werden und in regelmäßig wiederkehrenden Intervallen von einer sachkundigen Anstalt oder Person, welche nachgewiesenermaßen über ein Qualitätssicherungssystem verfügt, überprüft werden.

7.2 Institute, die Messungen der Abwasserbeschaffenheit im Rahmen der Fremdüberwachung durchführen, haben laufend ein Qualitätssicherungssystem zu betreiben. Das Qualitätssicherungssystem ist in einem Qualitätssicherungshandbuch festzuhalten. Die Erstellung und Weiterführung des Qualitätssicherungshandbuches hat unter Zugrundelegung der ÖNORM EN 45001, Juni 1990 zu erfolgen. Die laufende Einhaltung der im Qualitätssicherungshandbuch getroffenen Festlegungen, insbesondere das Arbeiten nach validierten Analysenmethoden, ist zu gewährleisten.

8. Analysenmethoden

8.1 Den Emissionsbegrenzungen des Parameters Nr. 2 der Anlage A liegen die folgenden Analysenmethoden zugrunde. Für die Bestimmung des Parameters Nr. 2.5 kann eine abweichende Methode verwendet werden, wenn dargelegt wird, daß diese Methode bezüglich des Nachweises der Beeinträchtigung biologischer Abbauvorgänge eine gleichwertige Aussagekraft besitzt wie die genormten Methoden.

8.2 Den Emissionsbegrenzungen der Parameter Nr. 1 sowie Nr. 3 bis 42 der Anlage A liegen folgende oder gleichwertige Analysenmethoden zugrunde. Im Rahmen der Eigenüberwachung gilt für einen Parameter Nr. 1 sowie Nr. 3 bis 42 der Anlage A eine Analysenmethode als gleichwertig, wenn ihre Bestimmungsgrenze kleiner ist als der Emissionswert; im Rahmen der Fremdüberwachung gilt die Analysenmethode als gleichwertig, wenn sie den Anforderungen der DIN 38402-A71, März 1987 entspricht.

Nr.	Parameter	Analysenmethode
1	Temperatur	DIN 38404-C4, Dez. 1976
		ÖNORM M 6616, März 1994
2	Toxizität	
2.1	Algentoxizität GA	DIN 38412-L33, März 1991
2.2	Bakterientoxizität	DIN 38412-L34, März 1991
	(Leuchtbakterien)	in Verbindung mit
	GL	DIN 38412-L341, Okt.1993
		ÖNORM M 6609, Juni 1993
2.3	Daphnientoxizität GD	ÖNORM EN 26341
		ÖNORM M 6264, Jan. 1984
2.4	Fischtoxizität GF	ÖNORM M 6263 Teil 1 oder 2,
		Nov. 1987
2.5	Beeinträchtigung biologischer Abbauvorgänge	
	Hemmung des Sauerstoffverbrauches	ÖNORM EN ISO 8192-B, März 1995
	Hemmung der Nitrifikation	ÖNORM EN ISO 9509, März 1995
3	Abfiltrierbare	DIN 38409-H2, März 1987
	Stoffe	Membranfiltration 0,45 µm
4	Absetzbare Stoffe	DIN 38409-H9, Juli 1980
		ÖNORM M 6271, Mai 1985
5	pH-Wert	DIN 38404-C5, Jänner 1984

6	Aluminium	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt.1991
7	Arsen	DIN 38405-D18, Sept.1985 Aufschluß gemäß Punkt10.1 zweimalige H2O2-Zugabe ÖNORM EN 26595, Juni 1993 Aufschluß gemäß Anhang A.1 zweimalige H2O2-Zugabe
8	Barium	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
9	Blei	DIN 38406-E6, Mai 1981 ÖNORM ISO 8288, Jan. 1988
10	Cadmium	ÖNORM EN ISO 5961, Juli 1995
11	Chrom	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
12	Chrom VI	DIN 38405-D24, Mai 198 ÖNORM M 6288, Okt. 1991
13	Cobalt	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
14	Eisen	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
15	Kupfer	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
16	Nickel	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
17	Quecksilber	ÖNORM EN 1483 ÖNORM ISO 5666/1, Okt. 1984
18	Silber	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
19	Zink	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
20	Zinn	DIN 38406-E22, März 1988 ÖNORM M 6279, Okt. 1991
21	Freies Chlor	DIN 38408-G4, Juni 1984 ÖNORM M 6256, Nov. 1985
22	Gesamtchlor	DIN 38408-G4, Juni 1984 ÖNORM M 6256, Nov. 1985
23	Ammonium-Stickstoff	DIN 38406-E5, Okt. 1983 ÖNORM M 6242, Sept. 1989
24	Chlorid	DIN 38405-D20, Sept. 1991 ÖNORM M 6289, Mai 1991
25	Cyanid, leicht freisetzbar	DIN 38405-D13, Febr. 1981 ÖNORM M 6285, Dez. 1988
26	Fluorid	DIN 38405-D4-1, Juli 1985 ÖNORM M 6607, Sept.1992

27	Nitrat-Stickstoff	DIN 38405-D20, Sept.1991
28	Nitrit-Stickstoff	DIN 38405-D20, Sept. 1991
		ÖNORM EN 26777, Mai 1993
29	Gesamtphosphor	DIN 38405-D11, Okt. 1983
		Aufschluß nach Punkt 8.5.1
		ÖNORM M 6237, Nov. 1986
		Aufschluß nach Punkt 6.4.1.1
30	Sulfat	DIN 38405-D20, Sept. 1991
31	Sulfid	DIN 38405-D26, April 1989
		ÖNORM M 6615, März 1994
32	Sulfit	ÖNORM EN ISO 10304-3
33	Gesamter org. geb. Kohlenstoff	ÖNORM EN 1484
		ÖNORM M 6284, Jänner 1988
34	Chemischer Sauerstoffbedarf	DIN 38409-H41, Dez. 1980
		ÖNORM M 6265, März 1991
35	Biochemischer Sauerstoffbedarf in fünf Tagen ÖNORM EN 1899-1,	ÖNORM M 6277, Febr. 1991
		mit Nitrifikationshemmung
36	Adsorbierbare org. gebundene Halogene AOX	ÖNORM EN 1485
		ÖNORM M 6275, Nov. 1987
37	Schwerflüchtige, lipophile Stoffe	DIN 38409-H17, Mai 1981
38	Summe der Kohlenwasserstoffe	DIN 38409-H18, Febr. 1981
39	Ausblasbare org. geb. Halogene (POX)	DIN 38409-H14, März 1985
		Abschn. 8.2.1
		ÖNORM M 6275, Nov. 1987
		Abschn. 7.2.2
40	Phenolindex	DIN 38409-H16-2, Juni 1984
		ÖNORM M 6286/B, Sept. 1988
41	Summe der anion. und nichtion. Tenside	
41.1	Anionische Tenside	ÖNORM EN 903, März 1994
41.2	Nichtionische Tenside	DIN 38409-H23, Mai 1980
		ÖNORM M 6253 T.2, Sept. 1986
42	Summe der flücht. aromat. Kohlenwasserstoffe	DIN 38407-F9, Mai 1991
	Benzol, Toluol und Xylole (BTX)	

Die genormten Methodenvorschriften können bezogen werden bei:

Österreichisches Normungsinstitut

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5.2 Wastewater emission limitations for the meat industry

(AEV Fleischwirtschaft, BGBl. II Nr. 12/1999)

Anlage A

Emissionsbegrenzungen gemäß § 1

		I)	**II)**
		Anforderungen an Einleitungen in ein Fließgewässer	**Anforderungen an Einleitungen in eine öffentliche Kanalisation**
A 1	**Allgemeine Parameter**		
1.	Temperatur	30 °C	35 °C
			a)
2.	Abfiltrierbare	30 mg/l	150 mg/l
	Stoffe b)		c)
3.	pH-Wert	6,5–8,5	6,0–9,5
A 2	**Anorganische Parameter**		
4.	Gesamtchlor	0,4 mg/l	0,4 mg/l
	ber. als Cl_2		
	d)		
5.	Ammonium	5,0 mg/l	f)
	ber. als N	e)	
6.	Gesamter geb.	h)	–
	Stickstoff TN_b		
	ber. als N		
	g)		
7.	Phosphor – Gesamt	1,0 mg/l	–
	ber. als P		
A 3	**Organische Parameter**		
8.	Gesamter org. geb.	30 mg/l	–
	Kohlenstoff TOC		
	ber. als C		
9.	Chemischer	90 mg/l	–
	Sauerstoffbedarf CSB		
	ber. als O_2		
10.	Biochemischer	20 mg/l	–
	Sauerstoffbedarf BSB_5		
	ber. als O_2		
11.	Adsorbierbare org.	0,1 mg/l	1,0 mg/l
	geb. Halogene AOX		
	ber. als Cl		
12.	Schwerflüchtige	20 mg/l	150 mg/l
	lipophile Stoffe		i)

a) Im Einzelfall ist eine höhere Emissionsbegrenzung zulässig, sofern sichergestellt ist, daß es zu keiner Ausbildung von Dämpfen oder Vereisungen und zu keiner Gefahr der gesundheitlichen Belastung durch Dämpfe für das Betriebspersonal einer öffentlichen Kanalisation kommt.

b) Die Festlegung für den Parameter Abfiltrierbare Stoffe erübrigt eine Festlegung für den Parameter Absetzbare Stoffe.

c) Im Einzelfall ist eine höhere Emissionsbegrenzung zulässig, sofern sichergestellt ist, daß es zu keinen Ablagerungen infolge einer Einleitung gemäß § 1 Abs. 2 kommt, die den Betrieb der öffentlichen Kanalisations- oder Abwasserreinigungsanlage stören.

d) Die Festlegung für den Parameter Gesamtchlor erübrigt eine Festlegung für den Parameter Freies Chlor.

e) Gilt nur bei einer Abwassertemperatur größer 12 °C im Ablauf der biologischen Stufe der Abwasserreinigungsanlage. Die Abwassertemperatur von 12 °C gilt als unterschritten, wenn bei fünf über den Untersuchungszeitraum gleichmäßig verteilten Temperaturmessungen mehr als ein Meßwert nicht größer ist als 12 °C.

f) Die Emissionsbegrenzung ist im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Bereich der öffentlichen Kanalisations- oder Abwasserreinigungsanlage festzulegen (ÖNORM B 2503, September 1992).

g) Summe von organisch gebundenem Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

h) Liegt der wasserrechtlichen Bewilligung der biologischen Stufe der Abwasserreinigungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB_5 *zugrunde, so ist die der biologischen Stufe der Abwasserreinigungsanlage zufließende Fracht an* TN_b *um mehr als 75% zu vermindern (Mindestwirkungsgrad). Der Mindestwirkungsgrad bezieht sich auf die der biologischen Stufe der Abwasserreinigungsanlage zufließende bzw. die aus der biologischen Stufe der Abwasserreinigungsanlage abfließende Fracht an* TN_b *eines Tages.*

i) Bei Gefahr der Ausbildung störender Fettablagerungen im Bereich der öffentlichen Kanalisations- oder Abwasserreinigungsanlage oder der Ausbildung störender Schwimmschlammdecken in Klärbecken der öffentlichen Abwasserreinigungsanlage zufolge einer Einleitung gemäß § 1 Abs. 2 ist eine geringere Emissionsbegrenzung vorzuschreiben, jedoch nicht kleiner als 100 mg/l.

5.3 Wastewater emission limitations for dairies

(AEV Milchwirtschaft, BGBl. II Nr. 11/1999)

Anlage A

		I) Anforderungen an Einleitungen in ein Fließgewässer	II) Anforderungen an Einleitungen in eine öffentliche Kanalisation
A 1	**Allgemeine Parameter**		
1.	Temperatur	30 ºC	35 ºC
			a)
2.	Absetzbare	0,3ml/l	10 ml/l
	Stoffe		c)
	b)		
3.	pH-Wert	6,5-8,5	6,0-10,5
A 2	**Anorganische Parameter**		
4.	Gesamtchlor	mg/l	0,4 mg/l
	ber. als Cl2		
	d)		
5.	Ammonium	5,0mg/l	f)
	ber. als N	e)	
6.	Gesamter geb.	h)	-
	Stickstoff TNb		
	ber. als N		
	g)		
7.	Phosphor - Gesamt	2,0mg/l	-
	ber. als P		
A 3	**Organische Parameter**		
8.	Gesamter org. geb.	25mg/l	-
	Kohlenstoff TOC		
	ber. als C		
9.	Chemischer Sauer-stoffbedarf CSB	75mg/l	-
	ber. als O2		
10.	Biochemischer Sauer-	20mg/l	-
	stoffbedarf BSB5		
	ber. als O2		
11.	Adsorbierbare org.	0,1mg/l	1,0 mg/l
	geb. Halogene AOX		
	ber. als Cl		
12.	Direkt abscheidbare	10mg/l	100 mg/l
	lipophile Leichtstoffe		
	i)		

a) Im Einzelfall ist eine höhere Emissionsbegrenzung zulässig, sofern sichergestellt ist, daß es zu keiner Ausbildung von Dämpfen oder Vereisungen und zu keiner Gefahr der gesundheitlichen Belastung durch Dämpfe für das Betriebspersonal einer öffentlichen Kanalisation kommt.

b) Die Festlegung für den Parameter Absetzbare Stoffe erübrigt eine Festlegung für den Parameter Abfiltrierbare Stoffe.

c) Im Einzelfall ist eine höhere Emissionsbegrenzung zulässig, wenn sichergestellt ist, daß es zu keinen Ablagerungen auf Grund einer Einleitung gemäß § 1 Abs. 2 kommt, die den Betrieb der öffentlichen Kanalisation oder der öffentlichen Abwasserreinigungsanlage stören.

d) Die Festlegung für den Parameter Gesamtchlor erübrigt eine Festlegung für den Parameter Freies Chlor.

e) Gilt nur bei einer Abwassertemperatur größer 12 ºC im Ablauf der biologischen Stufe der Abwasserreinigungsanlage. Die Abwassertemperatur von 12 ºC gilt als unterschritten, wenn bei fünf über den Untersuchungszeitraum gleichmäßig verteilten Temperaturmessungen mehr als ein Meßwert nicht größer ist als 12 ºC.

f) Die Emissionsbegrenzung ist im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Bereich der öffentlichen Kanalisations- oder Abwasserreinigungsanlage festzulegen (ÖNORM B 2503, September 1992).

g) Summe von organisch gebundenem Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

h) Liegt der wasserrechtlichen Bewilligung der biologischen Stufe der Abwasserreinigungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB_5 zugrunde, so ist die der biologischen Stufe der Abwasserreinigungsanlage zufließende Fracht an TNb um mehr als 75% zu vermindern (Mindestwirkungsgrad). Der Mindestwirkungsgrad bezieht sich auf die der biologischen Stufe der Abwasserreinigungsanlage zufließende bzw. die aus der biologischen Stufe der Abwasserreinigungsanlage abfließende Fracht an TNb eines Tages.

i) Die Festlegung für den Parameter Direkt abscheidbare lipophile Leichtstoffe erübrigt eine Festlegung für den Parameter Schwerflüchtige lipophile Stoffe.

5.4 Wastewater emission limitations for the production of sugar

(Abwasseremissionen aus der Zucker- und Stärkeerzeugung, BGBl. Nr. 1073/1994)

Anlage A

Emissionsbegrenzungen gemäß § 1 Abs. 1 *1)

		Anforderungen an die Einleitung in ein Fließgewässer
A.1 Allgemeine Parameter		
1.	Temperatur	30 ºC
2.	Toxizität G_F	<2
	a)	
3.	Absetzbare Stoffe	0,3 ml/l
	b)	
4.	pH-Wert	6,5–8,5
A.2 Anorganische Parameter		
5.	Ammonium	5 mg/l
	ber. als N	c)
6.	Chlorid	durch G_F
	ber. als Cl	begrenzt
7.	Ges. geb. Stickstoff	e)
	ber. als N	
	d)	
8.	Gesamt-Phosphor	1 mg/l
	ber. als P	
A.3 Organische Parameter		
10.	Chem. Sauerstoffbedarf,	0,35 kg/t g)
	CSB	0,5 kg/t h)
	ber. als O_2	75 mg/l
	f), i)	
11.	Biochem. Sauerstoffbedarf,	0,04 kg/t
	BSB_5	20 mg/l
	ber. als O_2	
	f), j)	

a) Ökotoxikologischer Kennwert; im Rahmen der Fremdüberwachung gemäß § 4 Abs. 3 bei begründetem Verdacht oder konkretem Hinweis der fließgewässerschädigenden Wirkung einer Abwassereinleitung, nicht jedoch im Rahmen der Eigenüberwachung gemäß § 4 Abs. 2 einzusetzen.

b) Die Festlegung für den Parameter Absetzbare Stoffe erübrigt eine Festlegung für den Parameter Abfiltrierbare Stoffe.

c) Gilt nur bei einer Abwassertemperatur größer 12 ºC im Ablauf der biologischen Stufe der Abwasserbehandlungsanlage. Die Abwassertemperatur von 12 ºC gilt als unterschritten, wenn bei fünf über den Untersuchungszeitraum gleichmäßig verteilten Temperaturmessungen mehr als ein Meßwert unter dem Wert von 12 ºC liegt.

d) Summe von Org. geb. Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

e) Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 5 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad). Der Mindestwirkungsgrad bezieht sich auf die der Abwasserbehandlungsanlage zufließende bzw. die aus der Abwasserbehandlungsanlage abfließende Fracht an Ges. geb. Stickstoff.

f) Die Festlegungen für die Parameter Chemischer Sauerstoffbedarf und Biochemischer Sauerstoffbedarf erübrigen eine Festlegung für den Parameter Ges. org. geb. Kohlenstoff.

g) Bei Zuckergewinnung ohne Einsatz des Quentinverfahrens.

h) Bei Zuckergewinnung nach dem Quentinverfahren.

i) Die spez. CSB-Fracht bezieht sich auf die Tonne verarbeiteter Rüben. In der Kampagnezeit ist die Festlegung für die spez. Fracht einzuhalten; außerhalb der Kampagnezeit ist die Festlegung für die Konzentration einzuhalten.

j) Die spez. BSB tief 5-Fracht bezieht sich auf die Tonne verarbeiteter Rüben. In der Kampagnezeit ist die Festlegung für die spez. Fracht einzuhalten; außerhalb der Kampagnezeit ist die Festlegung für die Konzentration einzuhalten.

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*1) Bei einem Kampagnebetrieb gemäß § 1 Abs. 4 können für die Dauer der Einfahrphase der biologischen Stufe der Abwasserbehandlungsanlage zu Kampagnebeginn abweichende Regelungen gemäß § 33b Abs. 10 WRG getroffen werden.

5.5 Wastewater emission limitations for the production of starch

(Abwasseremissionen aus der Zucker- und Stärkeerzeugung, BGBl. Nr. 1073/1994)

Anlage B

Emissionsbegrenzungen gemäß § 1 Abs. 2 *1)

		Anforderungen an die Einleitung in ein Fließgewässer
B.1 Allgemeine Parameter		
1.	Temperatur	30 ºC
2.	Toxizität G_F	<2
	a)	
3.	Absetzbare Stoffe	0,3 ml/l
	b)	
4.	pH-Wert	6,5 - 8,5
B.2 Anorganische Parameter		
5.	Ammonium	5 mg/l
	ber. als N	c)
6.	Chlorid	durch G_F
	ber. als Cl	begrenzt
7.	Ges. geb. Stickstoff	e)
	ber. als N	
	d)	
8.	Gesamt-Phosphor	2 mg/l
	ber. als P	f)
B.3 Organische Parameter		
9.	Ges. org. geb.	35 mg/l
	Kohlenstoff, TOC	g)
	ber. als C	
10.	Chem. Sauerstoffbedarf,	100 mg/l
	CSB	h)
	ber. als O_2	
11.	Biochem. Sauerstoffbedarf,	20 mg/l
	BSB_5	25 mg/l i)
	ber. als O_2	
12.	Adsorb. org. geb.	0,03 kg/t k)
	Halogene, (AOX)	0,1 kg/t l)
	ber. als Cl	
	j)	

a) Ökotoxikologischer Kennwert; im Rahmen der Fremdüberwachung gemäß § 4 Abs. 3 bei begründetem Verdacht oder konkretem Hinweis der fließgewässerschädigenden Wirkung einer Abwassereinleitung, nicht jedoch im Rahmen der Eigenüberwachung gemäß § 4 Abs. 2 einzusetzen.

b) Die Festlegung für den Parameter Absetzbare Stoffe erübrigt eine Festlegung für den Parameter Abfiltrierbare Stoffe.

c) Gilt nur bei einer Abwassertemperatur größer 12 ºC im Ablauf der biologischen Stufe der Abwasserbehandlungsanlage. Die Abwassertemperatur von 12 ºC gilt als unterschritten, wenn bei fünf über den Untersuchungszeitraum gleichmäßig verteilten Temperaturmessungen mehr als ein Meßwert unter dem Wert von 12 ºC liegt.

d) Summe von Org. geb. Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

e) Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 5 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad). Der Mindestwirkungsgrad bezieht sich auf die der Abwasserbehandlungsanlage zufließende bzw. die aus der Abwasserbehandlungsanlage abfließende Fracht an Ges. geb. Stickstoff.

f) Bei Abwasser gemäß § 1 Abs. 5 Z 1 aus der Verarbeitung von Mais ist eine Ablaufkonzentration entsprechend einem Mindestwirkungsgrad der Gesamt-Phosphor-Entfernung von nicht weniger als 85% zulässig. Der Mindestwirkungsgrad für den Parameter Gesamt-Phosphor bezieht sich auf die der Abwasserbehandlungsanlage zufließende bzw. die aus der Abwasserbehandlungsanlage abfließende Gesamt-Phosphor-Fracht.

g) Bei TOC-Zulaufkonzentrationen der Tagesmischproben über 350 mg/l (gemessen als arithmetisches Monatsmittel im Zulauf zur biologischen Stufe der Abwasserbehandlungsanlage) ist eine Ablaufkonzentration entsprechend einer TOC-Mindestabbauleistung von 90% zulässig. Die Abbauleistung bezieht sich auf das Verhältnis der TOC-Tagesfrachten im Zulauf bzw. Ablauf der Abwasserbehandlungsanlage. Als TOC-Tagesfracht im Zulauf ist die der wasserrechtlichen Bewilligung zugrundeliegende Belastung der Abwasserbehandlungsanlage maßgebend.

h) Bei CSB-Zulaufkonzentrationen der Tagesmischproben über 1000 mg/l (gemessen als arithmetisches Monatsmittel im Zulauf zur biologischen Stufe der Abwasserbehandlungsanlage) ist eine Ablaufkonzentration entsprechend einer CSB-Mindestabbauleistung von 90% zulässig. Die Abbauleistung bezieht sich auf das Verhältnis der CSB-Tagesfrachten im Zulauf bzw. Ablauf der Abwasserbehandlungsanlage. Als CSB-Tagesfracht im Zulauf ist die der wasserrechtlichen Bewilligung zugrundeliegende Belastung der Abwasserbehandlungsanlage maßgebend.

i) Bei Abwasser gemäß § 1 Abs. 5 Z 1 aus der Verarbeitung von Mais; bei BSB tief 5-Zulaufkonzentrationen der Tagesmischproben über 850 mg/l (gemessen als arithmetisches Monatsmittel im Zulauf zur biologischen Stufe der Abwasserbehandlungsanlage) ist eine Ablaufkonzentration entsprechend einer BSB tief 5-Mindestabbauleistung von nicht weniger als 97%, maximal aber 40 mg/l, zulässig. Die Abbauleistung bezieht sich auf das Verhältnis der BSB tief 5-Tagesfrachten im Zulauf bzw. Ablauf der Abwasserbehandlungsanlage. Als BSB tief 5-Tagesfracht im Zulauf ist die der wasserrechtlichen Bewilligung zugrundeliegende Belastung der Abwasserbehandlungsanlage maßgebend.

j) Vorschreibung nur erforderlich bei Abwasser aus der Stärkederivatisierung unter Einsatz chlorhaltiger oder chlorabspaltender Chemikalien. Bei Betrieben bzw. Anlagen mit Tätigkeiten gemäß § 1 Abs. 5 Z 1 oder 2 und Z 3 ist die Anforderung im Abwasserteilstrom aus der Stärkederivatisierung einzuhalten.

k) Bezogen auf die Tonne Kartoffelstärkederivat.

l) Bezogen auf die Tonne Maisstärkederivat.

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*1) Bei einem Kampagnebetrieb gemäß § 1 Abs. 5 zu Kampagnebeginn oder nach Betriebsstillständen, die länger als zwei Wochen angedauert haben, können für die Dauer der Einfahrphase der biologischen Stufe der Abwasserbehandlungsanlage abweichende Regelungen gemäß § 33b Abs. 10 WRG getroffen werden.

5.6 Wastewater emission limitations for the production of soft drinks

(Abwasseremissionen aus der Herstellung von Erfrischungsgetränken, BGBl.Nr. 1077/1994)

Anlage A

Emissionsbegrenzungen gemäß § 1

		I.	II.
		Anforderungen an Einleitungen in ein Fließgewässer	Anforderungen an Einleitungen in eine öffentliche Kanalisation
A.1 Allgemeine Parameter			
1.	Temperatur	30 °C	35 °C
2.	Toxizität G_F a)	<2	keine Beeinträchtigungen der biologischen Abbauvorgänge
3.	Absetzbare Stoffe b)	ba)	10 ml/l c)
4.	Abfiltrierbare Stoffe b)	ba)	750 mg/l c)
5.	pH-Wert	6,5 - 8,5	6,5 - 9,5
A.2 Anorganische Parameter			
6.	Eisen	2 mg/l	durch absetzbare und abfiltrierbare Stoffe begrenzt
7.	Kupfer ber. als Cu	0,5 mg/l	0,5 mg/l
8.	Gesamtchlor ber. als Cl_2	e)	0,3 mg/l
9.	Ammonium ber. als N	5 mg/l f)	g)
10.	Chlorid ber. als Cl	Durch G_F begrenzt	-
11.	Ges. geb. Stickstoff ber. als N h)	i)	-
12.	Gesamt-Phosphor ber. als P	1 mg/l	-
13.	Sulfid ber. als S d)	0,1 mg/l	1,0 mg/l
A.3 Organische Parameter			
14.	Gesamter org. geb. Kohlenstoff TOC ber. als C j)	30 mg/l	-
15.	Chem. Sauerstoffbedarf, CSB ber. als O_2 j)	90 mg/l	-
16.	Biochem. Sauerstoffbedarf, BSB_5 ber. als O_2	20 mg/l	-

17.	Adsorb. org. geb. Halogene, (AOX) ber. als Cl	0,5 mg/l	1,0 mg/l
18.	Summe anion. und nichtion. Tenside	1,0 mg/l	keine nachteilige Beeinflussung des Kanal- und Klärbetriebes

a) *Im Rahmen der Fremdüberwachung gemäß § 4 Abs. 3 bei begründetem Verdacht oder konkretem Hinweis der fließgewässerschädigenden Wirkung einer Abwassereinleitung, nicht jedoch im Rahmen der Eigenüberwachung gemäß § 4 Abs. 2 einzusetzen.*

b) *Für die Überwachung der Abwasserbeschaffenheit kann entweder der Parameter Absetzbare Stoffe oder der Parameter Abfiltrierbare Stoffe eingesetzt werden.*

ba) *Die Festlegung für die Parameter TOC, CSB und BSB_5 erübrigt Festlegungen für die Parameter Absetzbare Stoffe und Abfiltrierbare Stoffe.*

c) *Im Einzelfall ist ein höherer Emissionswert zulässig, sofern sichergestellt ist, daß es zu keinen Ablagerungen auf Grund einer Einleitung gemäß § 1 Abs. 2 kommt, die den Betrieb der öffentlichen Kanalisation oder der Abwasserbehandlungsanlage stören.*

d) *Vorschreibung nur bei Abwasser gemäß § 1 Abs. 2 Z 1 erforderlich.*

e) *Gesamtchlor darf bei einer Einleitung gemäß § 1 Abs. 1 nicht nachweisbar sein.*

f) *Gilt nur bei einer Abwassertemperatur größer 12 Grad C im Ablauf der biologischen Stufe der Abwasserbehandlungsanlage. Die Abwassertemperatur von 12 Grad C gilt als unterschritten, wenn bei fünf über den Untersuchungszeitraum gleichmäßig verteilten Temperaturmessungen mehr als ein Meßwert unter dem Wert von 12 Grad C liegt.*

g) *Im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- und Kläranlagenbereich (ÖNORM B 2503, September 1992) festlegen.*

h) *Summe von organisch gebundenem Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.*

i) *Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 5 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad).*

j) *Für die Überwachung der Abwasserbeschaffenheit kann entweder der Parameter TOC oder der Parameter CSB eingesetzt werden.*

5.7 Wastewater emission limitations for breweries and malting houses

(Abwasseremissionen aus Brauereien und Mälzereien, BGBl 1994/1074)

Anlage A

Emissionsbegrenzungen gemäß § 1

		I.	II.
		Anforderungen an Einleitungen in ein Fließgewässer	Anforderungen an Einleitungen in eine öffentliche Kanalisation
A.1 Allgemeine Parameter			
1.	Temperatur	30 °C	35 °C
2.	Absetzbare Stoffe a)	aa)	20 ml/l b)
3.	Abfiltrierbare Stoffe a)	aa)	1000 mg/ b)
4.	pH-Wert	6,5 - 8,5	6,5–9,5
A.2 Anorganische Parameter			
5.	Kupfer ber. als Cu c)	0,5 mg/l	0,5 mg/l
6.	Zink ber. als Zn c)	2,0 mg/l	2,0 mg/l
7.	Gesamtchlor ber. als Cl_2	d)	0,3 mg/l
8.	Ammonium ber. als N	5 mg/l e)	f)
9.	Ges. geb. Stickstoff ber. als N g)	h)	-
10.	Gesamt-Phosphor ber. als P	2 mg/l	-
Organische Parameter			
11.	Ges. org. geb. Kohlenstoff, TOC ber. als C i)	30 mg/l	-
12.	Chem. Sauerstoffbedarf, CSB ber. als O_2 i)	90 mg/l	-
13.	Biochem. Sauerstoffbedarf, BSB_5 ber. als O_2	20 mg/l	-
14.	Adsorb. org. geb. Halogene, (AOX) ber. als Cl	0,5 mg/l	1,0 mg/l

a) Für die Überwachung der Abwasserbeschaffenheit kann entweder der Parameter Absetzbare Stoffe oder der Parameter Abfiltrierbare Stoffe eingesetzt werden.

aa) Die Festlegung für die Parameter TOC, CSB und BSB_5 erübrigt Festlegungen für die Parameter Absetzbare Stoffe und Abfiltrierbare Stoffe.

b) Im Einzelfall ist ein höherer Emissionswert zulässig, sofern sichergestellt ist, daß es zu keinen Ablagerungen infolge einer Einleitung gemäß § 1 Abs. 2 kommt, die den Betrieb der öffentlichen Kanalisation oder der Abwasserbehandlungsanlage stören.

c) Vorschreibung bei Abwasser gemäß § 1 Abs. 2 Z 1 nicht erforderlich.

d) Gesamtchlor darf bei einer Einleitung gemäß § 1 Abs. 1 nicht nachweisbar sein.

e) Gilt nur bei einer Abwassertemperatur größer 12 Grad C im Ablauf der biologischen Stufe der Abwasserbehandlungsanlage. Die Abwassertemperatur von 12 Grad C gilt als unterschritten, wenn bei fünf gleichmäßig über den Probenahmezeitraum verteilten Temperaturmessungen mehr als ein Meßwert unter dem Wert von 12 Grad C liegt.

f) Im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- und Kläranlagenbereich (ÖNORM B 2503, September 1992) festlegen.

g) Summe von organisch gebundenem Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

h) Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 5 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad).i) Für die Überwachung der Abwasserbeschaffenheit kann entweder der Parameter TOC oder der Parameter CSB eingesetzt werden.

5.8 Wastewater emission limitations for the production of yeast, bio-ethanol and citric acid

(Abwasseremissionen aus der Hefe-, Spiritus- u. Zitronensäureerzeugung, BGBl. Nr. 1080/1994)

	I. Anforderungen an Einleitungen in ein Fließgewässer	II. Anforderungen an Einleitungen in eine öffentliche Kanalisation
A.1 Allgemeine Parameter		
1. Temperatur G_F	30 ºC	35 ºC
2. Toxizität a)	<2	keine Beeinträchtigungen der biologischen Abbauvorgänge
3. Absetzbare Stoffe	0,3 ml/l	10 ml/l
b)		c)
4. pH-Wert	6,5–8,5	6,5–9,5
A.2 Anorganische Parameter		
5. Kupfer	0,5 mg/l	0,5 mg/l
ber. als Cu		
d)		
6. Zink	2,0 mg/l	2,0 mg/l
ber. als Zn		
d)		
7. Freies Chlor	e)	0,2 mg/l
ber. als Cl_2		
8. Gesamtchlor	0,4 mg/l	0,4 mg/l
ber. als Cl_2		
9. Ammonium	5,0 mg/l	g)
ber. als N	f)	
10. Chlorid	durch G_F begrenzt	-
ber. als Cl		
11. Cyanid-Gesamt	1,5 mg/l	1,5 mg/l
ber. als CN		
d)		
12. Ges. geb. Stickstoff	i)	-
ber. als N		
h)		
13. Nitrit	2,0 mg/l	10 mg/l
ber. als N		
14. Gesamt-Phosphor	1 mg/l	-
ber. als P	j)	
15. Sulfat	-	k)
ber. als SO_4		
16. Sulfid	0,1 mg/l	1,0 mg/l
ber. als S		
17. Sulfit	1,0 mg/l	20 mg/l
ber. als SO tief 3		
l)		
A.3 Organische Parameter		
18. Chem. Sauerstoffbedarf,	110 mg/l	-
CSB	n)	
ber. als O_2		
m)		

19. Biochem. Sauerstoffbedarf,	25 mg/l	-
BSB_5		
ber. als O_2		
20. Adsorb. org. geb. Halogene, (AOX)	0,5 mg/l	0,5 mg/l
ber. als Cl		

a) Ökotoxikologischer Kennwert; im Rahmen der Fremdüberwachung gemäß § 4 Abs. 3 bei begründetem Verdacht oder konkretem Hinweis der fließgewässerschädigenden Wirkung einer Abwassereinleitung, nicht jedoch im Rahmen der Eigenüberwachung gemäß § 4 Abs. 2 einzusetzen.

b) Die Festlegung für den Parameter Absetzbare Stoffe erübrigt eine Festlegung für den Parameter Abfiltrierbare Stoffe.

c) Im Einzelfall ist ein höherer Emissionswert zulässig, sofern sichergestellt ist, daß es zu keinen Ablagerungen auf Grund einer Einleitung gemäß § 1 Abs. 2 kommt, die den Betrieb der öffentlichen Kanalisation oder der Abwasserbehandlungsanlage stören.

d) Vorschreibung nur bei Abwasser gemäß § 1 Abs. 2 Z 2 erforderlich.

e) Im Abwasser darf kein Freies Chlor bestimmbar sein.

f) Gilt nur bei einer Temperatur über 12 ºC im Ablauf der biologischen Stufe der Abwasserreinigungsanlage. Die Temperatur von 12 ºC gilt als unterschritten, wenn bei fünf gleichmäßig über den Untersuchungszeitraum verteilten Temperaturmessungen mehr als ein Meßwert unter dem Wert von 12 ºC liegt.

g) Im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- und Kläranlagenbereich (ÖNORM B 2503, September 1992) festlegen.

h) Summe von Org. geb. Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.

i) Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 5 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad).

j) Bei Abwasser gemäß § 1 Abs. 2 Z 2 kann derzeit kein Emissionswert festgelegt werden.

k) Der Emissionswert ist im Einzelfall bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- oder Kläranlagenbereich unter Berücksichtigung der Verdünnungsverhältnisse im Kanal entsprechend ÖNORM B 2503 September 1992 festzulegen.

l) Vorschreibung nur bei Abwasser gemäß § 1 Abs. 2 Z 1 aus der Herstellung von Spiritus aus Wein erforderlich.

m) Die Festlegung für den Parameter Chemischer Sauerstoffbedarf erübrigt eine Festlegung für den Parameter Gesamter organisch gebundener Kohlenstoff.

n) Für Abwasser gemäß § 1 Abs. 2 Z 2 34 kg/t. Der Emissionswert bezieht sich auf die in einer Anlage gemäß § 1 Abs. 2 Z 2 verarbeitete Menge an Zucker.

5.9 Wastewater emission limitations for the production of animal and plant oils and fats

(Abwasseremissionen aus der Erzeugung pflanzlicher od. tierischer Öle, BGBl. Nr. 1079/1994)

Emissionsbegrenzungen gemäß § 1

A.1 Allgemeine Parameter

		I. Anforderungen an Einleitungen in ein Fließgewässer	II. Anforderungen an Einleitungen in eine öffentliche Kanalisation
1.	Temperatur	30 ºC	35 ºC
2.	Toxizität G_F	<2	keine Beeinträchtigungen der biologischen Abbauvorgänge
	a)		
3.	Absetzb. Stoffe	0,3 ml/l	10 ml/l
	b)		
4.	pH-Wert	6,5–8,5	6,5–10

A.2 Anorganische Parameter

5.	**Chrom-gesamt**	**0,5 mg/l**	**0,5 mg/l**
	ber. als Cr		
6.	Nickel	0,5 mg/l	0,5 mg/l
	ber. als Ni	c)	c)
7.	Quecksilber	0,005 mg/l	0,005 mg/l
	ber. als Hg		
8.	Freies Chlor	d)	0,2 mg/l
	ber. als Cl_2		
9.	Gesamtchlor	0,4 mg/l	0,4 mg/l
	ber. als Cl_2		
10.	Ammonium	5 mg/l	f)
	ber. als N	e)	
11.	Ges. geb. Stickstoff	h)	-
	ber. als N		
	g)		
12.	Gesamt-Phosphor	2 mg/l	-
	ber. als P		
13.	Sulfat	-	i)
	ber. als SO_4		
14.	Sulfid	0,1 mg/l	2,0 mg/l
	ber. als S		

A.3 Organische Parameter

15.	**Ges. org. geb.**	**50 mg/l**	**-**
	Kohlenstoff, TOC	j)	
	ber. als C		
16.	Chem.	150 mg/l	-
	Sauerstoffbedarf,		
	CSB	k)	
	ber. als O_2		
17.	Biochem.	25 mg/l	-
	Sauerstoffbedarf,		
	BSB_5		
	ber. als O_2		
18.	Adsorb. org. geb.	0,5 mg/l	0,5 mg/l
	Halogene, (AOX)		
	ber. als Cl		
19.	Schwerflüchtige	20 mg/l	100 mg/l
	lipophile Stoffe		l)
20.	Summe der	10 mg/l	20 mg/l
	Kohlenwasserstoffe		

a) *Im Rahmen der Fremdüberwachung gemäß § 4 Abs. 3 bei begründetem Verdacht oder konkretem Hinweis der fließgewässerschädigenden Wirkung einer Abwassereinleitung, nicht jedoch im Rahmen der Eigenüberwachung gemäß § 4 Abs. 2 einzusetzen*

b) *Die Festlegung für den Parameter Absetzbare Stoffe erübrigt eine Festlegung für den Parameter Abfiltrierbare Stoffe.*

c) *Bei katalytischer Fetthärtung im Abwasserteilstrom aus der Fetthärtung 2 mg/l. Erfolgt die katalytische Fetthärtung zeitlich begrenzt, so ist der Emissionswert 2,0 mg/l im Zeitraum der Fetthärtung einzuhalten (temporärer Teilstrom).*

d) *Im Abwasser darf kein Freies Chlor bestimmbar sein.*

e) *Gilt bei einer Abwassertemperatur größer 12 ºC im Ablauf der biologischen Stufe der Abwasserbehandlungsanlage. Die Abwassertemperatur von 12 ºC gilt als unterschritten, wenn bei fünf Temperaturmessungen im Laufe eines Tages mehr als ein Meßwert unter dem Wert von 12 ºC liegt.*

f) *Der Emissionswert ist im Einzelfall bei Gefahr von Geruchsbelästigungen oder bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- und Kläranlagenbereich (ÖNORM B 2503, September 1992) festzulegen.*

g) *Summe von Org. geb. Stickstoff, Ammonium-Stickstoff, Nitrit-Stickstoff und Nitrat-Stickstoff.*

h) *Liegt der wasserrechtlichen Bewilligung der Abwasserbehandlungsanlage eine Tagesrohzulauffracht von mehr als 150 kg BSB tief 3 zugrunde, so ist die der Abwasserbehandlungsanlage zufließende Fracht an Ges. geb. Stickstoff um mehr als 75% zu vermindern (Mindestwirkungsgrad).*

i) *Der Emissionswert ist im Einzelfall bei Korrosionsgefahr für zementgebundene Werkstoffe im Kanalisations- und Kläranlagenbereich unter Berücksichtigung der Verdünnungsverhältnisse im Kanal entsprechend ÖNORM B 2503 September 1992 festzulegen.*

j) Bei einer TOC-Zulaufkonzentration der Tagesmischprobe über 330 mg/l (gemessen als arithmetisches Monatsmittel im Zulauf zur biologischen Stufe der Abwasserbehandlungsanlage) ist eine Ablaufkonzentration entsprechend einer TOC-Mindestabbauleistung von 85% zulässig. Die Abbauleistung bezieht sich auf das Verhältnis der TOC-Tagesfrachten im Zulauf bzw. Ablauf der Abwasserbehandlungsanlage. Als TOC-Tagesfracht im Zulauf ist die der wasserrechtlichen Bewilligung zugrundeliegende Belastung der Abwasserbehandlungsanlage maßgebend.

k) Bei einer CSB-Zulaufkonzentration der Tagesmischprobe über 1000 mg/l (gemessen als arithmetisches Monatsmittel im Zulauf zur biologischen Stufe der Abwasserbehandlungsanlage) ist eine Ablaufkonzentration entsprechend einer CSB-Mindestabbauleistung von 85% zulässig. Die Abbauleistung bezieht sich auf das Verhältnis der CSB-Tagesfrachten im Zulauf bzw. Ablauf der Abwasserbehandlungsanlage. Als CSB-Tagesfracht im Zulauf ist die der wasserrechtlichen Bewilligung zugrundeliegende Belastung der Abwasserbehandlungsanlage maßgebend.

l) Im Einzelfall ist ein höherer Emissionswert zulässig, sofern sichergestellt ist, daß es in der öffentlichen Kanalisations- und Abwasserbehandlungsanlage zu keinen störenden Fettablagerungen sowie in der Abwasserbehandlungsanlage zu keiner Ausbildung von störenden Schwimmschlammdecken in Klärbecken zufolge einer Einleitung gemäß § 1 Abs. 2 kommt.

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The report describes processes and techniques applied in installations of the Austrian Food Industry. Consumption and emission figures are presented for selected processes and for industrial installations as a whole. The focus lays on those techniques and processes which are relevant from an environmental point of view – either because of the consumption of energy or raw materials or because of emissions of pollutants (in particular, TOC/COD, TN, TP and BOD).
Based on the assessment of the techniques applied and the associated consumption and emission figures, best available techniques for certain processes are described. The data presented has been coordinated with the operators of the installations, the Austrian Chamber of Commerce, the Food Industries Association of Austria and the Austrian Dairy Association as well as with the competent authorities.

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