When meat industry discharges wastewater to municipal sewers – What should you know?

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BEST
Better Efficiency for Industrial Sewage Treatment

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

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Basic facts

Main process steps and intermediate products generating wastewaters

- Wastewater generated by slaughterhouses and meat processing plants results from the cleaning of cattle sheds and transport vehicles, as well as from the different stages of slaughtering.
- Water consumption at slaughterhouses is high because nearly all stages of meat processing produce wastewater. Water demand at slaughterhouses per slaughtered animal is around 2–18 l/kg.

Wastewater from meat industry

Content and quality of the wastewater

- The problems caused by meat processing wastewater concern the high temperature of wastewater, lack of oxygen in wastewater, organic matter ending up in wastewater, high fat and protein contents in wastewater, nitrogen in a form of ammonia and odour problems.
- Fats, protein and blood contents in wastewater increase the BOD and COD values of wastewater. Especially fat loading can be seen in the COD values of meat processing wastewater. Fats and sulphide included in the wastewater produce odour causing sulphur compounds and fatty acids. The generation of hydrogen sulphide increases when warm and oxygen-free wastewater flows into an anaerobic space. Sulphur compounds can still generate sulphuric acid which is corrosive to concrete sewers.
- Factors which affect the composition of wastewater include the species of the slaughtered animals, amounts of slaughtered animals, cleaning agents, disinfectants and water consumption.

Pre-treatment and monitoring the wastewater

Wastewater from meat industry requires usually pre-treatment prior to conveying it to the sewer.
The slaughterhouse wastewater should be monitored for BOD7 or BOD5, CODCr, total nitrogen, total phosphorus, solids, pH value, electrical conductivity and fat concentration. When making the industrial wastewater contract, limit values for these parameters should be set. If necessary, the temperature of wastewater should be measured. High temperature makes fat liquid and when temperature decreases fat may block sewer pipes or cause damage to wastewater treatment plant.

A screen with a 6 mm mesh should be used to prevent solids from entering the sewer (EC Regulation 1774/2002 on Animal By-Products). The aim should be to prevent blood and fat from ending up in wastewater as efficiently as possible. Chemicals, e.g. ferric nitrate or lye, which improve the oxygen level, can be used to combat odour emissions. The applied pre-treatment can be, among others, fat separation, solids separation, chemical precipitation, pH adjustment and reducing of organic loading (biological processes).

Examples of pre-treatment methods

Fat and grease removal

Pretreatment is generally needed when industrial wastewater contain oils, fat or grease. Both animal-origin and plant origin fats block sewers and have high BOD concentrations. Fats need to be separated in grease traps, which need regular maintenance and overflow alarms.

Flotation

Even the light particles, which would normally settle down slowly or not at all (e.g. fibers from pulp and paper processing or grease from food processing), can be separated by flotation. In this process, liquid-solid separation is induced by dissolving pressurized gas into the treatment unit. The gas is released as micro-bubbles that rise to the surface, capturing the solids on the way. The sludge bed formed on the surface of the tank is withdrawn by scrapers or overflow, and must be subsequently processed. Chemical coagulant and/or flocculant are usually required to accumulate particles into separable flocs.

Neutralizing

Chemical treatment can be applied for neutralization, to improve solids removal. Chemical precipitation by coagulation and flocculation can be used also for removing phosphorus. Inorganic coagulants (typically ferric sulphate or polyaluminium chloride) and/or polymer are needed.

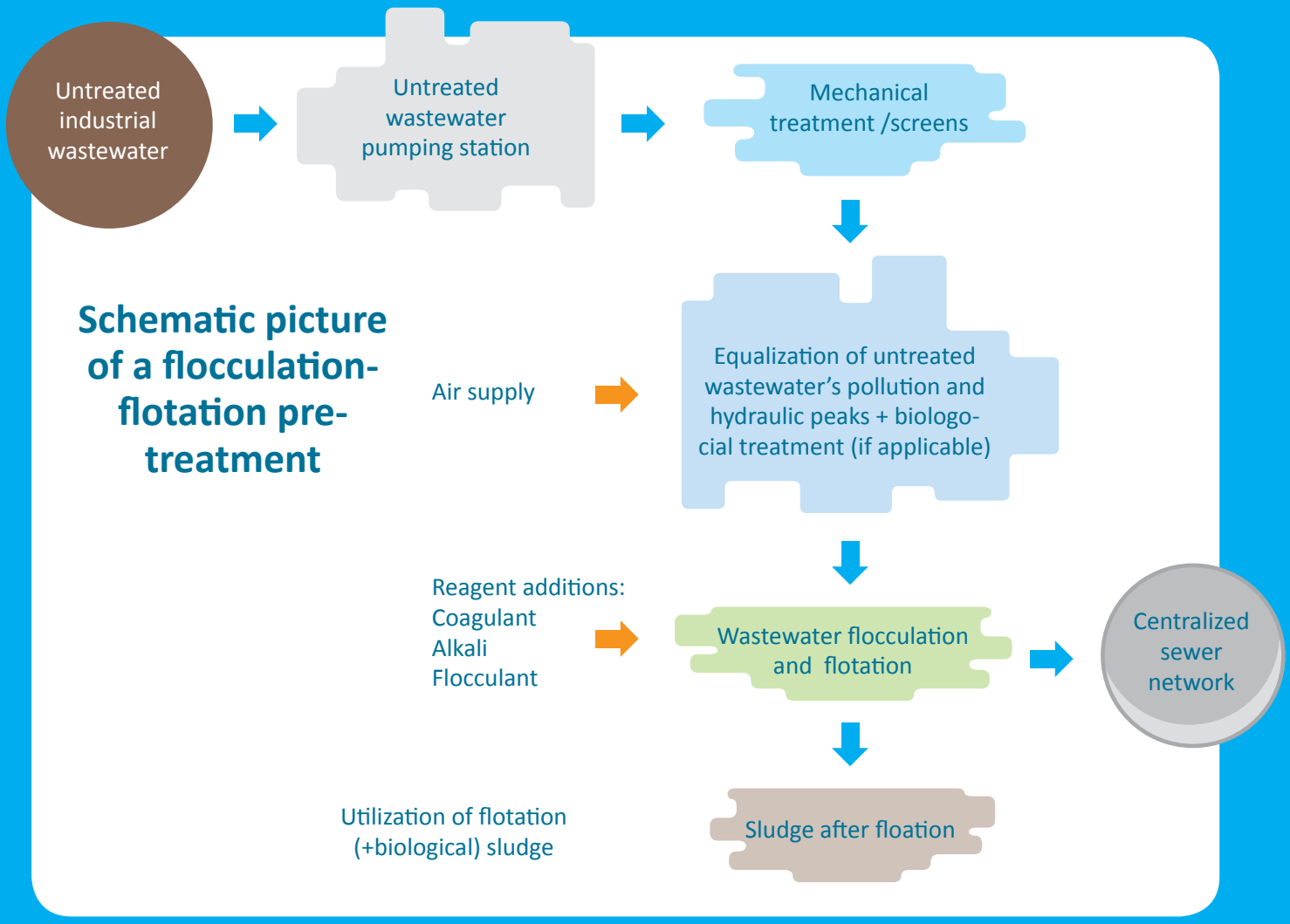
Biological treatment

In addition to physical and chemical processes described above, biological processes may also be needed as pretreatment. Biological treatment is generally applied to reduce BOD loading to the WWTP, but it can also be designed to remove nitrogen. Biological pretreatment is suitable for industrial wastewaters with high concentrations of BOD and nitrogen.

Industrial wastewaters with high BOD concentration can also be pretreated with anaerobic processes. Anaerobic processes tend to have a lower energy demand and smaller sludge production compared to aerated processes.

Balancing tank

The role of the balancing tank is to act as a buffer against the fluctuations in the wastewater volume or concentrations. In order to keep the volume and concentration even, the wastewater from an industrial plant is directed to a balancing tank before discharge to sewer.



In a nutshell: What should be taken into account when conveying wastewater from meat industry to municipal sewer

- Capacity of the municipal wastewater treatment plant where the water is discharged
- Temperature and pH of the discharged wastewater
- Organic load of the discharged wastewater
- Fat and grease removal
- 'Content of suspended solids in the discharged wastewater
- Possible problems caused by hydrogen sulfide and odour
- Corrosion risks caused to sewer network

Sources

Finnish Water Utilities Association, 2018. Finnish Industrial Wastewater Guide, Conveying non-domestic waste-water to sewers. Publication series no. 69 of the Finnish Water Utilities Association. Helsinki, 2018.

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This leaflet was produced by project BEST – Better Efficiency for Industrial Sewage Treatment funded by the European Regional Development Fund, Interreg Baltic Sea Region Programme.

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