

Biological Waste Water Treatment

Emscher-Klärwerk

Bottrop

Central Waste Water Treatment Plant



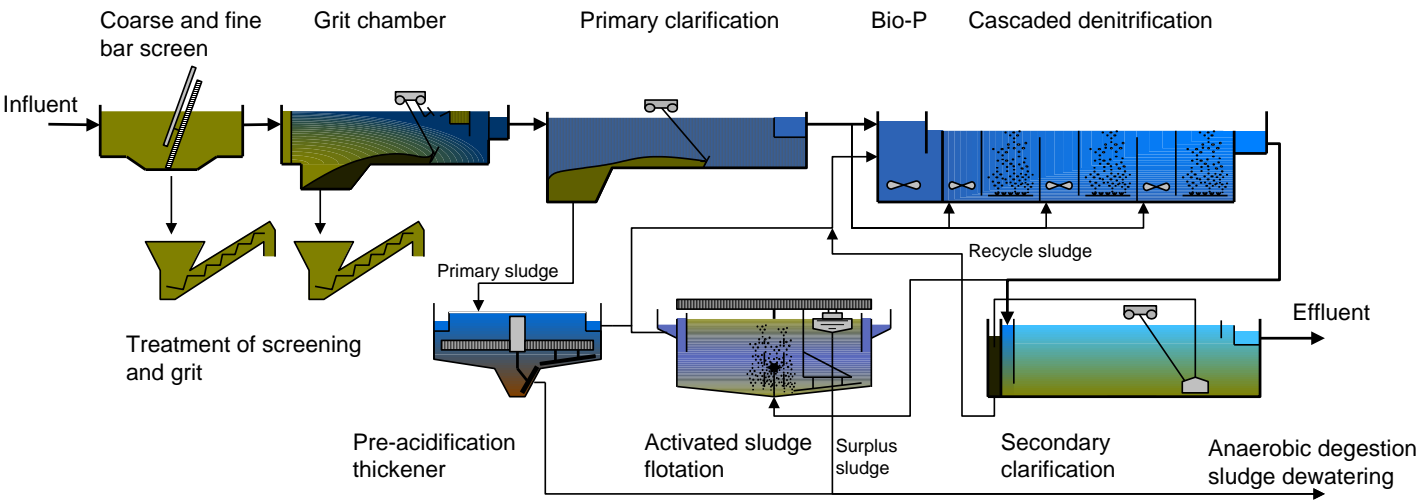
The central sewage treatment works of Emschergenossenschaft in Bottrop, Germany treats municipal and industrial waste water from a catchment area of 240 km² by mechanical, physio-chemical and biological methods. The plant is designed for a capacity of 1.34 million population equivalents.

The design of the individual process stages reflects the latest state of the art. The cascaded denitrification process employed offers the dual advantages of minimum floor area requirements and low treated effluent nitrate levels.



Bamag is an international EPC contractor for water and wastewater treatment plants as well as thermal processes. We design, supply and operate your plant. We are...

... the experts



Compliance with the regulatory discharge standards relieves the Rhine river from a major pollutant burden.

1. Objective

Combined treatment of municipal and industrial waste water

- Design data

Throughput	308,000 m ³ /d
Max. stormwater rate	30,600 m ³ /h
BOD ₅ load	66,000 kg/d
COD load	148,000 kg/d
TKN	14,600 kg/d
Total P	3,100 kg/d

- Treatment criteria

BOD ₅	≤ 15 mg/l
COD	≤ 75 mg/l
NH ₄ -N	≤ 10 mg/l
Total P	≤ 1 mg/l

2. Plant concept

- Process steps

Mechanical pre-treatment, cascaded denitrification, secondary clarification, activated sludge flotation, pre-acidification thickener, sludge digestion, sludge dewatering, sludge drying and incineration.

- Brief description

The incoming waste water is distributed over six parallel bar screen lines which are followed by the same number of aerated grit chambers with integrated grease traps for grit and grease removal.

Suspended solids are settled in six primary clarifiers and continuously discharged from the system. In the three downstream pre-acidification thickeners, the organic sludge constituents are broken down into organic acids. The thickener supernatant with the dissolved organic acids is routed to the aeration stage where it enhances biological phosphorus elimination.

Further reduction of biodegradable organic pollutants including nitrogen and phosphorus compounds takes place in aeration tanks composed of cascaded anaerobic, denitrification and nitrification zones.

In the cross-flow secondary clarifiers, the waste activated sludge generated is settled and drawn off with the aid of suction scrapers.

A special feature of the plant is that the waste activated sludge is directly drawn off from the aeration tank and concentrated in an activated sludge flotation unit. This yields a sludge with a significantly higher dry solids content compared to conventional plants.

The waste activated sludge from biological treatment and the pre-acidified sludge from the mechanical primary clarifier are directed to the downstream digester. The digested sludge is dried and burned.

3. Characteristic plant data

- 3 coarse bar screens	
Channel width	1.8 m
Bar spacing	50 mm
- 6 fine screens	
Channel width	1.8 m
Bar spacing	15 mm
- 6 grit chambers	
Total volume	3,170 m ³
- 6 primary clarifiers	
Total volume	16,320 m ³
Clarification area	800 m ² /tank
- 3 aeration tanks	
Total volume	253,425 m ³
Anaerobic zones	36,075 m ³
Denitrification zones	82,215 m ³

Nitrification zones	135,135 m ³
Depth of water	10 m
Fine-bubble diffused aeration	

- Compressor station

Number of compressors	6 + 2
Motor rating per unit	1,200 kW

- 18 dual-compartment secondary clarifiers, rectangular, cross-flow type

Clarification area	17,856 m ²
--------------------	-----------------------

- Activated sludge flotation

Waste activated sludge	60,000 kg/d
Influent DS content	3.5 kg DS/m ³
Total clarification area	576 m ²
Solids concentration of float	> 6 % (without flocculant addition)

- Sludge treatment

3 pre-acidification thickeners	Ø 29 m
Digestion	
Sludge drying and incineration	

4. Operating experience

The plant has been in operation achieving excellent treated effluent qualities. Residual effluent NH₄-N concentrations are consistently below 1 mg/l. Phosphorus reduction to the prescribed discharge limit of 0.6 mg/l P_{tot.} is already achieved by biological P elimination.