

Case study



RA-2 WWTP - NITROGEN REMOVAL



Highlights

General information

The municipal waste water plant RA-2 is located in Strømmen, and is one of the largest wastewater treatment plants in Norway. In 2003 the Kaldnes™ MBBR biofilm process was implemented to remove nitrogen from the wastewater.

Operational Since: 2003

Challenge

The plant had to be designed to fit into a limited underground cavern system.

Solution

Utilize the Kaldnes™ MBBR biofilm process was a cost-effective, compact solution for this unique application.

Effluent requirements

TN: >70% removal
Total P: 90% removal
Max 0.25 mg/l on average
Never more than 0.5 mg/l

Challenge

The rock blasting of the 3 caverns was completed prior to deciding the layout of the biological treatment process, resulting in challenges regarding space availability, water levels and reactor configuration. Because only two caverns were to be used, the third being a reserve, the system had to be designed in a compact way but still handle a flow of 2 m³ /s.

Concepts

Design of the aeration system, mixers and outlet sieves needed special consideration because of the circular tank shapes and fibre glass reinforced plastic (GRP) materials that were used in the plant.

Mixing of biomedium in tanks with water depth more than 8 m and volumes above 1000 m³ was solved by using stainless steel, medium speed mixers positioned close to the surface facing down.

Due to health and safety considerations, the external carbon source is stored in tanks in open-air environment resulting in long transport distances for these liquids.

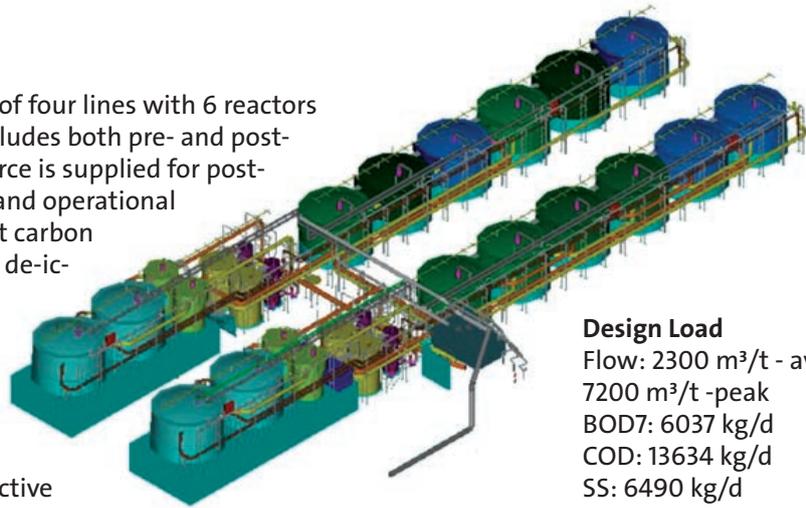


Bioreactors

Design

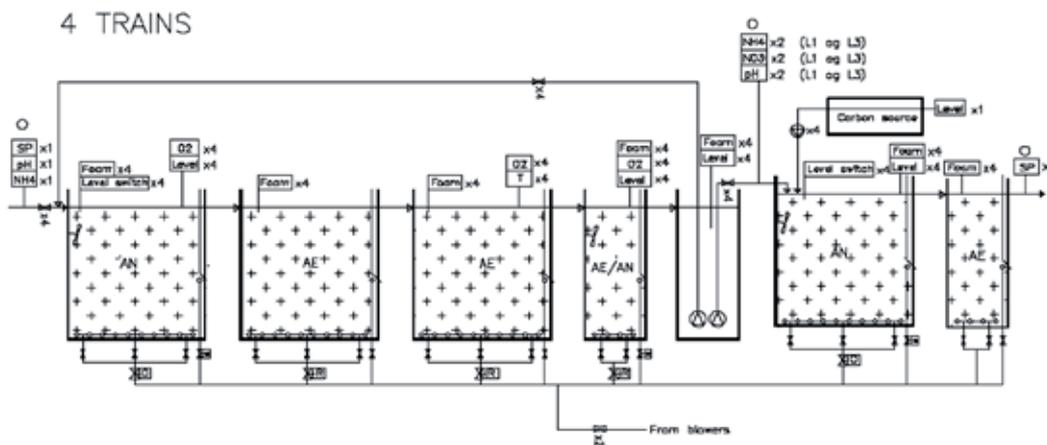
The biological treatment step consists of four lines with 6 reactors each. The nitrogen removal process includes both pre- and post-denitrification. An external carbon source is supplied for post-denitrification. To provide economical and operational flexibility the plant can accept different carbon sources, even spent glycol from airport de-icing activity.

To make orientation easier within this great treatment plant, the reactors are painted in different colours. Blue are anoxic, green are aerobic and so on, making the plant look very attractive as well as being practical.



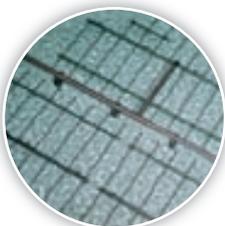
Design Load

Flow: 2300 m³/t - average
 7200 m³/t - peak
 BOD7: 6037 kg/d
 COD: 13634 kg/d
 SS: 6490 kg/d
 Design Temperature: 7 °C



Results

The BOD removal and nitrification were achieved within a few weeks after wastewater was added.



Aeration System



Mixer



Outlet sieve in circular tank

Each line	Reactor volume	Diameter	Biomedia % fill
Reactor 1	1164	13,5	54
Reactor 2	1135	13,5	49
Reactor 3	1121	13,5	49
Reactor 4	211	6	52
Reactor 5	102	13,5	14
Reactor 6	190	6	47

The table above shows the dimensions of the reactors and filling degree of biomedia. The total reactor volume is 19 368 m³. Total biomedia amount is 8268 m³ of K1.