

Case study



LILLEHAMMER WWTP
- Lillehammer, Norway



Highlights

General information

PROJECT LOCATION: Lillehammer, Norway
CLIENT: Lillehammer Municipality
OPERATIONAL SINCE: 1994

Challenge

Concentrations are rather low and during the snow melting period the water temperature drops down to a minimum of 3.5°C.

Solution

The plant was upgraded with the Kaldnes Moving Bed™ Biological treatment process to overcome the effluent discharge limits.

Achievements

The plant has showed very good results with more than 80% removal of total nitrogen. The biological treatment has had a positive effect on the chemical stage resulting in lower costs for chemical dosing.

Effluent Requirements:

Phosphorus	<0.2 mg /L	(yearly average)
Nitrogen	70% removal	(yearly average)
BOD ₇	<10 mg BOD ₇ /L	(yearly average)

Overview

Lillehammer is a city in the inland of Norway, lying approximately 170 kilometers north of Oslo. The plant was put into operation in 1994, the same year the city of Lillehammer hosted the XVII Olympic Winter Games.

Challenge

The city's original wastewater treatment plant had been in operation since 1977. The plant was originally built to remove phosphorous, and suspended solids. As time went on the recipient of the effluent, Lake Mjosa, became regarded as a threat to the environment because of eutrophication. In addition to strict effluent standards for phosphorous the plant was instructed to remove nitrogen as well.

In 1992 Kaldnes signed an agreement with the municipality of Lillehammer to design the biological portion of their wastewater treatment plant. The challenges the plant had to overcome included a lack of building area, long periods of diluted water and low water temperatures.



Banana Blade Mixer



Design

Pretreatment

- ▶ 3mm Step Screen
- ▶ Grit and Solids Removal
- ▶ Primary Sedimentation
- ▶ Total Surface Area 600 m²
- ▶ Water Depth 2.5m



Wedge wire sieves

Biological Treatment

- ▶ 2 Parallel Lines
 - 9 Reactors each
- ▶ BOD Removal
- ▶ Nitrogen Removal
- ▶ Post Denitrification with external carbon source
- ▶ Total Volume 3840 m³

Chemical Treatment

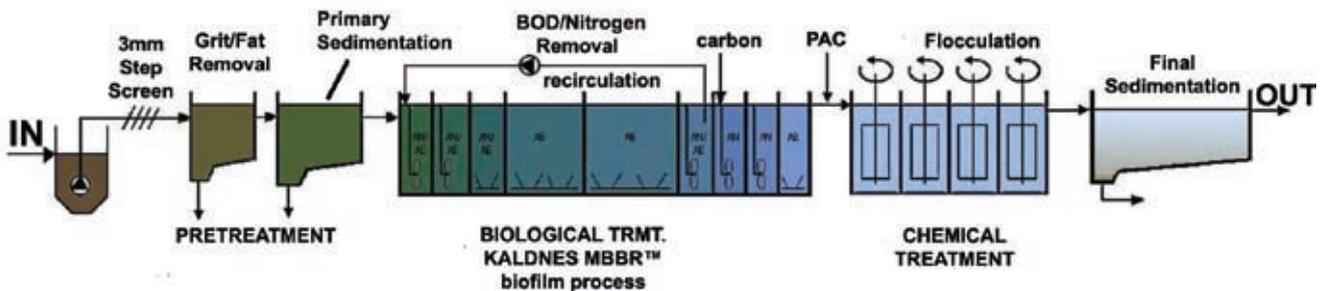
- ▶ PAC for Phosphorus Removal
- ▶ Total Flocculation Volume 600 m³

Separation

- ▶ Final Sedimentation
- ▶ Total Surface Area 860 m²
- ▶ Water Depth 3.5m

Design Load

Flow: Dimensioning -1,200 m³/h
 Max. -1,900 m³/h
 BOD: 2,900 kg/d
 COD: 5,925 kg/d
 TSS: 2,900 kg/d
 TN: 755 kg/d
 Phosphorus: 107 kg/d
 Temperature: 10°C

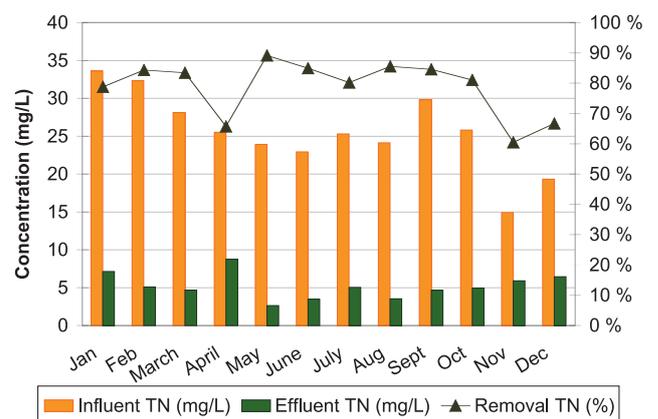


Results

Results from the year 2000 show very good performance. In November 1999 a testing period was carried out to determine the nitrification rate in the system. The test concluded that the average nitrification rate was 1.2 g NH₄-N/m²d in reactor 4 with a water temperature of 11°C.

In the Springtime of 1995, the plant had an involuntary shutdown due to a flooding situation that lasted for almost one month. When the plant was restarted the process showed complete nitrification within 48 hours.

That indicated that the nitrifying bacteria did not suffer from the long shutdown and it demonstrates one of the major assets of having a fixed-film biological system.



Average Values – Year 2000

	Influent (mg/L)	Effluent (mg/L)	Removal
BOD ₇	81.67	3.33	96%
TN	25.46	5.17	80%
TP	3.67	0.08	98%

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