MBR (Membrane Bio Reactor) at Mølleåværket, Lundtofte, Denmark

By installation of membrane technology and restoring the natural aquatic environment, Mølleåverket in the northern part of Greater Copenhagen has the ambition to become the best European sewage water treatment plant.

Background

The ecosystem of the lakes upstream of Mølleåværket sewage treatment plant (125 000 pe), Lundtofte, Denmark, have been significantly impacted as a result of stormwater normally directed to the lakes being treated by the sewage treatment plant and discharged into the Öresund straight. The Danish Environment Agency "danska naturastyrelsen" began a project in 2008 to restore the natural wetland habitat of the lake system, this required a portion of Mølleåværket plant's effluent to be discharged back to the lake system. As a result Mølleåværket effluent quality needed to be significantly improved, in particular with regards to new EU requirements. Availability of land at the existing works was very limited and thus a solution with a minimum footprint was required.

Solution

Purac AB implemented a membrane bioreactor or MBR which meets the high quality effluent specification within the confines of the available land at Mølleåværket sewage treatment plant. The MBR process chosen was the ZeeWeed membrane bioreactor (MBR) process by GE Process & Water Technologies. This consists of a suspended growth biological reactor integrated with an ultrafiltration membrane system, using the ZeeWeed 500 immersed hollow fiber membrane. Essentially, the ultrafiltration system replaces the solids separation function of secondary clarifiers and sand filters in a conventional activated sludge system. A new denitrification process was added to one of the conventional biological lines and a membrane bioreactor which consisted of 4 No membrane reaction tanks with a total capacity of 50-200 L/s.

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Per Plannthin, Director of Lyngby-Taarbaek Forsyning A/S

Process

With MBR (Membrane Bio-Reactor) technology microorganisms break down organic pollutants present in the water which then are mechanically filtered through membranes. The method does not need any final sedimentation, i.e. the plant requires significantly less space. The quality of the treated water will also be significantly better than with conventional technology. Primarily, it is a technique used in countries where water resources are more limited than in the North. In this project Purac collaborates with GE Water, a leading manufacturer of UF membranes for waste water treatment.

Mølleåverket treatment plant situated in Lundtofte, Denmark, handles sewage water from approximately 125 000 households, and once completed will the treated water of bathing water quality to be discharged into the Öresund straight. In the long term, the intention is to pump the water to Kalvemosen, which is the first step in a long system of lakes and rivers in Zealand. Kalvemosen is part of Mølleåsystemet, which is one of 11 priority areas for the Danish government directed water and nature activities.

The project to restore the environment in which reconstruction of Mölleåverket is a part, has attracted considerable international interest. "We have been visited by delegations from China, France and even the Seychelles in the Indian Ocean", says Per Plannthin, Director of Lyngby-Taarbaek Forsyning A/S, the municipal company in charge of sewage collection and treatment from four neighboring municipalities in the area.

Result

Permeate quality is guaranteed to:

- TSS < 1 mg/l
- Turbidity < 1 NTU
- E-coli< 100 cfu/100ml, 80%ile
- Coliforms <500 cfu/100ml, 80%ile
- Faecal coliforms <100 cfu/100ml

In addition to this the treatment also results in phosphorous and nitrogen removal far superior to conventional techniques.

An existing biological stream was taken out of service and upgraded to include the new MBR process. The selection of this process allowed the existing plant to maintain its output and performance target during installation and commissioning. The plant was successfully commissioned, performance tested, and handed over in January 2013.

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