

Stora Enso Anjala Mill, Finland

The Client

Stora Enso Anjala Mill in Anjalankoski in Finland has a production capacity of 515,000 tons of paper/year from mechanical pulp.



Key Figures

- COD: 8.5-9.5 tonnes/d
- BOD: 1.5 tonnes/d annually, 2.5 tonnes/d monthly
- Nitrogen: 200 kg/d
- Phosphorus: 15 kg/d



The Client's Needs

The existing wastewater treatment plant has been modernized over the last few years with the addition of a pretreatment step using AnoxKaldnes™ MBBR technology. The existing pond has been removed and a tertiary treatment step and flotation have been introduced. The new treatment plant, a BAS™ biological process, was taken into full operation in the autumn 2005. The challenge was to fulfill the outlet demands for COD, BOD, nitrogen and phosphorus.

Process

The treatment plant consists of pre-clarification, cooling, dosing of nutrients, a BAS™ biological process consisting of two MBBR reactors and one activated sludge tank, settlers with sludge recycle, chemical addition and post-flotation. The MBBR reactors are filled to 30 % with suspended carriers, type M2, for biofilm growth.

The total mill effluent is treated in the BAS™ biological process. The normal flow is about 30,000-35,000 m³/d (7.9-9.25 MGD), which results in a hydraulic retention time (HRT) of 5.5 hours in the MBBR step and 24 hours in the activated sludge step. The normal COD load is 50-80 tonnes/d and the design maximum daily load is 110 tonnes/d. The design temperature in the biological steps is 37-39 °C and the design DO concentration is 2 mg/l in the MBBR step and 1.5-2 mg/l in the activated sludge process.

Solution

The existing pond was removed and a BAS™ biological process was installed.

Results

The removal of COD over the MBBR pretreatment is 35-50%. The COD removal in the activated sludge process is 60-70% and the total COD removal after the post-clarification is normally greater than 85-90%. The effluent nitrogen and phosphorus levels after the post-clarification are around 12 mg/l and 0.2-0.6 mg/l respectively. This means a phosphorus outlet of 10 kg/d. The total nitrogen demand has been difficult to reach, due to inert nitrogen being present in several chemicals used in mechanical pulp and paper production (DTPA etc.). The results from the nutrient limited BAS™ biological process show that this concept provides an opportunity for a stable and efficient biological treatment at varying organic loading conditions. The loading has been higher than expected but still the outlet demands have been fulfilled. The treatment performance is characterized by high removal of organic matter, low effluent concentrations of nutrients, a consistently low sludge production and very good activated sludge properties.

Parameter	Influent	MBBR	Activated sludge
COD load, normal/maximum (tonnes/d)	50-80/110	50-80/110	40/70
Flow (m3/d)	30,000-35,000 (7,9-9,25 MGD)	-----	-----
COD concentration (mg/l)	1,500-2,200	-----	-----
BOD7 concentration (mg/l)	1,000	-----	-----
HRT (h)	-----	5.5-6.5	24
Temperature (°C)	-----	37-39	37-39
DO (mg/l)	-----	2	1.5-2
SS (mg/l)	-----	-----	5.000
Sludge age (d)	-----	-----	9-15