Case Study BIO-CEL® MBR & MICRODYN RO in Food Processing Plant

MANN+HUMMEL

Case Study: Industrial MBR & RO for Food Production

A food processing plant in Europe is using BIO-CEL® L-1 MBR modules and TurboClean® RO spiral elements to treat and reuse production wastewater.

PROBLEM
Limited space available in plant to meet wastewater reuse needs

SITE
Food processing plant in Europe

OUTCOME
Delivering high-quality effluent that meets requirements

OBJECTIVE

The plant is designed to treat the wastewater from a food processing plant. The wastewater is high in starch and is treated in several anaerobic and aerobic treatment steps. The permeate is reused in the production line as process water. Because of this, the requirements for the permeate quality are very strict. The customer decided to use an MBR process as pretreatment before the RO. The MBR process was selected because space availability was limited, and an excellent permeate quality was required.

MATERIALS & METHODS

The design of the plant includes a pretreatment with anaerobic and aerobic biological steps. The effluent of the last aeration tank is pumped into the MBR tanks. Six pieces of BIO-CEL® L-1 membrane modules are installed in separate tanks, but all are operated with a combined header for scouring air and a combined header for permeate.

The permeate from the MBR plant is fed into an RO process with 30 TurboClean® HP 8040-RO-HS elements. The RO system is designed in two stages, with 20 modules in the first and 10 modules in the second stage.

Figure 2 Wastewater tank with BIO-CEL® L-1 modules installed

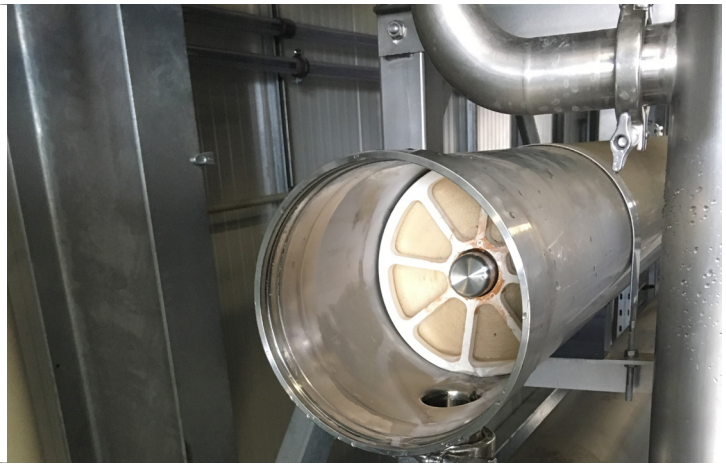

Figure 1 TurboClean® elements in pressure vessels

RESULTS

The BIO-CEL® L-1 modules retain all solids and the remaining particulate organic pollution so that the biological treatment could not break down. It is creating a high-quality feed water for the RO system. Looking at just the process of MBR combined with RO, the plant realizes a >97% reduction of COD and a >93% reduction of dissolved solids. These impressive numbers are achieved on wastewater that has already gone through treatment by anerobic and aerobic bioreactors, showing the full capabilities of a tertiary treatment.

CONCLUSION

With the installed combination of MBR and RO, the wastewater can be treated on-site to a quality level that is suitable to be reused as process water. The design of the plant makes it very flexible to accommodate periods of low flow and peak flow due to installation of the BIO-CEL modules in separate tanks. The TurboClean® RO modules with their reduced bypass flow have significantly lowered operational cost for the operators, and the excellent retention ensures that the permeate can be re-used, saving the operators the cost for disposal and fresh water.

The operators are happy with the performance and especially the stability of the systems.

Figure 3 BIO-CEL® L-1 module

Tables & Data

Table 1 Design Parameters: UF

Parameter	Value
Max. Flow Rate	41.6 m^3/h (0.22 MGD)
Permeability	240 LMH/bar (9.6 GFD/psi)
Net Average Flux	12.8 L/m^2h (7.5 gfd)
Installed Membrane Surface	2,880 m^2 (31,000 ft^2)
Temperature	21°C (70°F)

Table 2 Design Parameters: RO

Parameter	Value
Max. Flow Rate	38.5 m^3/h (169.5 gpm)
Recovery	70 %
Feed Pressure	7.3 bar (106 psi)
Installed Membrane Surface	1,128 m^2 (12,142 ft^2)
Temperature	21°C (70°F)

Table 3 Wastewater Quality

Parameter	Feed to Biological Treatment	Permeate UF	Permeate RO
Conductivity (µS/cm)	3,300	3,380	220
Hardness (°dH)	18	18.5	0.4
COD (mg/l)	166	21	< 5
Chlorine (mg/l)		390	28
Sulfate (mg/l)		59	2.9
Calcium (mg/l)		57	1.4
Magnesium (mg/l)		42	0.9
Iron (mg/l)		0.03	< 0.01

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