

Case Study
BIO-CEL® Wastewater
Treatment for
Irrigation - Israel

Case Study: Municipal BIO-CEL[®] MBR Modules

Provide MBR membrane modules capable of producing high quality effluent for irrigation purposes.



PROBLEM

Damaged MBR modules in wastewater treatment plant



SITE

Treatment plant in HaSolelim, Israel



OUTCOME

Successfully met & exceeded effluent requirements while reducing costs

OBJECTIVE

Located in HaSolelim, Israel, a municipal wastewater treatment plant updated its membrane bioreactor (MBR) plant, due to damage to the previously installed modules.

The purpose of the plant is to provide high quality effluent for irrigation purposes.

An MBR system using 6 BIO-CEL[®] XL MBR modules was chosen, due to its superior performance and low energy demand.

The plant offers a total membrane area of 11,520 m².

MATERIALS & METHODS

The raw wastewater is stored in a lagoon where it is pre-aerated, and works as an equalization tank. It is further pre-screened by a punch hole rotary screen. The MBR plant treats about 4,000 m³/d (1.06 MGD) municipal wastewater and is equipped with 6 BIO-CEL XL modules divided into two identical lines, each line containing 3 modules. The modules are installed directly in the aeration tanks and are attached to the bottom of the tank. Maintenance cleaning of the modules is executed every 10 to 14 days via backwashing. During chemical backwashing, permeate is sent back through the membranes along with 500-750ppm sodium hypochlorite. The configuration of the MBR process is shown in Figure 1.

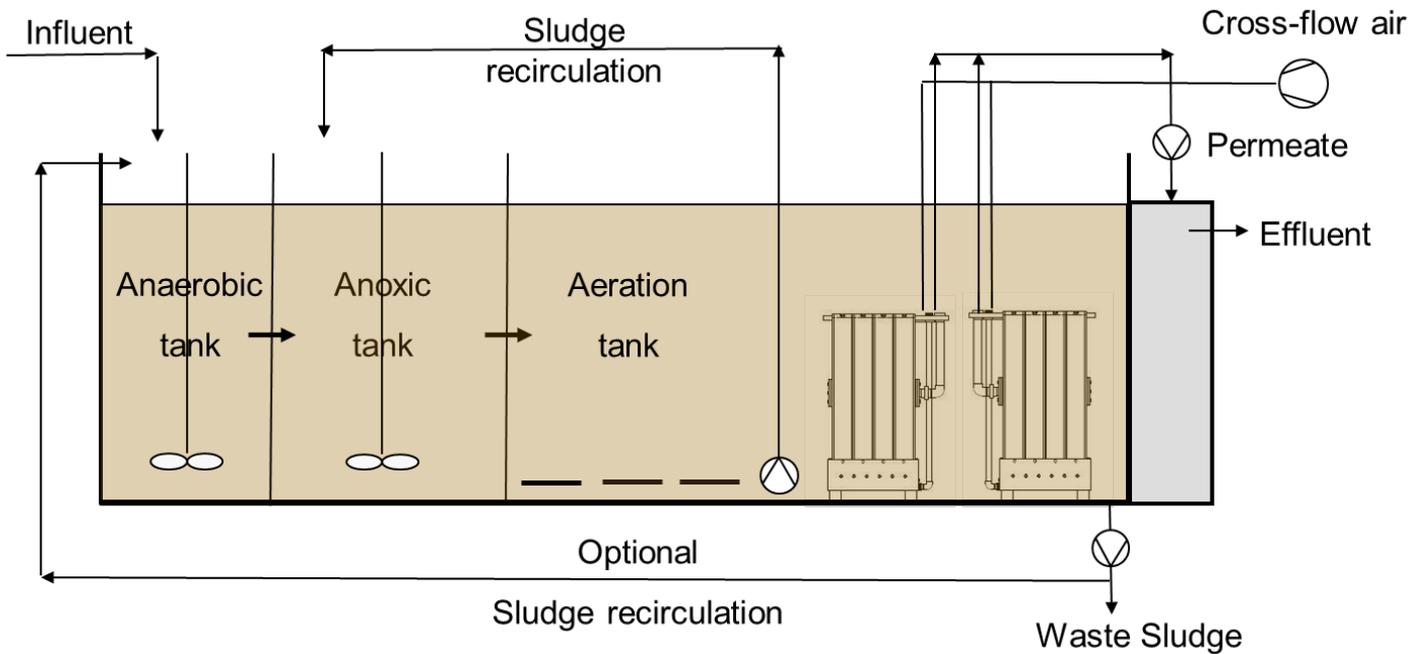


Figure 1 Configuration of biological and MBR process in HaSolelim

RESULTS

The MBR system with the BIO-CEL® XL modules obtained results that meet the requirements of the customer. Table 2 shows that COD, BOD, total nitrogen (TN), total phosphorus (TP), TSS, and ammonia were reduced to levels below the required values, surpassing expectations. The system proved its ability to provide high-quality effluent for irrigation purposes.



Tables & Data

Table 1 Plant Operational Parameters

Parameter	Value
Modules	6 x BIO-CEL® XL
Total Membrane Area	11,520 m ² (124,000 ft ²)
Daily Average Flow	4,000 m ³ /d (1.06 MGD)
Peak Flow	200 m ³ /d (880 gpm)
MLSS	8-10 g/L
Solids Retention Time	20 days
Average Flux	17.1 LMH (8 GFD)
Avg. Transmembrane Pressure	-70 mbar (-1 psi)
pH	7.0
Minimum Temperature	18°C (64°F)

Table 2 BIO-CEL MBR Performance

Parameter	Raw Influent	MBR Effluent	Required
COD (mg/L)	600	< 20	-
BOD (mg/L)	300	< 5	< 10
Total Nitrogen (mg/L)	60	< 10	< 25
Total Phosphorus (mg/L)	10	< 1	< 5
TSS (mg/L)	500	< 5	< 10
Ammonia (mg/L)	48	< 1	< 20

Conclusion

The direct installation of the modules in the aeration tanks positively affected the average energy consumption of the plant. By having the modules in the aeration tanks, aeration can be used entirely for the biological process, reducing overall energy demand.

Backwashing and the self-healing effect of the membrane led to easy and comfortable maintenance for the plant operator. If a membrane becomes damaged during operation, the spacer material in-between the BIO-CEL membrane laminate sheets seals the damage with the help of the biomass in the system. Even if the membrane laminate is severely damaged, solids and bacteria are still rejected by the BIO-CEL module and consistent, high quality effluent is produced.

Overall, the BIO-CEL® XL modules successfully met irrigation water quality requirements and saved the plant significant operating and maintenance costs. Due to the successful commissioning and operation of this MBR system, the wastewater treatment plant expects to add two additional lines of 3 BIO-CEL XL modules to process another 4,000 m³/d (1.06 MGD) soon. Furthermore, the plant plans to build another unit to process an additional 8,000-12,000 m³/d.



Results & Conclusions

Table 4 MBR Pollutant Removal

Indicator	Elimination Rate
BOD	98.3 %
COD	96.7 %
TN	83.3 %
TP	90.0 %
TSS	99.0 %
Ammonia	97.9 %

