CASE STUDY
MICRODYN *i*Sep™ 500 UF
MBR Peak Flow Management

MICRODYN NADIR
ADVANCED SEPARATION TECHNOLOGIES

Project Goal

Using spiral-wound polymeric UF membrane modules in conjunction with MBR systems for peak flow management and removal of suspended solids.

Feed

- Raw sewage treatment
- Feed TSS: 50-330 mg/L
- Alum addition in UF Feed

Membranes

- MICRODYN *i*Sep™ 500-PVDF UF modules

Parameters Measured

- Operating flux: 43-51 lmh (25-30 gfd)
- TSS removal

Objective

Membrane bioreactors (MBRs) have often been viewed as a cost prohibitive technology for wastewater treatment plants (WWTP) that experience high, transient peak flows. In areas with frequent wet weather events, peaking factors can range from two to ten times greater than the rated capacity of a plant. Since MBRs are generally designed to handle peak flows only twice that of the average daily flow rating, it is difficult to implement the technology in plants with frequent infiltration and inflow (I&I) events.

Designing an MBR plant to treat dilute, transient peak flow rates becomes a tremendous challenge due to high capital costs and potential operating inefficiencies. The most effective wastewater treatment plants are ones with the most operating flexibility. However, high flexibility with MBR plants can lead to intensive cost requirements. An innovative process utilizing physical-chemical treatment methods was developed to solve the peak flow problem associated with MBR plants.

Materials & Methods

MICRODYN *i*Sep™ 500 ultrafiltration (UF) modules were piloted to demonstrate the use of a spiral-wound polymeric UF membrane system, followed by deep-bed media filtration, for the treatment of raw wastewater during storm events. The UF membranes were operated directly on full strength raw wastewater to ensure the system could operate under worst case scenarios. Typical wastewater characteristics seen during the pilot study are shown in Table 1.

Table 1. Pilot study influent water characteristics.

Parameter	Value	Units
Turbidity	242	NTU
TSS	328	mg/L
COD	409	mg/L
BOD	190	mg/L
FOG	50-100	mg/L
pH	6.5-7.0	-

Coagulant (alum) was added directly to the wastewater (UF feed) downstream of the 3 mm screen at a target rate of 175 mg/L to the feed to help bind up organic matter, making it easier to clean the membranes using mechanical methods (i.e. backwashing).

Results

A continuous operating flux of 43-51 lmh (25-30 gfd) was observed in the pilot study. A list of operating parameters for the UF pilot are

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shown in Table 2. At the end of the pilot study, the membrane showed no signs of solids (i.e. hair, paper) accumulation, showing that a 3 mm screen was adequate pretreatment to the UF.

Table 2. UF pilot design parameters.

Parameter	Value	Units
Operating Flux	43-51 (25-30)	lmh (gfd)
TMP	0.14-0.34 (2-5)	bar (psi)
Backwash Frequency	10	min
Backwash Duration	1	min
Recovery	75-90	%
Air Scour	None	-
Alum Addition	175	mg/L
pH Adjustment	7.0-7.5	-

Conclusion

A peak flow management process using ultrafiltration (UF) membranes was developed to operate in conjunction with MBR systems. The UF system takes a side-stream of fine-screened (FS) plant influent (i.e. raw sewage) and removes all total suspended solids (TSS) with the help of alum. For organics (BOD) and nutrient removal, the UF system is followed by activated carbon (AC) and zeolite (ZEO) media. The combined unit operations are intended to produce an effluent that meets all regulatory permit requirements.

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