

# CASE STUDY

RO | NF | UF | MBR

Municipal Wastewater Treatment  
Crestview, Florida



# TORAY

Innovation by Chemistry

## Toray MBR Modules' Successful Long-term Operation for Water Reuse in Crestview, Florida

### BACKGROUND

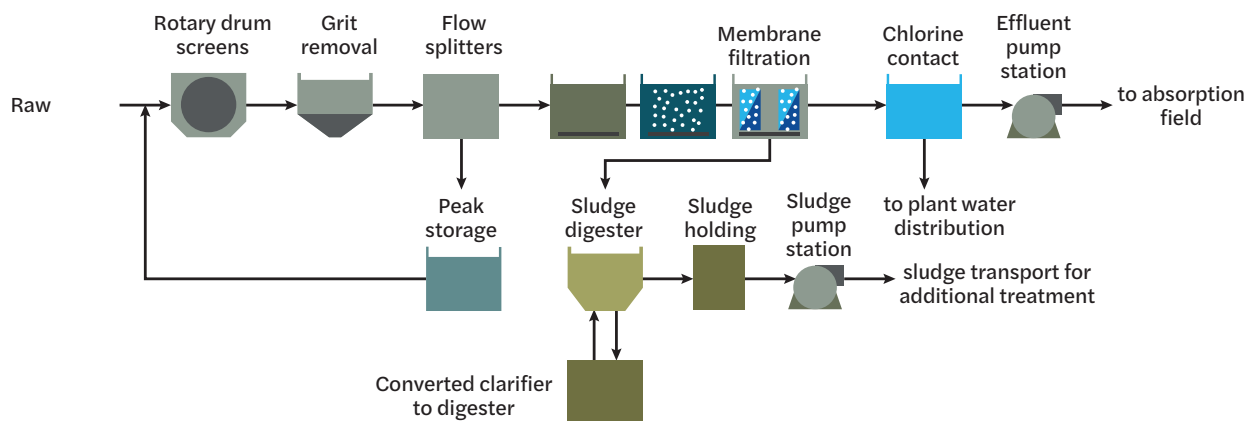
In January 2010, Toray's flat-plate membrane bio-reactor (MBR) modules began operation at the Bob Sikes Water Reclamation Facility (WRF) in Crestview, Florida. The plant is designed to treat an annual average daily flow (AADF) capacity of 1.0 MGD (3,800 m<sup>3</sup>/d). The overall wastewater treatment system is illustrated in Figure 1 and consists of the following: Headworks with screening; Grit removal; Peak flow bypass facilities (flow splitters); Three-train MBR treatment process with anoxic and aeration basins; Chlorine disinfection; Effluent pump station; Aerobic sludge digesters; and Holding tank and pump for sludge transportation for additional treatment. Lastly, the treated effluent is pumped to an absorption field system for reuse.

Each MBR train contains two MBR tanks housing eight TMR140-100S modules totaling sixteen modules per train. The total number of MBR modules installed is forty-eight in the three-train MBR filtration system. Details of the MBR system is outlined in Table 1.

The membrane used in Toray MBR modules is a composite structure of Toray's durable PVDF (Polyvinylidene Fluoride) membrane layer as the functional membrane material on a PET (polyester) non-woven support fabric. The robust and flexible composition of the membrane structure gives Toray MBR modules high physical strength and chemical stability.

Table 1 – MBR System	
Toray MBR model	TMR140-100S
System capacity (mgd)	1.00
No. of modules	48
No. of membrane elements per module	100
Design flow rate (mgd)	1.00
Design peak hour flow rate (mgd)	2.5
Design MLSS (mg/L)	10,000–12,000
Net flux at design flow (gfd)	13.8
Net flux at design peak hour flow (gfd)	34.5

Figure 1: Wastewater treatment scheme at Bob Sikes WRF



The Bob Sikes WRF facility is authorized to direct reclaimed water for reuse to an absorption field system, based on the following treated water quality in Table 2 below:

**Table 2 – Treated Effluent Requirements**

Parameter	Unit	Max/Min	Limit	Statistical Basis
Flow	mgd	Max	1.000	Annual Average
Biological Oxygen Demand (BOD), Carbonaceous 5 day, 20°C	mg/L	Max	20.0	Annual Average
			30.0	Monthly Average
			45.0	Weekly Average
			60.0	Single Sample
Solids, Total Suspended (TSS)	mg/L	Max	10.0	Single Sample
Coliform, Fecal	#/100mL	Max	200	Annual Average
			200	Monthly Geo. Mean
			800	Single Sample
pH	s.u.	Min	6.0	Single Sample
		Max	8.5	Single Sample
Chlorine, Total Residual (for Disinfection)	mg/L	Min	0.5	Single Sample
Nitrogen, Nitrate, Total (as N)	mg/L	Max	12.0	Single Sample

The designed parameters for the MBR system, compared to actual treated water quality is shown in Table 3 below:

**Table 3 – MBR effluent quality**

Parameter	Design	Treated (actual)
BOD <sub>5</sub> (mg/L)	<20 (annual average)	<2 on average
TSS (mg/L)	<1.0	Non-detect
Total Nitrate (mg/L)	<12	4–6 with addition of polysweet
Turbidity (NTU)	<1.0	<1.0

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Figure 2: Aerial view of the WRF



Figure 3: MBR treated water clearwell

**SUMMARY**

The treated water quality far exceeds the permit requirements for reuse with TSS non-detect and BOD less than 2 mg/L on average.

The successful long-term operation was possible at the Bob Sikes WRF in treating 1 MGD of mixed liquor for over ten years due to the facility's competent staff and the high physical strength and chemical stability of Toray MBR membranes.

