



Case Study  
MICRODYN  
BIO-CEL® Petroleum  
Refining Wastewater  
Treatment

# Case Study: Industrial MICRODYN BIO-CEL<sup>®</sup> MBR Modules

Upgraded wastewater treatment process and enhanced the effluent water quality for petroleum refining wastewater treatment plant.



## PROBLEM

Insufficient performance treating petroleum refining wastewater



## SITE

Treatment plant in Shandong Province, China



## OUTCOME

Successfully met & exceeded environmental permit requirements

## OBJECTIVE

Due to insufficient performance, a petroleum refining wastewater treatment plant in Shandong Province, China, reconstructed and changed to an MBR solution using MICRODYN BIO-CEL<sup>®</sup> XL modules. The wastewater treatment plant utilized 14 BIO-CEL modules, offering a total membrane area of 26,880 m<sup>2</sup>. The modules are arranged in two separate filtration lines in a single basin. The maximum daily flow is 13,500 m<sup>3</sup>/d with a daily average flow 9,600 m<sup>3</sup>/d.

## MATERIALS & METHODS

This wastewater treatment plant uses 14 BIO-CEL modules installed in two filtration tanks. The technological processes of the treatment system include:

- Oil separation tank
- Cavitation Air Floatation (CAF) treatment
- Dissolved Air Flotation (DAF) treatment
- Equalization tank
- Primary Anoxic/Oxic tanks
- Sedimentation tank
- Secondary Anoxic/Oxic tanks
- Filtration tank (MBR)





## Tables & Data

**Table 1** Plant design

Parameter	Value
Module Type	MICRODYN BIO-CEL® XL
Number of Modules	14
Total Membrane Area	26,880 m <sup>2</sup>
Maximum Daily Capacity	13,500 m <sup>3</sup> /d
Average Daily Capacity	9,600 m <sup>3</sup> /d
pH	6-9
Temperature	35°C (95°F)

**Table 2** Temperature standardized

Parameter	Influent	Effluent	Required
COD (ppm)	700	≤ 60	70
BOD (ppm)	200	≤ 15	20
Total Nitrogen (ppm)	100	8	15
Total Phosphorus (ppm)	3	0	1
TSS (ppm)	230	≤ 10	10
Oil (ppm)	25	0	5
Turbidity (NTU)	-	≤ 0.5	1

## RESULTS

The results of this MBR system indicate that MICRODYN BIO-CEL® XL modules can successfully treat petroleum refining wastewater and consistently meet environmental effluent permit requirements. The effluent quality from the MBR system regularly met or exceeded the customer's requirements. As shown in Table 2, the MBR system met the TSS effluent requirement of 10 ppm. The COD, BOD, total nitrogen, total phosphorus, oil and turbidity levels were dramatically reduced and surpassed the customer's effluent requirements and permit requirements.

## CONCLUSION

The system using BIO-CEL MBR modules successfully removed high levels of COD, BOD, total phosphorus, ammonia nitrogen, suspended particulates, turbidity and oil from petroleum refining wastewater. This system allowed the plant to meet and exceed their environmental permit requirements while obtaining better and more stable effluent quality and higher treatment capacity compared to a Conventional Activated Sludge (CAS) wastewater treatment plant.







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