

The background of the slide is a photograph of an industrial structure, possibly a distillation column or a similar piece of equipment, silhouetted against a dramatic sunset sky. The sun is a bright, glowing orb positioned near the bottom center, partially obscured by the structure's legs. The sky is filled with wispy, light-colored clouds, and the overall color palette is dominated by the warm tones of the sunset (oranges, yellows, and reds) and the dark blues and greys of the industrial structure and the green text box.

Case Study
BIO-CEL® Petroleum
Refining Wastewater
Treatment

Case Study: Industrial BIO-CEL[®] 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 BIO-CEL[®] XL modules. The wastewater treatment plant utilized 14 BIO-CEL modules, offering a total membrane area of 26,880 m². The modules are arranged in two separate filtration lines in a single basin. The maximum daily flow is 13,500 m³/d with a daily average flow of 9,600 m³/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	BIO-CEL® XL
Number of Modules	14
Total Membrane Area	26,880 m ²
Maximum Daily Capacity	13,500 m ³ /d
Average Daily Capacity	9,600 m ³ /d
pH	6-9
Temperature	35°C (95°F)

Table 2 Influent and Effluent Parameters

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 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.



