

Marathon Petroleum oil refinery

Application: Biological treatment for the safe discharge of petroleum wastewater

Capacity: 50,000 gpd (190 m³/day)

Location: Catlettsburg, Kentucky, United States

Commissioned: August 2003



challenge

Marathon Oil, or Marathon Petroleum Company (MPC) is a wholesale supplier of gasoline, asphalt, and other petrochemical products.

The Marine River Terminal is located in Kentucky, and owned and operated by MPC. This terminal is located on the Ohio River, and services barges that carry petroleum to various refineries. In 2001, MPC began experiencing problems meeting the City of Ashland's discharge criteria for wastewater produced at its barge treatment operations.

The current system consists of an equalization tank, followed by dissolved air flotation. The water was very difficult to treat, as it contained solids, oil, grease, aromatic hydrocarbons, including the "BTEX" compounds, metals, BOD, and occasionally arsenic.

solution

MPC worked with a variety of different firms to supply the design portion of the plant, and selected Tetra Tech, Inc. Due to the nature of the wastewater, Tetra Tech knew that membrane bioreactor (MBR) would be an ideal solution. In early 2002, a treatability study was performed using ZeeWeed* membranes from SUEZ. In addition to COD, BOD and TSS removal, the study showed that the system could also remove "BTEX" compounds and heavy metals to acceptable levels.

As a result of the treatability study, the ZeeWeed MBR system was selected to treat this difficult wastewater. The plant was successfully commissioned in less than one year, and now safely discharges treated effluent into the City of Ashland's wastewater treatment system.

With a nominal pore size of 0.04µm, ZeeWeed membranes are the key to effective wastewater treatment. The reinforced hollow-fiber membrane acts as a physical barrier, preventing suspended solids, and colloidal material from being released in the final effluent.

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process overview

Raw water from the plant is pumped to a grit removal system for the removal of heavy solids, and then through an oil-water separator before entering the bioreactor.

Mixed Liquor overflows at a rate of six times the effluent flow to the membrane tank.

Filtration is achieved by drawing water to the inside of the membrane fiber using suction created by permeate pumps. In order to meet the flow requirements, one membrane train with two 11 module ZeeWeed 500 series cassettes was supplied.

Recirculation pumps take the remainder of the flow back to the bioreactor to ensure these tanks remain at the same relative MLSS concentration. Sludge is wasted from the recirculation line to a filter press, where it is thickened and then hauled off site.

Typical Treated Water Results		
	Raw Water	Treated Water
BOD (mg/L)	775	< 22
TSS (mg/L)	66	< 5
COD (mg/L)	1,000	< 300
Oil and Grease (mg/L)	165	< 16
BTEX (mg/L)	10	< 0.72

process flow diagram

