

# INDUSTRIAL WASTEWATER CASE STUDY

## OILY WASTEWATER FILTRATION PROJECT ENGINE PLANT MANUFACTURING



**Background / History:** One of three major US Auto Manufacturers has operated the engine block casting and engine manufacturing facility in Brookpark, OH near Cleveland since the post WWII Era. Recent changes in the Auto industry, this auto manufacturer determined that casting was no longer in the best interest of the business.

The recent decision to end engine block casting at this facility made a huge impact in which method of wastewater treatment would be required to produce acceptable water quality that could be discharged to the local POTW.

The removal of casting operations greatly reduced the total volume of water that ultimately diluted the concentrated oily wastewater from engine manufacturing operations. The standard treatment of the oily wastewater from engine manufacturing was oil skimming, coagulation, flocculation and floating. This physical / chemical treatment did provide some level of reduction of oil and grease levels, but without the greater volume of water from casting operations would not adequately meet POTW standards.

**Treatment Improvements:** Amongst Ford Engineering, IFM and membrane manufacturers, it was determined that engine manufacturing wastewater under proper conditions, be filtered with ultrafiltration membrane technology.

The water soluble oils used for lubrication of machining, grinding and cutting associated with engine manufacturing, if maintained in an emulsion will be retained by ultrafiltration membranes. The emulsion is essentially dewatered through this technology, concentrating oils to a marketable concentration and producing high quality effluent acceptable to the POTW.

Other components are required along with membrane filtration to make a successful system. Aerated Equalization is required to provide a homogenous blend of various lubricant dumps and peak flows. Aeration is required to keep emulsified oils from going anaerobic (septic) due to biological activity. Biological Activity must be reduced to a minimum to reduce the formation of low pH conditions and biofilms that affect emulsion integrity and negatively affect membrane filtration.

Free oil must be removed physically prior to membrane filtration also. This is accomplished through Corrugated Plate technology prior to UF membrane Technology. pH adjustment is accomplished within process tanks associated with UF membranes to help maintain emulsion integrity, which makes the filtration process work more effectively.

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### System Design and Performance:

- Feed concentration material
  - 5,000 mg/l oil and grease
  - pH 6.5-10.0 SU
  - 500 mg/l TSS
  - 1% Total Solids content
- Two UF Membrane Systems with 336 UF Tubes totaling 739 ft<sup>2</sup> of surface area
- Each capable of averaging 50 GFD (gallons / ft<sup>2</sup> / day) over minimum 3 day continuously working period
- Average Daily Processing flow of 36,950 gpd, Peak Daily Processing Flow of 73,900 gpd
- Two complete Automatic CIP Systems with programmed chemical feed, heating, displacement and multiple cleaning cycles including automatic calculation of successful CIP Cycles
- Complete controls specified per the manufacturing facility
- Effluent Quality Projected / Actual
  - Turbidity < 10 NTU / <1 NTU
  - Oil and Grease levels < 100 mg/l / <50 mg/l
  - pH 8-10 SU
  - Total Suspended Solids <250 mg/l / < 10 mg/l
- Cycle Runs and concentration of oily materials (minimum 20x concentration factor)
  - 300,000 gallon of oily wastewater concentrated to ~3,000 gallons of 25% oil content
  - 25% oil content, 28% Total solids



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