Membrane separation vs. chemical treatment

The decision on whether to specify membrane separation or chemical treatment requires an understanding of the principles involved. Consideration should be given to the implications of cost and exposure to liability with regards to waste disposal from the system. If reuse of the water is being considered, the quality of water from each type of system must be evaluated.

System Operation

Chemical treatment systems generally rely on two principles. First, the chemical bond, which keeps contaminants in suspension (or in the case of oils in emulsion), is broken. This is most often achieved by adjusting the pH and adding a coagulant designed for the application. In addition, a high molecular weight polymer floc will be added, which is designed to attach itself to the tiny particles of solids and oil causing them to sink rapidly where they can be removed for disposal. The water will then be neutralized if necessary.

Membrane separation mechanically separates and removes the contaminants. The pores of the membrane are measured by the weight of the molecules, which can pass through it. This filter is so effective that colloidal and emulsified contamination is removed from the water leaving clear water containing only soluble components. Chemicals are not required to coagulate and flocculate the solids to be removed.

Waste Disposal

Chemical treatment systems generally produce a sludge for disposal. This waste will generally be disposed of in a landfill creating long-term liability. Membrane filtration does not require chemical pretreatment and therefore the residual waste/sludge volume is less.

For each application, Dynatec selects the membrane that will provide the most cost effective long-term solution
Water Quality
Chemical treatment systems rely on the addition of chemicals to separate and remove the contaminants. In order to ensure that this treatment continues successfully and to account for variations in the waste stream, more treatment chemicals in excess of stoichiometric volumes are added to the wastewater. These chemicals used in excess of stoichiometric volumes can adversely affect the process.

System Costs

Three costs are important when considering a waste treatment process:

Capital or First Costs
Chemical treatment systems vary widely in cost. In general, membrane filtration is less expensive than chemical treatment when the daily volume is small to average and more expensive when the flow is large.

Operating Costs
Membrane treatment systems are designed to operate continuously and most have built-in safety devices and controls to permit this. The largest cost is that of operating the process pump in this pressure driven process. Labor costs are limited to cleaning the system, usually weekly, and involve up to one hour of an operator’s time.

Chemical treatment systems can vary widely in their labor requirements. Simple batch systems will have the most labor required while more automated systems will require less labor. Continuous monitoring to ensure effective treatment will also be required. The most significant cost, however, is the purchase of treatment chemicals and sludge disposal. Membrane filtration does not require chemical treatment.

Disposal Costs
Membrane treatment systems create a concentration of the contaminants removed. For instance, in wash water, a fairly common type of waste, a concentrate of oil, dirt and water is formed. The concentrated waste is generally acceptable to waste oil processors who will remove the oil for beneficial reuse. Since at least part of the waste is reused, disposal costs are minimized.

A chemical treatment system ties the contaminants into a sludge consisting of the oil, dirt and treatment chemicals.

Summary
When consideration is being given to the type of treatment system suitable for an application, membrane treatment will operate with less expense. The positive barrier of the membrane creates a security against accidental discharge of contaminants, which is unmatched by any other type of process.