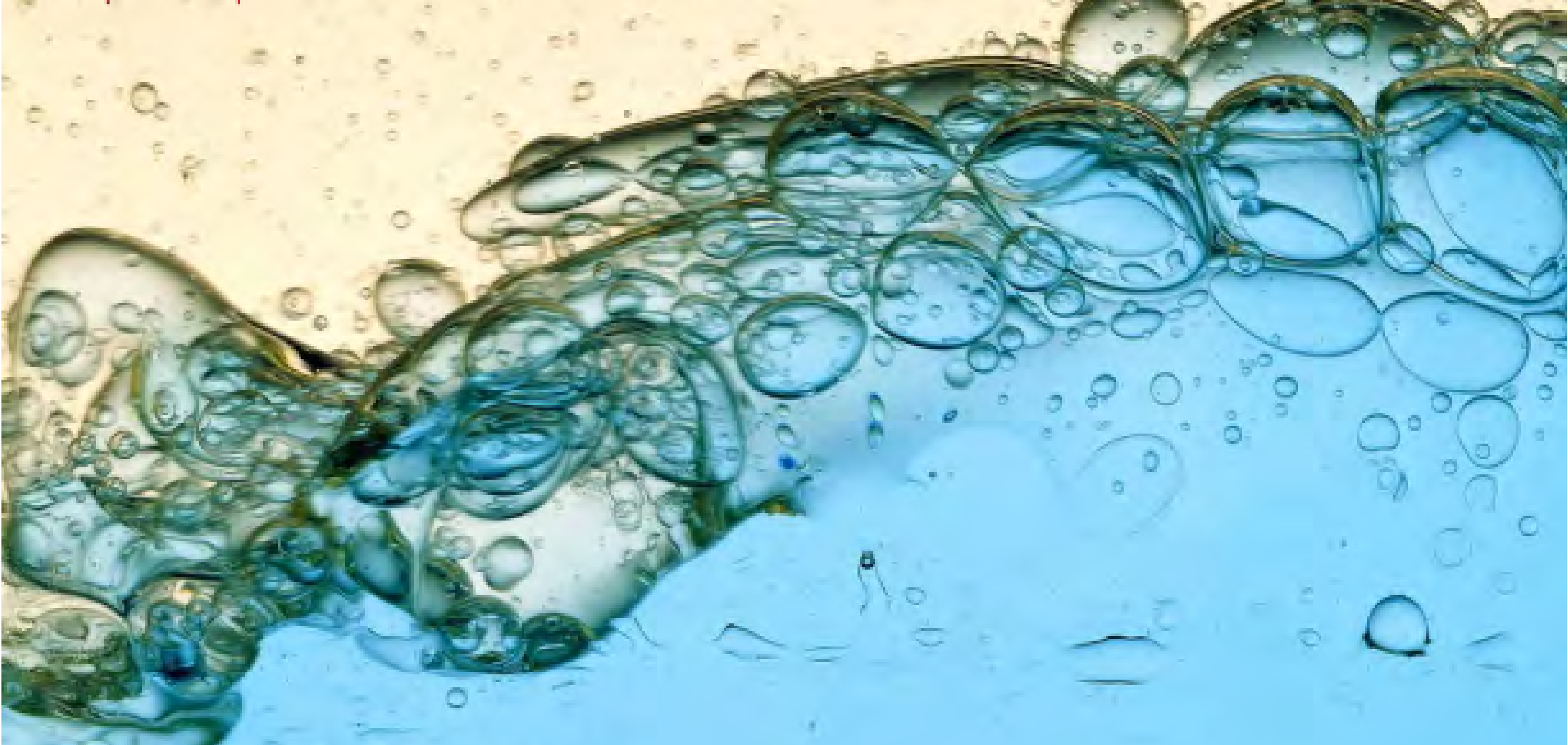
Molecular® Filtration, Inc.



Changing The World One Molecule At A Time®

SEAWATER

Within the world, the continued rise in population, decline in the amount of available natural resources, and increasingly stringent water quality criteria continue to impact the suitability and availability of water supplies. This situation significantly impacts the world and regions in varying ways, such as necessitating expanded raw water, supply capacity and an increased level of treatment on ground water to reduce analytes that, at one time, met now-outdated drinking water standards. Other impacts include the necessity of coastal regions to investigate seawater as an alternative droughtproof resource. The investigation of seawater sources also aids water suppliers with the ability to diversify their water portfolio because other options are too costly, will take too long to implement, or are simply not available. Seawater represents an alternative supply that can be treated to meet the needs of a population while maintaining all Federal, State, and regional water quality requirements.

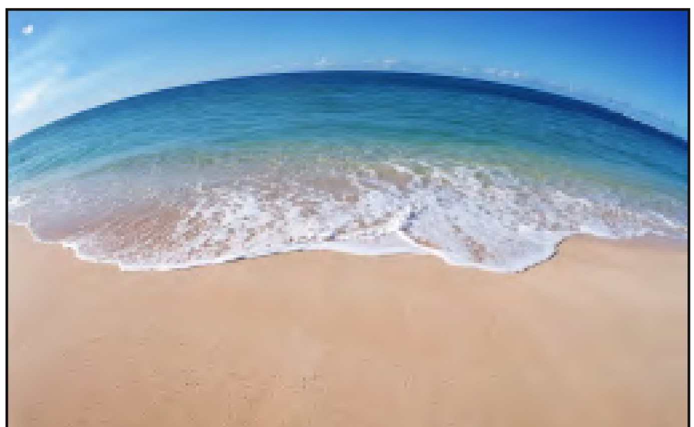
However, as planners, owners, engineers, and investors look towards the various technical and, in some cases, economic costs of implementing this alternative, a variety of information is simply not available domestically to support the multitude of interrelated components that go into seawater desalination projects.

While use of reverse osmosis (RO) for demineralization of seawater has been practiced on a wide scale for approximately two decades, potable applications within the United States have been limited in number and capacity.

Cost has always been the key component in the development of seawater treatment facilities, and many applications have typically been in areas of the world with very low power costs or where there was no other reasonable potable water alternative. As a result, costs were absorbed based on the absence of other alternatives.

However, as costs for RO treatment decrease due to efficiency improvements, and the need for alternative water supplies increases, the level of interest for seawater desalination continues to grow significantly.

Key considerations associated with desalination efforts include identification of an optimal intake location and a correspondingly appropriate pretreatment process. These two factors have far-reaching implications and a direct impact on costs and operational sustainability of seawater treatment plants.



"Pretreatment considerations represent a critical factor in determining project viability and costs"

Seawater Pre-treatment
Key for efficiency and safety

Molecular Filtration technology will change the way pre-treatment is done on seawater, by truly filtering at the molecular level at high flow rate outputs. It is designed to remove and reject bacteria and all low molecular weight organic components that will be present in the water. Especially the ones of hydrocarbon origin that will damage irreversible most of the reverse osmosis membranes and bio-fouling distillation equipment.

Because of its super nanotechnology capabilities to reject organics at the molecular level

"Molecular Filtration is setting a new standard in the seawater pre-treatment industry"

Designed to handle seawater with no bio-fouling effect on its organophobic ceramic membrane, the life span of the ceramic membrane will make a long term return on investment, insuring the safety and quality of the filtration process.

What makes us different?

How a conventional ceramic membrane is manufactured?

Several companies have developed inorganic ceramic membranes for ultrafiltration, microfiltration and nanofiltration. These micro-porous membranes are made from aluminum, titanium or silica oxides. Ceramic membranes have the advantages of being chemically inert and stable at high temperatures, conditions under which polymer membranes fail.

Size Exclusion - Definition:

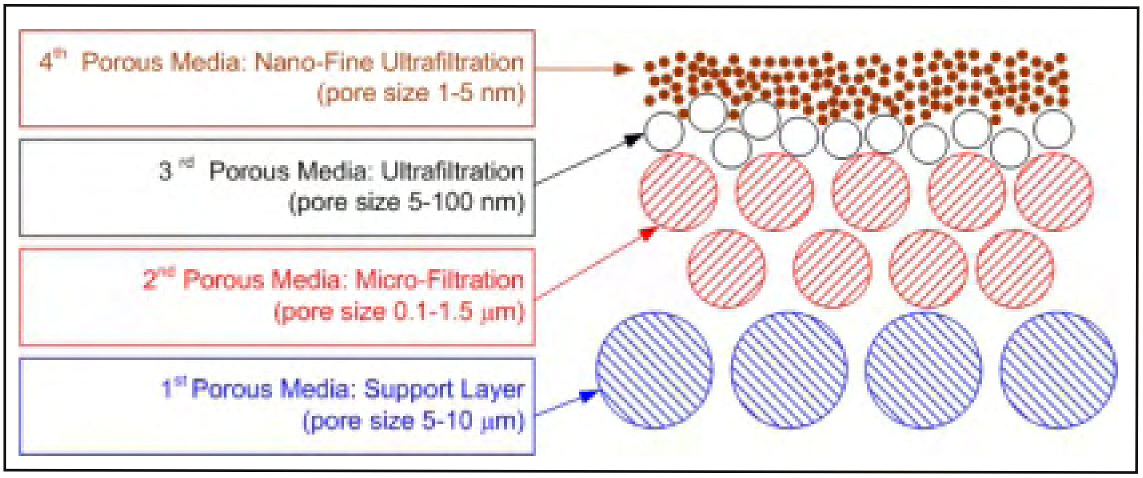
Size-exclusion is a method in which molecules in solution are separated by their size, not by molecular weight.

Convential Ceramic Membranes:

Convential ceramic membranes work by the principal of size exclusion, which means they can only separate molecules in solutions by their size, not by molecular weight or any other property.

The simple fact of size exclusion gives room to biofouling by the small size of other molecules present in the solution.

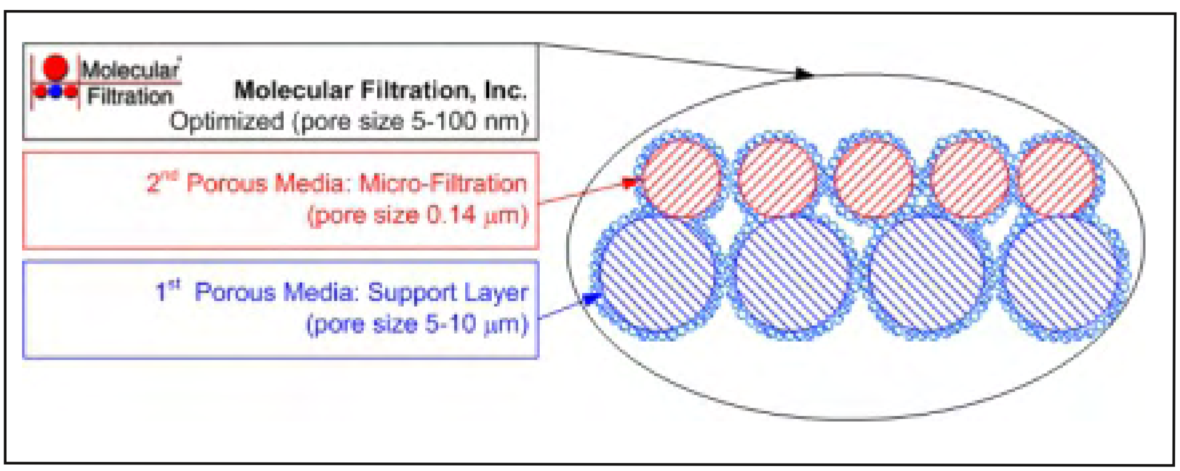
The principal of size exclusion in the conventional ceramic membrane is defined by the last layer built on the the membrane. Hence, molecules are separated by their size, not by their molecular weight or any other property.



Convential ceramic membrane layers

Molecular Filtration A true molecular filter!

Molecular Filtration, Inc. developed and patented the first organophic inorganic ceramic membrane for filtration at the molecular level. With its unique patent technology, Molecular Filtration, Inc. made possible the filtration process based on molecular weight and the inherent properties of the molecules to be separated. What is more important, it made possible to customize specific separations due to the composition of the molecules present on the stream,



targeting the non desired component and allowing the desired component to cross the membrane. The unique properties of our membranes allow the separation of solvents and organic componets as benzene, xylene, tolune, with minumum transmembrane pressure and no heat.

Recycling... more than just a good IDEA!

Recycling is one of the easiest, most tangible ways of taking action for the planet. It's a visible demonstration of caring and conservation, and it sets a positive example for children, families and communities.

Recycling is a feel-good activity… but does it actually help the environment?

You bet it does!

WATER RECYCLING AND REUSE:

THE ENVIRONMENTAL BENEFITS

"Water recycling is a critical element for managing our water resources. Through water conservation and water recycling, we can meet environmental needs and still have sustainable development and a viable economy."

What Is Water Recycling?

While recycling is a term generally applied to aluminum cans, glass bottles, and newspapers, water can be recycled as well.

Water recycling is reusing treated waste water for beneficial purposes such as agricultural and landscape irrigation, industrial processes, toilet flushing, and replenishing a ground water basin (referred to as ground water recharge).

Water is sometimes recycled and reused on site; for example, when an industrial facility recycles water used for cooling processes, a common type of recycled water is water that has been reclaimed from municipal wastewater, or sewage.

The term water recycling is generally used synonymously with water reclamation and water reuse.

Through the natural water cycle, the earth has recycled and reused water for millions of years.

Water recycling, though, generally refers to projects that use technology to speed up these natural processes. Water recycling is often characterized as "unplanned" or "planned."

Mastering Water recycling in the Oil & Gas Industry

WATER - OIL & GAS INDUSTRY

Significant quantities of water—primarily for processing and cooling— are needed to produce fuel. Refineries use about 1 to 2.5 gallons of water for every gallon of product, meaning that the United States, which refines nearly 800 million gallons of petroleum products per day, consumes about 1 to 2 billion gallons of water each day to produce fuel (USDOE, 2006).

Water used to be seen as a low-cost resource to refineries, and was used inefficiently. However, as the standards and costs for wastewater treatment increase and the costs for feedwater makeup increase, the industry has become more aware of water costs. In addition, large amounts of energy are used to process and move water through the refinery. Hence, water savings will lead to additional energy savings.

Oil Field & Refining Processes and Wastewater Sources

Emulsions

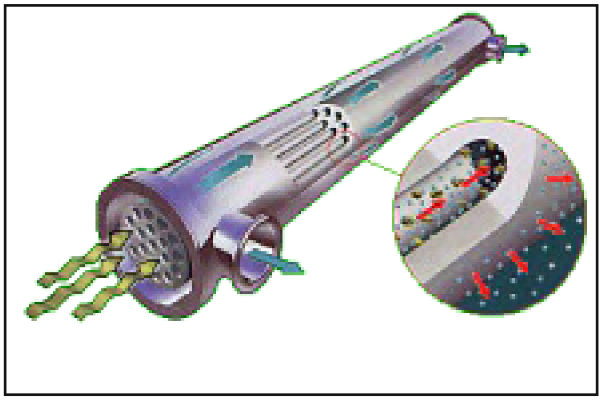
"By far the most complicated, time consuming and energy intense process in the oil and gas industry"

Separation of Water From Oil: The production of water with oil continues to be a problem for engineers and the oil producers. Since 1865 when water was coproduced with hydrocarbons, it has challenged and frustrated the industry on how to separate the valuable from the disposable. Innovation over the years has led from the skim pit to installation of the stock tank, to the gunbarrel, to the freewater knockout, to the hay-packed coalescer and most recently to the Performax Matrix Plate Coalescer, an enhanced gravity settling separator. The history of water treating for the most part has been sketchy and spartan. There is little economic value to the produced water, and it represents an extra cost for the producer to arrange for its disposal. Today oil fields produce greater quantities of water than they produce oil. Along with greater water production are emulsions and dispersions which are more difficult to treat. The separation process becomes interlocked with a myriad of contaminants as the last drop of oil is being recovered from the reservoir. In some instances it is preferable to separate and to remove water from the well fluid before it flows through pressure reductions, such as those caused by chokes and valves. Such water removal may prevent difficulties that could be caused downstream by the water, such as corrosion which can be referred to as being a chemical reactions that occurs whenever a gas or liquid chemically attacks an exposed metallic surface. Corrosion is usually accelerated by warm temperatures and likewise by the presence of acids and salts. Other factors that affect the removal of water from oil include hydrate formation and the formation of tight emulsion that may be difficult to resolve into oil and water. The water can be separated from the oil in a three-phase separator by use of chemicals and gravity separation. If the three-phase separator is not large enough to separate the water adequately, it can be separated in a free-water knockout vessel installed upstream or downstream of the separators.

Separation of Water from Oil at the Molecular Level:

Molecular Filtration

With the invention of Molecular Filtration, Inc. organophobic ceramic filters, filtration at the molecular level became a reality and now separation of water from oil is as simple as feeding the water oil emulsion and separating the components into two define streams.



By the principal of cross filtration at high flow velocity, the organophobic membranes patented by Molecular Filtration, Inc. will reject the organics of hydrocarbon origin allowing the water to cross (permeate) the membrane.

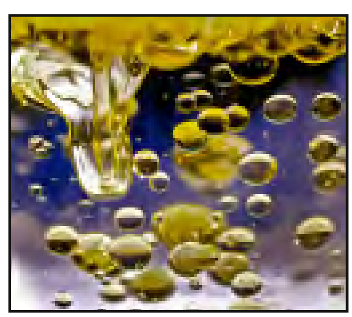
Refining Processes and Wastewater Sources

The desalter: The desalter water is a major source of contaminated wastewater and a source of hydrocarbons as oil undercarries to the extent that emulsions are not completely broken.

Surfactants: Surfactants entering the refinery wastewater system will increase the amount of emulsions and sludges generated. Surfactants are one of the Pollutants of Concern because of their potential to pose a toxicity threat to aquatic organisms and to the biomass in activated sludge treatment processes and because they can interfere with the settling processes in wastewater treatment systems. Surfactants are used in various cleaning and washing operations and in high end point gasoline treating operations. Although surfactants are necessary for refining operations, refiners recognize the need to control surfactant use more closely.

Benzene: Benzene is one of the Pollutants of Concern.

Hydrotreating: Wastewater generally originates in the fractionation of the treated product stream. Stripping steam condensed in the product stripper reflux drum is the primary source of wastewater. The wastewater stream is usually alkaline and contains suspended solids, ammonia, and H_2S. It may contain phenols if the feed to the unit includes cracked products. Flow rates vary from unit to unit but are on the order of one gallon per barrel of feedstock to the unit.



Hydrocracking: Wastewater from hydrocracking is often similar to that described above for catalytic cracking in that it contains products released from cracking heavier cuts of petroleum. Flow rates are lower than in a typical FCCU since there is less steam used in the process. They are generally on the order of 2 gallons per barrel of feed.

Catalytic Reforming: The process wastewater from a catalytic reformer is typically a very small stream since the naphtha feedstock has been hydrotreated and pre-fractionated. The effluent produced generally contains negligible quantities of phenols and H2S broken.

Isomerization: Isomerization typically produces an acidic wastewater stream that is relatively high in dissolved solids (chlorides). Since the feed to the unit must be desulfurized, the wastewater is low in H2S and ammonia. Flow rates are usually very low.

Coking: Coking units produce wastewater that is usually alkaline and contains high levels of suspended solids (coke fines) along with ammonia and H2S. COD loads are typically high. Water use is high in delayed coking units, in which steam is fed to a coke drum to remove hydrocarbon vapors at the end of the coking cycle after which the coke drum is filled with water to cool the contents. High-pressure water jets are then used to cut out the coke. However, much of this water is recycled within the unit, and typical wastewater flow rates from the unit may be on the order of one gallon per barrel of feed.

Visbreaking: The visbreaking process yields a wastewater stream that is alkaline and that contains high levels of ammonia, H2S, phenol, and suspended solids. It also represents a significant source of BOD and COD.
Flow rates are on the order of two gallons per barrel of feed to the visbreaker. The source of wastewater is primarily stripping steam condensate.

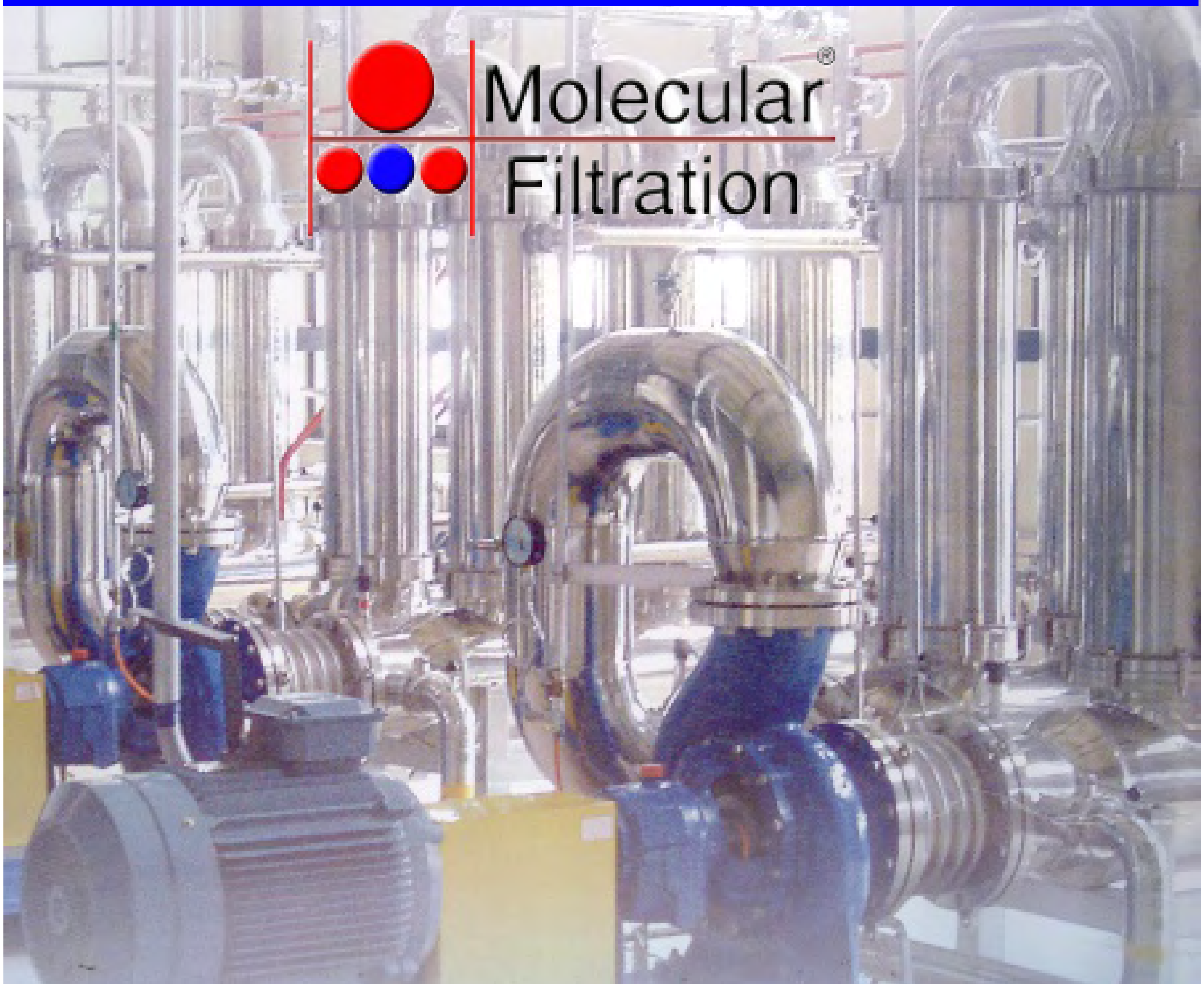
Alkylation: The alkylation unit produces an acidic wastewater stream with significant levels of dissolved and suspended solids and COD. Minimal quantities of H2S, ammonia, and phenols are usually present.
Wastewater from a sulfuric acid alkylation unit will contain spent sulfuric acid.

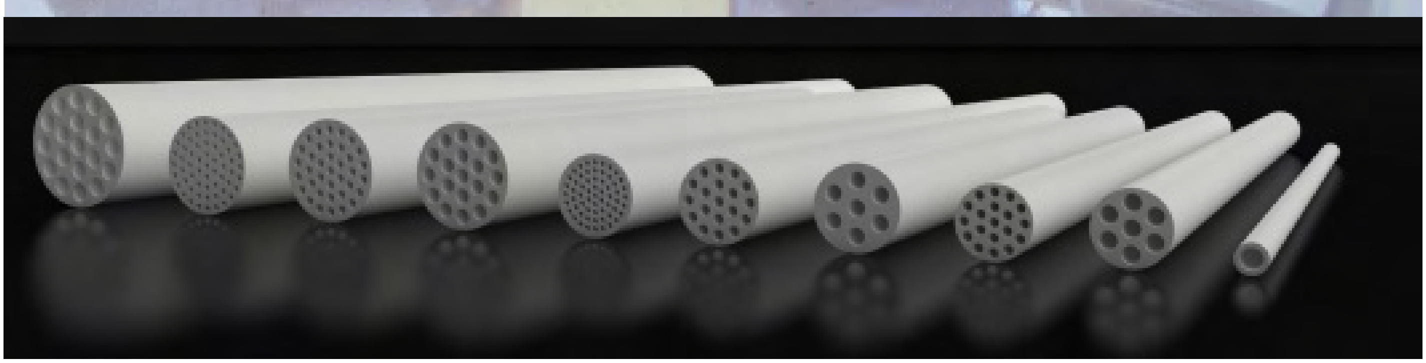
Polymerization: Wastewater from the polymerization process is alkaline and contains ammonia, H2S, and mercaptans. Flow rates are minimal.

Light Ends (Vapor) Recovery: Gases from the crude unit contain varying quantities of water in the form of steam condensate due to the use of live steam in the crude distillation process. Depending upon the quantity of steam used in the crude unit and the degree of condensate collection and removal in the crude unit overhead, the light gases sent to gas recovery will have more or less water to be removed and blown down from the light ends recovery operation.

Residual Upgrading: To the extent that live steam stripping is employed in the process, condensate from the solvent stripper overhead is routed to the sewer system. The quantity depends on the type of upgrading technology employed. The organics content of this stream will be relatively high.

DIVIDE AND CONQUER





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