New Membrane Technology Demonstrating Enhanced Long Term Fouling Resistance for UF Water Filtration using Kynar® Durable Hydrophilic PVDF

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Membrane water filtration is a critical technology throughout the world to help provide clean drinking water, as well as treating waste water for reuse. Hollow fiber membranes serve a major part of this market due to advantages in surface area per unit volume. PVDF hollow fiber membranes dominate in many water treatment applications due to their excellent ductility, durability and chemical resistance to chlorine oxidant cleaning chemicals.

For all membranes, a persistent challenge is both reversible and irreversible fouling. Membrane fouling creates the need for require regular backwashing and chemical cleaning intervals. The cost of membrane cleaning, and system downtime during cleaning, affect both system OPEX (cleaning chemicals, energy) as well as CAPEX (need for greater installed capacity). Membrane system and operational costs are a major hurdle to greater adoption of membrane technology.

Current PVDF membranes often incorporate hydrophilic additives, such as polyvinylpyrrolidone, to improve fouling resistance and flux recovery after backwashing and cleaning. However, these additives are susceptible to degradation by typical hypochlorite cleaning chemicals. Over the lifetime of these membranes, hydrophilicity is lost due to degradation of the hydrophilic additives and the membranes become more susceptible to irreversible fouling. By the end of their life cycle, these modules require more frequent cleanings, reducing their productivity.

Arkema has developed a new breakthrough technology to create a durable hydrophilic PVDF membrane which maintains strong anti-fouling properties throughout the life of a membrane module. We carried out fouling performance tests to compare this new PVDF membrane technology against samples of commercial PVDF hollow fiber membranes obtained from pressurized modules. In the lab scale mini module testing, we compare membrane fouling performance before and after sequential chlorine exposures (to chemically "age" them) up to 1 million ppm-hrs to simulate many years of cleaning cycles.

Our results show clear improvement in retained flux and reduced irreversible fouling through 1 million ppm-hours of chlorine exposure. Improved flux retention is on the order of 20 – 30% vs commercial PVDF membranes. This improvement in retained flux will have direct impact on system OPEX and could potentially allow for CAPEX reduction by use of reduced membrane area.

We will present our developments with this unique low fouling Kynar® PVDF resin in hollow fiber membranes, including recent field trial performance results.