



ADVANCED SHIPBOARD  
DESALINATION:  
THE BEGINNING OF  
MECO *smart*ANALYTICS™



## **ADVANCED SHIPBOARD DESALINATION: THE BEGINNING OF MECO *smart*ANALYTICS™**

Conventional shipboard desalination plants are plagued by fouling in coastal or littoral waters that necessitates the replacement of filters every few days and membranes every few months, adversely impacting reliability and the logistics tail associated with replacement parts. They are not able to run reliably in harbors or very dirty littoral waters. Even under ideal conditions, they are usually manned by operators who monitor performance and make adjustments as needed for changing conditions in feed water supply and plant performance parameters. The maintenance interval of conventional plants can be significantly extended and the operational availability can be increased with advancements in technology.

Funding was provided by the Office of Naval Research (ONR) Future Naval Capability Program for the development of advanced shipboard desalination systems. The multiyear program beginning in 2012 provided the starting point for two new designs of desalination plants using advanced membrane technology combined with data analytics. The MN-4 and MN-100 are rated at 4,000 GPD and 100,000 GPD respectively. The MN-100 has the capability to produce not only drinking water but also ultra-pure water for special purposes, such as electronics cooling and turbine injection. The MN-100 and the MN-4 are designed to eliminate or significantly minimize sailor involvement related to normal operation and maintenance.

Reliable operation with maximum online availability and minimal sailor involvement is largely a function of good membrane performance. The membrane performance, in turn, is influenced by a number of factors, including seawater temperature, salinity and turbidity. Variations in feed water characteristics can have an impact on a number of operating parameters, including pressure, water quality, production rate and membrane fouling.



**MECO Advanced Seawater Desalination Unit - 100,000 GPD**  
**United States Navy Office of Naval Research**

The ONR program provided the platform for the development of MECO *smart*ANALYTICS™ such that it can now be applied to industrial water purification systems. The new units were designed to be highly automated with the capability to adapt to changing conditions, optimizing operation continuously and eliminating the need for routine operator intervention. Consumable filters were eliminated in favor of chlorine-tolerant membranes that retard fouling and are automatically backwashed based upon the plants' needs.

The result is the elimination of downstream particulate and biological fouling of desalination membranes. The MN-4 produces twice the output of traditional machines within the same space and weight. Both the MN-4 and the MN-100 use electricity for power and are highly energy efficient, reducing energy consumption over existing technology by 75 percent and 98 percent, respectively. Another attribute is an increase in freshwater recovery without adding chemical pretreatments, resulting in a reduction of seawater feed flow to the machines. The MN-4 improves freshwater recovery by 40 percent over typical shipboard membrane systems. The MN-100 reduces feed water consumption by 90 percent over existing distillation technology. Constructed principally of titanium and high-alloy stainless steel, the machines are relatively lightweight and are corrosion and fire resistant.



MECO *smart*ANALYTICS™ is a data profiling and analytics tool that connects and analyzes the components of a MECO water purification plant to improve operational efficiency and reliability. The data collected is profiled against our operating standard design and other plants in the field. MECO *smart*ANALYTICS™ enables MECO to ensure that each plant is operating in the most optimal and cost-advantageous manner.