

## Western Water and Power Solution Bulletin

Research and Development Office — Denver, Colorado

Bulletin No. 29  
September 2011

### Automated Filter Plugging Analyzer Measures Silt Density Index

*New device provides continual information on the concentration of suspended sediment in desalination plant feed water*

#### What Is The Problem?

Membrane desalination treatment processes (e.g., reverse osmosis and nanofiltration) use semi-permeable membranes with extremely fine pores that are prone to surface fouling from materials in the feed water that attach to the membrane surfaces. Even partially fouled membranes have significantly lower treatment efficiency from decreased flow, higher operating pressures, and increased power requirements. For water desalination plants, pretreating feed water is almost always required to reduce the potential for filter plugging. Monitoring fouling potential parameters is needed to verify adequate pretreatment and to allow for timely operating decisions to maximize plant efficiency.

At many desalination plants, samples of pretreated feed water are analyzed periodically to measure fouling potential. The water's silt density index (SDI) is usually measured either by using a manual conventional plugging factor or SDI measurement devices. These methods are labor intensive, costly, and prone to error. Moreover, it is impractical to perform more than a limited number of tests per day.

#### What Is The Solution?

Reclamation has collaborated with Chemetek LLC to develop an automated filter plugging analyzer (FPA) that continuously monitors the SDI for up to four feed water sources sequentially. The FPA uses the highly sensitive standard for measuring SDI (ASTM 4189-07). SDI values for feed water correlate with the fouling tendency of suspended sediments and large organic materials and the plugging tendency of desalination filters.

#### Who Can Benefit?

The FPA is fully automated and requires much less maintenance than other commercially available SDI monitoring equipment. Its computer control system with graphical interface provides on-line data analysis capabilities. The measurement and control portion of the analyzer was developed by Chemetek LLC for the semiautomatic model FPA-3300 and then adapted for the automated model under design. This new device will be marketed to users and suppliers of desalination treatment equipment. It will fulfill a growing need in industry and government desalination water treatment plants to monitor and control feed water quality.

#### Where Have We Applied This Solution?

The FPA prototype shown at right was developed at Chemetek LLC's facilities and was then tested at Reclamation's Water Quality Improvement Center (WQIC) in Yuma, Arizona. It was

developed by combining the mechanical portion of Reclamation's automated FPA with Chemetek's semi-automatic SDI monitor. Prototype testing that began in 2003 has been successfully completed with the prototype operating reliably with over 100,000 tests registered on the analyzer's test counter. Chemetek LLC is working to market this moitor. The latest version (FPA 5500) is in final design for production and marketing.

In early 2010, Reclamation awarded a \$1,040,929 contract to Chemetek LLC under the American Recovery and Reinvestment Act of 2009 (ARRA). Chemetek LLC has supplied 24 FPA devices for use at Reclamation's Yuma Desalting Plant and WQIC.



Filter plugging analyzer.

#### Future Development Plans

Future plans are to market the commercial-level unit now supplied to Reclamation under the ARRA contract.

#### More Information

Information on the standardized SDI test is available at: <http://www.astm.org/Standards/D4189.htm>.

#### Contact Information

Chuck Moody, Reclamation Technical Service Center  
(303) 445-2258 [cmoody@usbr.gov](mailto:cmoody@usbr.gov)  
John Kaakinen, Chemetek LLC  
(503) 730-6117 [kaakinen@pacifier.com](mailto:kaakinen@pacifier.com)

#### Collaborators

Reclamation's Science and Technology Program, Lower Colorado Region, and Yuma Area Office, as well as Chemetek LLC.