

## Western Water and Power Solution Bulletin

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### Reverse Osmosis Pretreatment Using A Slow Sand Filter

*Costs of Water Desalting Process Reduced by 20% with Slow Sand Filter Pretreatment*

#### What Is The Problem?

Desalting of water is an expensive, complex process, and pretreatment can be a significant contributor to these high costs. Pretreatment of water to be desalted typically requires large amounts of chemicals. This increases treatment costs three ways: (1) the chemicals must be purchased and delivered, (2) the chemicals may foul the desalting membranes reducing their length of operation, and (3) these chemicals contribute to the waste stream after the water has been treated.

#### What Is The Solution?

Many conventional plants use slow sand filtration facilities during the water treatment process. This method can also be used to treat water to be used in the reverse osmosis desalting procedure. Slow sand filtration is a highly effective way to treat water prior to filtering it through reverse osmosis desalting equipment. It is widely recognized as a low cost, low labor, and chemical-free process.

Slow sand filtration has been labeled incorrectly as “old technology” because it has been in use since the early 19<sup>th</sup> century. Most modern water treatment plants utilize rapid sand filtration because it processes more water using less time and space. However, slow sand filtration is able to provide high quality water under differing circumstances. It is uncomplicated, economical, and consistent. Slow sand filters are still in use in some major world cities.

Slow sand filtration is uniquely applicable as a water treatment process in low-tech situations where land is available and inexpensive, such as rural communities, Native American communities, and developing countries. As a process to pretreat water for use in desalination, slow sand offers the potential of saving 20-30% in treatment costs, largely because of the reduced chemical purchase/disposal costs. In the age of enhanced security, slow sand also offers the advantage of being chemical free. If the chemical delivery schedule is disrupted, the slow sand filter continues to operate while conventional rapid sand systems, without coagulation chemicals, must shut down.

#### Who Can Benefit?

Public sector managers and water treatment professionals looking for a low-cost way to pre-treat water for the desalting process could find slow sand filtration an excellent choice.

#### Where Have We Applied This Solution?

Two pilot tests evaluating slow sand filtration as a pretreatment for water desalting have been completed by Reclamation. The first test was completed in 2002 at the Twin Peaks Pumping Plant Complex near Tucson, AZ. The second set of tests, begun

in 2006, is in progress at Reclamation’s Water Quality Improvement Center (WQIC) in Yuma, AZ.

#### Future Development Plans

Because filter cleaning represents 60% of the cost of slow sand filter operation, cleaning technologies are being evaluated. Finally, to attempt to further reduce the cost of slow sand technologies, and improve environmental conditions, sand from Reclamation’s ongoing Colorado River dredging operations will be tested to determine if it is appropriate for use in these filters.



Slow sand filter pilot testing at Reclamation’s WQIC

#### More Information

Reports on the pilot testing discussed above are available at: [http://www.usbr.gov/pmts/water/publications/reportpdfs/report09\\_0.pdf](http://www.usbr.gov/pmts/water/publications/reportpdfs/report09_0.pdf) and <http://www.usbr.gov/research/science-and-tech/research/results/SlowSandFilterReport.pdf>

A good summary of slow sand filter technology and general applications can be found at: [http://www.nesc.wvu.edu/ndwc/pdf/OT/TB/TB14\\_slowsand.pdf](http://www.nesc.wvu.edu/ndwc/pdf/OT/TB/TB14_slowsand.pdf)

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#### Collaborators

Reclamations Science and Technology Program, Title I Salinity Control Research Program and the Lower Colorado Regional Office