

Western Water and Power Solution Bulletin

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Slow Sand Filter Treatment of Surface Water for Municipal Use

Municipal Water Treatment Costs Using Slow Sand Filter One-fourth That of Conventional Treatment

What Is The Problem?

The 1996 amendments to the Safe Drinking Water Act required the Environmental Protection Agency to establish an Interim Enhanced Surface Water Treatment Rule to specifically address disease-causing organisms in municipal drinking water. This interim rule established filtering and monitoring requirements for water treatment systems serving more than 10,000 people, but excluded smaller systems. In January 2002 the EPA finalized the Long Term 1 Enhanced Surface Water Treatment Rule which establishes filtering requirements for the previously excluded smaller systems.

Suddenly, small municipal water providers were required to address water filtering requirements as part of their treatment processes. Traditional rapid sand filtering and other techniques used in large treatment systems may not be feasible for many small systems. For example, rapid sand filters are quite technical, requiring large quantities of chemicals and highly trained operators. The chemicals are expensive, and are sometimes in short supply for small municipal systems.

What Is The Solution?

Slow sand filtering has been in use since the early 19th century for various water treatment applications, including municipal treatment, and is still in use in many 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 small or rural communities, Native American communities, and developing countries. It is widely recognized as a low cost, low labor, and chemical-free process. Slow sand filtration is able to provide high quality water under differing circumstances. It is uncomplicated, economical, and consistent.

Slow sand systems require relatively large land areas generally not available in densely populated cities. In the age of enhanced security, slow sand 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.

In a pilot investigation conducted near Marana, Arizona, Reclamation found that slow sand filtering cost approximately one-fourth that of conventional rapid sand filtering, microfiltration, or ultrafiltration.

Who Can Benefit?

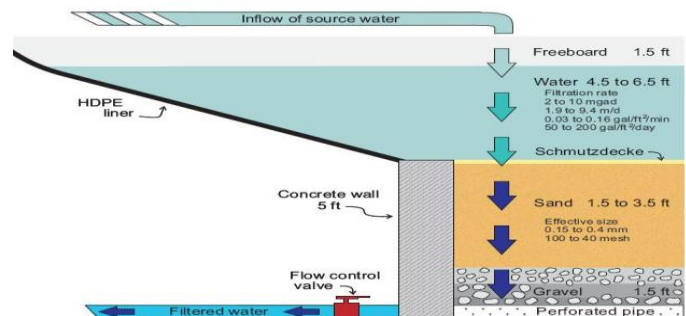
Public sector managers and small system water treatment professionals looking for a low-cost way to comply with federal filtering requirements many find slow sand an attractive option.

Where Have We Applied This Solution?

Slow sand filtration pilot studies are ongoing at Reclamation's Water Quality Improvement Center (WQIC) in Yuma, Arizona. Reclamation also participated in the previously mentioned pilot studies near Marana, Arizona during 2000 to 2002, to demonstrate the appropriateness of slow sand filtering of Colorado River water.

Future Development Plans

Because filter cleaning represents 60% of the cost of slow sand filter operation, cleaning technologies are being evaluated. Also, filter sand requirements are being analyzed in an attempt to further reduce the cost of slow sand technologies. For example, sand from Reclamation's ongoing Colorado River dredging operations will be tested to determine if it is appropriate for use in the filters at the WQIC.



Cross sectional view of a typical slow sand filter

More Information

Reports on the pilot testing discussed above are available at: 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

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Collaborators

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