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Tapping Into High-Nitrate Groundwater Sources to Supplement Municipal Water Supplies

By Frank DeSilva
National Sales Manager, ResinTech, Inc.

Cities throughout the Southwest have found that next-generation ion-exchange technologies provide a reliable, economical, ready-made way to leverage local groundwater resources without the expense of a hard-piped treatment facility or the problems of dealing with waste management.

The entire Southwest is facing a severe shortage of water. Years of drought have reduced the availability of surface water, and the long-term use of chemicals related to agriculture and manufacturing have contaminated the groundwater supply. Nitrate contamination alone has shut down more than 10,000 wells in the United States.

Yet, the region keeps demanding more water, to quench the thirst of an ever-expanding population. Between 1990 and 2000, Arizona experienced a 40 percent population growth rate, three times the national average. This unparalleled growth shows no sign of slowing; in Southern California, the population is expected to grow by six million people over the next 20 years.

Providing an adequate supply of safe, clean drinking water to the community is an ongoing challenge faced by today's Southwestern water agencies and cities.

Approaches to nitrate removal

Technologies traditionally used to remove nitrate are ion exchange, electrodialysis reversal, and reverse osmosis. However, two of these technologies, electrodialysis reversal and reverse osmosis, carry a heavy penalty: high waste rates, often exceeding 25% of the influent. Water agencies using these technologies are forced to throw away a considerable amount of water, and deal with a considerable amount of waste.

For this reason, ion exchange has become the preferred technology for nitrate removal. Conventional ion exchange technologies have waste rates of 3-10%, a significant advantage over the alternatives. But, there are improved ion exchange technologies currently available, which have waste rates in the 0.2-0.6% range. That can translate into *tens of millions of gallons* of additional water production, to say nothing of dramatically reduced costs associated with waste management.

New technologies offer advantages to cities

One of the leading innovators in next-generation ion exchange technologies is Basin Water, Inc. This company, founded and headquartered in Southern California, holds several patents on its proprietary multiple-bed ion exchange technology and simulation software.

Because of the low energy requirements and low waste rates generated by Basin Water's technology (often a full order of magnitude lower than conventional ion exchange systems), their treatment units can be installed in remote locations, right at the wellhead. These are full-scale facilities, producing thousands of gallons of drinking water per minute for the communities they serve. The installations offer excellent case studies showing how to use new technologies to reclaim previously lost groundwater resources.

Here's how two different water agencies used next-generation ion exchange technology to reactivate wells and ensure a reliable, safe source of drinking water for their customers.

California Water Service Company

California Water Service Company, the second-largest investor-owned water utility in the U.S., supplies water to the City of Salinas, California, serving a population of roughly 150,000 people.

Extensive nitrate contamination from agricultural chemicals forced California Water Service Company to shut-in more than half its wells. And, making a bad situation worse, no alternative source of water is available.

Beginning in 2002, Basin Water installed four wellhead nitrate removal systems in Salinas, each system designed to treat 1000 gpm, with two more being installed this year. Nearly 50% of the water being used in Salinas will be treated using these nitrate removal units.

The treatment facilities returned to service wells that had been shut-in for an average of 15 years. The systems have been running smoothly, allowing California Water Services Company to tap into its groundwater resources again to meet growing demand.

California Water Service Company
1100 GPM Nitrate Removal Unit
Jim Luongo –
Superintendent of Production

City of Pomona

The City of Pomona covers nearly 23 square miles, and serves a population of approximately 156,600 people. As early as 1992, the City looked to ion exchange technology, building a centralized nitrate removal facility producing more than 15 million gallons of drinking water per day.

However, when the need arose in 2002 to add additional nitrate treatment capacity, the City of Pomona selected the new, high efficiency units provided by Basin Water.

Here, the waste rate figures are telling. The older facility, based on conventional ion exchange technology, has a waste rate of 5-7%. The Basin Water wellhead system, using a patented multi-bed technology, effectively removes nitrates with a waste rate of 0.38%. That's less than 1/15th the waste of the conventional ion exchange system, revealing how highly efficient this newer technology is in actual field use.

"Basin Water's nitrate removal technology creates over 90% less waste than our current conventional treatment plant" says Jim Taylor, Water/Wastewater Operations Manager for the City of Pomona. "That's a significant savings for the City of Pomona!"

Energy consumption is lower too, leading the City of Pomona to estimate that they save $150 per acre foot by treating their own local groundwater instead of buying imported water.

As for reliability, one senior City engineer associated with the project reports that the system has been running "flawlessly."

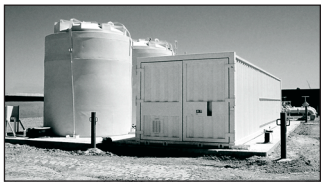
City of Pomona
1000 GPM Nitrate Removal Unit

Other nitrate removal installations using wellhead treatment

There is extensive field experience in the use of wellhead nitrate removal systems.

Basin Water wellhead treatment for nitrate removal is currently being operated by American States Water, East Valley Water District, High Desert Water District, the City of Pomona, and California Water Service Company, to name a few.

In Arizona, the cities of Avondale and Goodyear have operated nitrate removal units. In 2003 the City of Avondale installed a 1000 gpm nitrate treatment unit on well 8. This system was installed in four weeks and helped the City of Avondale provide water during the peak summer and fall months. In 2004, the City of Avondale installed a new 2000 gpm nitrate removal/blending facility at well 8A. They recently followed this with the selection of Basin Water to supply a second 2000 gpm nitrate removal/blending facility at the Northeast pump station site.



City of Avondale
2000 GPM Nitrate Removal

In an environment where technology is advancing as quickly as regulations change, it's prudent for water agencies to team up with a water treatment partner that is a proven part of the research and development vanguard. This real-world experience and forward-looking expertise helps prevent them from getting stranded with outdated or unreliable solutions, and ensures maximum return on their investment in nitrate removal technologies.

The future of water treatment

With the increasing cost and decreasing reliability of surface water, treatment of high-nitrate groundwater sources will become a priority for Arizona cities and water agencies.

Fortunately, next-generation ion exchange technologies will continue to make groundwater treatment both cost-effective and efficient, ensuring a reliable and affordable source of locally controlled water to meet the needs of growing communities throughout the Southwest.

Article provided by ResinTech, one of the leading independent providers of ion exchange resins for drinking water applications. To learn more about Basin Water, Inc. log on to their website at www.basinwater.com.