



# A drop of innovation

Water conservation is bringing environmental and cost savings to Boeing

By Bill Seil

Photos by Gail Hanusa

**C**onservation-minded Boeing employees are finding creative ways to avoid pouring money down the drain. From 2002 through 2008, the company reduced its water consumption by 40 percent, according to the company's 2009 Environment Report. That's a total reduction of 4.2 billion gallons (15.9 billion liters) for a total savings of more than \$10 million.

That momentum continues as Boeing sites around the United States share water conservation ideas. From 2007 to 2008 alone, enterprise water consumption was reduced by 17 percent.

Spiro Xenos, leader of Shared Services' Water Conservation Initiative, said the recent reductions are impressive because there was no major reduction in company facilities.

"That 2008 percentage reduction—from 2.3 billion gallons (8.7 billion liters) to 1.9 billion gallons (7.19 billion liters)—was quite a lot for one year," Xenos said. "In 2002, we reduced our footprint through major building consolidations. Consequently, we had some comparable reductions in water use. The recent water reductions are due primarily to conservation projects at several sites."

Water and sewer charges account for only 15 percent of the company's total utilities budget, Xenos said. The rest of the budget is energy, which includes electricity and natural gas. That's why so much of the company's conservation investment to date has been devoted to energy—there's more of it and the return on investment is much higher.

But the potential of water conservation started gaining momentum several years ago when new approaches to reducing consumption became available. This included technology that allowed zero liquid discharge from cooling towers, which are part of building cooling systems. Water-saving bathroom fixtures, some already popular in other countries, were evaluated for use in company restrooms. Lawn irrigation in Everett, Wash., was improved, based on more accurate precipitation data. In addition to reducing consumption, methods were found to cut back on wastewater disposal costs.

"While purchasing water is a significant expense, it costs three or four times as much to dispose of it after it is used," Xenos said. "It's not like electricity, where it does its job and that's it. We also have to consider sewage rates and any special processing costs."

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— Spiro Xenos, leader of the Shared Services Group Water Conservation Initiative

Measurement is vital in keeping sewage costs under control. Meters are used to measure water that is lost due to evaporation and irrigation. This way, the company is not charged sewer fees for water that goes elsewhere.

Xenos said water conservation focals at individual sites continue to make steady progress. Facilities located in the U.S. Southwest, including Southern California and Mesa, Ariz., along with other regions with water shortages, have been the most aggressive at implementing conservation measures. Water supplies in the past have also been limited in Houston, as well as some areas in the East, including Huntsville, Ala., and Philadelphia.

"Most sites focus on energy conservation, because that's where the greatest savings can be found," Xenos noted. "But areas that experience frequent droughts, like Mesa and Huntsville, tend to give energy and water the same weight."

Mona Simpson, director of Site Services for El Segundo and Seal Beach, Calif., said Southern California has been experiencing drought conditions that have lowered the level of Lake Mead to less than 67 percent of capacity. Water is expected to be a

matter of serious concern in the region for years to come.

"Our claim to fame in El Segundo has been our retrofit of toilets in all the men's rooms and ladies' rooms," Simpson said. "Understandably, this has led to some humorous comments by employees. But that's good, because it has made the project visible and drawn attention to our commitment to water conservation."

The conversion was conducted over three months, with financial support from the local Metropolitan Water District. Two hundred toilets with dual-flush valves were installed in women's restrooms in 23 El Segundo buildings. Dual-flush valves allow flushers to use less water for liquid waste disposal (pull the lever up) than solid waste disposal (push the lever down). Men's restrooms are also conserving water with the installation of ultra-low-flush toilets. The site also is considering the use of waterless urinals. Overall, it is estimated that the existing toilet conversions will save about 870,000 gallons (3.3 million liters) per year.

Water conservation also is key in a program at the El Segundo site to construct a fully "green" building that is certified under

the Leadership in Energy and Environmental Design, or LEED, program.

El Segundo also has reduced water, sewer and maintenance costs by using new zero-liquid-discharge systems in its building of cooling towers, an approach piloted at Boeing's Kent, Wash., facility. (See related story on Page 50). Boeing's Mesa, Ariz., site is installing a water treatment system to support its cooling tower maintenance processes as well. It is expected to reduce water consumption by 10 million gallons (37.9 million liters) per year, according to Rick McKenney, senior maintenance manager for Mesa Site Services.

Mesa's very hot climate naturally makes water conservation a high priority.

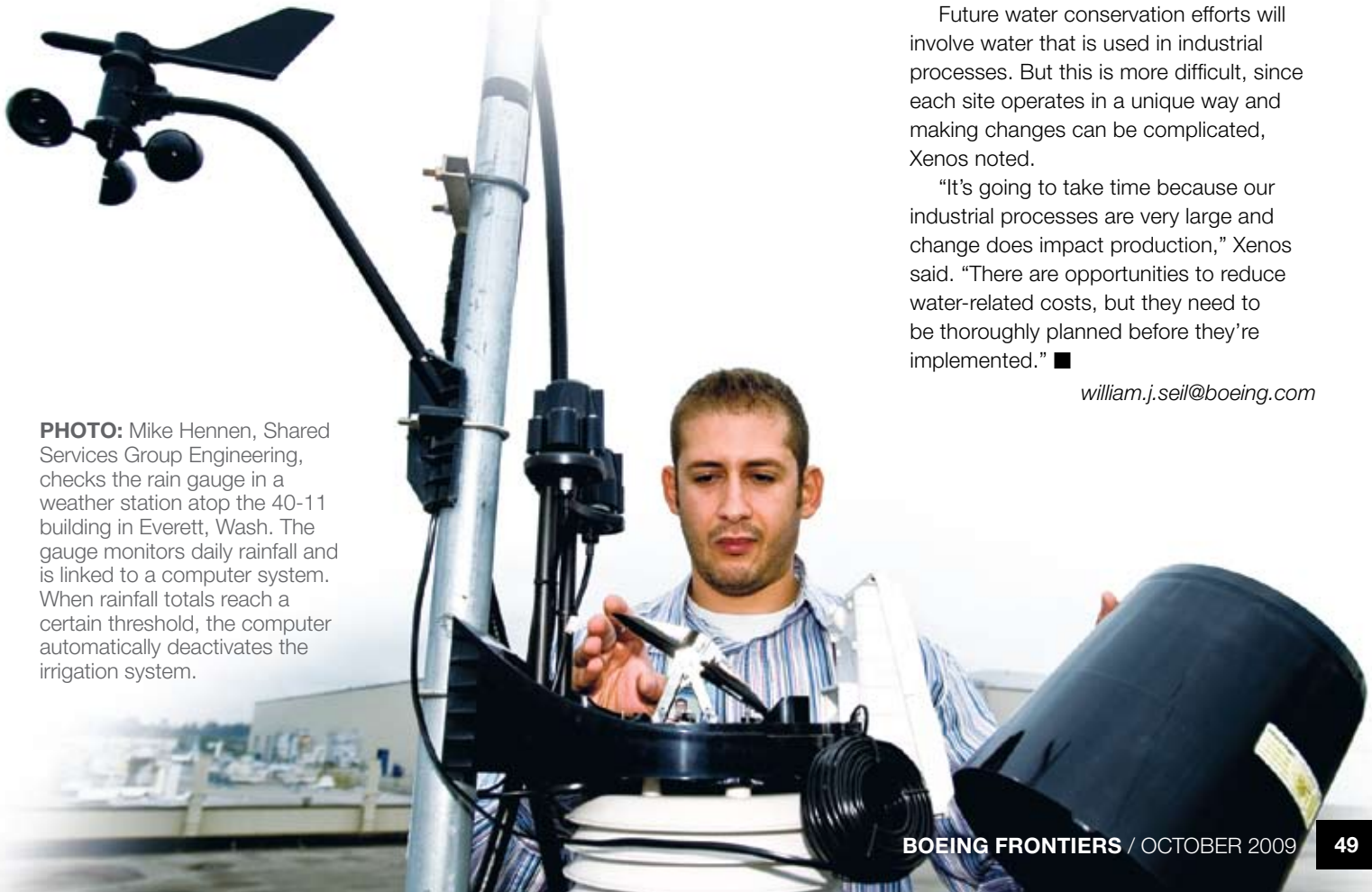
"Evaporation is a big problem here due to the heat," McKenney said. Like El Segundo, Mesa is reducing water consumption in its restrooms through the installation of reduced-flow toilets and aerators to reduce the flow of water from faucets. McKenney credits the site's plumbing team with brainstorming the restroom improvements. They stepped forward because they wanted to contribute to Mesa's conservation cost-containment goals, he said.

Future water conservation efforts will involve water that is used in industrial processes. But this is more difficult, since each site operates in a unique way and making changes can be complicated, Xenos noted.

"It's going to take time because our industrial processes are very large and change does impact production," Xenos said. "There are opportunities to reduce water-related costs, but they need to be thoroughly planned before they're implemented." ■

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**PHOTO:** Mike Hennen, Shared Services Group Engineering, checks the rain gauge in a weather station atop the 40-11 building in Everett, Wash. The gauge monitors daily rainfall and is linked to a computer system. When rainfall totals reach a certain threshold, the computer automatically deactivates the irrigation system.





# A big splash in savings

New water pre-treatment process reduces costs and conserves water

By Kathleen Spicer

**A**t a Boeing building in Kent, Wash., nine cooling towers can support the production of 23,000 gallons (87,000 liters) per minute of chilled water that is used to support critical heating, ventilation and air-conditioning systems.

A conservation initiative by Site Services of Shared Services Group is expected to save 7.6 million gallons (28.9 million liters) a year there, plus eliminate harmful chemicals and significantly reduce maintenance. Similar improvements at Boeing facilities in El Segundo, Calif., are expected to save an estimated 95,000 gallons (356,600 liters) of water a month.

What is a cooling tower and why is this important? A cooling tower works in combination with a chiller to remove heat from the air inside a building and release it to the outside atmosphere. An efficiently operating chilled water system provides air conditioning for offices, labs, fabrication and assembly areas.

Optimizing cooling-tower operations is critical to maximizing a facility's performance and reducing its environmental footprint. No one knows that better than the Site Services teams and councils who sponsored an improvement pilot that resulted in a major step toward saving water, reducing chemical usage, and lowering sewage and maintenance costs.

## FROM RESEARCH TO REALITY

Roger Sampair, SSG lead mechanical plant engineer at Kent said the idea started when looking for improved technology in cooling-tower operations that would be better for the environment and save on maintenance costs. Sampair learned about a process to pre-treat the water used in cooling towers that doesn't involve chemicals and softens the water to prevent scale buildup.

"The result is a more efficient tower," Sampair said. "The steel industry uses a similar process to eliminate the buildup of chemicals and scale during steel production. The same philosophy can be applied at Boeing."

The testing at the Kent site showed significant results: Fresh water entering the operation has decreased by 40 percent; maintenance costs on cleaning the towers have been reduced from once a month to a couple times a year—approximately an 80 percent reduction—and harmful chemicals have been eliminated in the process. And these savings may just be a drop in the bucket—the potential savings could be \$5 million or more per year across the enterprise.

## HOW IT WORKS

Cooling towers hold an average of 800 gallons (3,028 liters) of water. A building's or site's chiller operation uses the tower water to make chilled water for building, equipment and computer-room air conditioning to optimize operating temperatures.



**PHOTO:** Boeing heating, ventilation and air-conditioning mechanic Brett Weberg adds salt used in regeneration tank for cooling-tower water softeners at the Kent, Wash., site. The water softener is part of a new process initiated by lead mechanical engineer Roger Sampair (right) that will save water and reduce sewage and maintenance costs across Boeing. **MARIAN LOCKHART/BOEING**

However, as water naturally evaporates in the tower, minerals are left behind that can form hard deposits. These remains can stick to the surfaces in the cooling towers, affecting their efficiency. To reverse this, chemicals are added to keep the minerals suspended in the water, and then the water is drained out of the tower and replaced. This is known as a “blow-down” process. The cycle is periodically repeated to keep the tower maintained.

Sampair led the Kent Maintenance team in a one-year trial using the water softener with a 500-ton (454-metric-ton) tower that supports operations at the 7-107 building. Following promising results, a second system was installed in the Kent 18-54 building, where the benefits have been even greater due to high usage of the nine cooling towers.

Several groups, including the Site Services Plant Engineering and Enterprise Mechanical Technical Committee councils, identified this improvement as an enterprise operating cost reduction and championed its replication to other Boeing sites.

Cooling-tower water-saving improvements recently earned Kent’s Maintenance team a Boeing Conservation Award as one of 18 projects that reduced the company’s energy and water usage or increased alternative commuting and recycling rates.

The awards were recently expanded to include water initiatives, noted Jeff Nunn, SSG Conservation Initiative program manager.



**PHOTO:** Site Services engineer Art Kienle (left) and mechanic Doug Macpherson helped replicate water and cost savings from Kent, Wash., to El Segundo, Calif. *GLADYS WICKERING/BOEING*

### CHANNELING SUCCESS

The Site Services team at the Boeing satellite manufacturing facility in El Segundo, Calif., was first to replicate the improvement with a similar pilot program.

Cooling towers are an important part of the site’s environmental control infrastructure because certain temperatures and the proper humidity are required when assembling and integrating satellites—and this Site Services business partner depends upon that reliability.

“The new process has made a noticeable difference,” said Art Kienle, a plant mechanical engineer in El Segundo who

helped facilitate the pilot program. “The piloted tower was much easier and faster to clean than the others, which means the new system is working well and minerals aren’t depositing to the sides of the tower.”

According to Kienle, 90,000 to 100,000 gallons (340,600 to 378,500 liters) of water per month are saved using the new process.

The benefits add up—from reducing chemicals to consuming less water to lowering sewage and water costs, Kienle said. “Even our equipment will last longer because it will run more efficiently.”

Although the costs of water vary from site to site, Site Services Maintenance is looking for other opportunities across Boeing.

“That’s the real value—this new process can be replicated at other Boeing sites, so we not only conserve water, help protect the environment and save on maintenance costs here,” Sampair said, “but at other locations as well.” ■

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