Water Conservation: The Business Case

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Record-breaking droughts have plagued the Southeast and the arid Southwest. Georgia is caught in the grip of a drought that is the worst in 100 years of record keeping while at the same time 30 million people in the Southwest witnessed water reserves in Lake Mead and Lake Powell, both part of the Colorado River system, decline to near-record low levels. Drought combined with rapid growth has created a water crisis in many parts of the United States— and there may be little relief in sight. A recent federal report predicts that water shortages in 36 states will continue into the next decade.

Shortages have re-positioned water as a valuable commodity. No longer “free,” the true value of water is beginning to emerge as residents are forced to conserve water by installing low-flow shower heads, low-flush toilets, and high-efficiency washing machines. Bans on car washing and lawn sprinkling are the rule in many areas.

As a result, the pressure is on industry to make an equivalent effort by implementing water conservation programs. Industrial water conservation has become more than a goal; it’s now viewed as a cultural and moral obligation.

The good news is that several methods can be employed by industry to reduce

water withdrawal rates and minimize waste discharges. And these are not just good for the environment; they're good for the bottom line, too.

Water conservation can be as simple as making process changes that reduce the demand for fresh water. Eliminating sources of leaks and other wasteful uses of water can really add up to large savings. Systems that overflow or valves that continuously leak to drain waste large volumes of water. A continuous 5 gpm leak, for example, wastes 216,000 gallons per month.

Meter It

As the saying goes, "If you don't measure it, you can't manage it." Water conservation begins by taking stock of your current water usage. Monitor each water-using process to determine the minimum and maximum flows through the system.

In addition to the main incoming meter, install water meters on each process to allow assessment of the water demands on a system-by-system basis. For example, the makeup and bleed for each cooling tower should be metered. Likewise, track the makeup demand for the boilers along with steam production rates. Other processes that use large volumes of water for washing, rinsing or cooling should be outfitted with a dedicated water meter. The goal is to generate a set of data that profiles the water demand including process uses, utility uses, and all other.

The water meter data is used to produce a water balance diagram that summarizes freshwater withdrawal rates, process demand, utility uses, domestic consumption, evaporation losses, and waste water generation. The water balance provides the big picture and is the basis for making decisions regarding process design and retrofit changes that are necessary to achieve your water conservation goals.

Reduce The Demand

Water conservation can be as simple as making process changes that reduce the demand for fresh water. Eliminating sources of leaks and other wasteful uses of water can really add up to large savings. Systems that overflow or valves that continuously leak to drain waste large volumes of water. A continuous 5 gpm leak, for example, wastes 216,000 gallons per month.

An employee education program on the value of water is also beneficial. People still tend to think of water as a “free” commodity and, therefore, fail to appreciate the impact the costs have on overall operating expenses.

Reuse It

The boundary between water and wastewater is becoming less distinct. Older process designs allowed for using water once before discharging it to drain. Closer examination reveals that the waste water from one process is often perfectly acceptable for use as the feedwater to another.

The reverse osmosis (RO) process, for example, produces a purified water stream and a concentrated waste stream. Approximately 75 percent of the RO feedwater is recovered as usable permeate with 25 percent of the feedwater discharged as waste. In many instances, the RO “wastewater” stream is of acceptable quality for use as cooling tower makeup, for backwashing filters, or as makeup to a scrubber water system. Discharging RO reject to drain is a waste that can and should be avoided.

In other cases boiler blowdown can be used as cooling tower makeup or for various washing and rinsing operations. These and other opportunities are revealed by careful analysis of the water balance diagram.

The key to successful reuse strategies is to find process applications where waste water can be used, without further treatment, as the feedwater to another process.

Regenerate It

Wastewater can be treated to remove impurities that would otherwise prohibit its use in another process. Regeneration refers to any physical or chemical processes that makes the wastewater suitable for reuse or recycle. This includes filtration (media, activated carbon), ion exchange, membrane separation (ultrafiltration, reverse osmosis), pH adjustment, or biological treatment.

For example, RO water used for rinsing operations may pick up some dissolved and suspended solids from the process, but otherwise remains of better quality than the freshwater intake. Regenerating the rinse water through a pressure filter or ultrafilter is all it takes to make it suitable for use as boiler makeup, for example.

With ever-increasing water costs and wastewater disposal charges, the economics of regeneration and reuse are becoming more favorable. Many of the regeneration processes, such as filtration, are relatively inexpensive and have a favorable return on investment. Paying dollars to dispose of wastewater when it can be regenerated for pennies is poor economics. Again, careful study of the water balance will reveal opportunities for regeneration reuse and recycle.

Benefits
Industrial water costs vary throughout the country, but the average for municipal water is $2.06 per 1,000 gallons (Kgal). The cost to dispose of process wastewater also varies depending on the type and concentration of the impurity, but can average up to eight times the cost of the source water. A typical “turnaround” cost for an industrial process ranges from $4 to $20 per Kgal (based on a 2003 study).

In addition to the raw cost of water and wastewater, many industrial processes require chemical treatment to prevent scale deposition, corrosion, and microbiological growths. The use of supplemental chemical treatments typically doubles the cost of the municipal water.

Further, water must be pumped, distributed from one point to another, and heated or cooled, all of which requires energy. It’s estimated that 15 percent of a plant’s energy usage is associated with water.

Water conservation, recycling, and reuse programs offer the benefit of reducing costs through a reduction in source water withdrawals, wastewater discharge, chemical consumption, and energy usage. In many instances, the cost savings realized by using water more efficiently have a favorable return on investment of as little as 6 months.

Finally, businesses benefit in that water conservation is simply “the right thing to do.” Public relations are enhanced by demonstrating that the plant is making every effort to conserve water and minimize waste. Being a good neighbor by managing water resources efficiently is an important step in maintaining the trust and goodwill of the community.

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