



How form of physical water treatment combats hardness and scale

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Although the varied climatic conditions along California's Central Coast, home of Hahn Family Wines, are ideal for the growing of grapes, the water underground, which the vintner uses for closed-loop heat-cleaning of fermenting barrels and bottles, is mineral-rich and scale-producing. Gritty deposits collect and become troublesome with the application of heat.

After years of using salt-based water softening for critical boiler-treatment applications, Hahn Family Wines sought an environmentally friendlier form of water treatment, one free of chemicals, salt, and waste discharge. For its main water supply, it commissioned the installation of a template-assisted-crystallization (TAC) central treatment system.

Physical Water Treatment

TAC falls into a category often referred to as "physical water treatment" (PWT). The primary goals of PWT are to:

- Avoid the use of chemical additives.
- Minimize or avoid discharge water, regenerates, and waste water.
- Avoid pollution and disposal costs.
- Minimize capital costs and ongoing maintenance.

The technology behind TAC treatment systems was developed in Germany about 15 years ago and used throughout Europe before coming to the United States about eight years ago.

TAC media start out as polymeric beads (resin) in the 20-to-40-mesh size range. Catalytically active sites, or templates, are imprinted on the beads' surface through a batch-coating process.

PWT works by changing the physical characteristics of a solution, with little or no change in the solution's chemical composition. PWT is used chiefly to reduce water hardness (calcium carbonate) in plumbing systems, appliances, and equipment (boilers, water heaters, dish washers, automotive- and process-washing equipment), valves, and other components that generate or use heated water.

Most PWT devices promote hardness crystallization

Template-Assisted Crystallization

An alternative to salt-based water softening

Hahn Family Wines enjoys near-perfect soil and climatic conditions. Its ground-water quality, however, presents challenges.

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in a bulk solution to prevent scale formation on downstream surfaces.

TAC is technology that influences a water solution at localized sites (on the media surface) so that hardness ions and their counter-ions (bicarbonate) combine to form inert nanometer-size “seed crystals.” Called nucleation, this is the process by which dissolved molecules or ions dispersed throughout a solution gather to create clusters in the sub-micron size range.

The sum of the seeds provides an enormous area for preferential growth of remaining hardness ions still in solution. Making use of the phenomenon of low-energy heterogeneous transfer, by which solubility shift is achieved, the remaining dissolved ions attach to the seed crystals and continue harmlessly downstream, eventually to be consumed or drained.

Although there is no flow to drain in closed-loop boiler systems, TAC has been successful in controlling scale while reducing or eliminating chemical additives in systems that incorporate a bottom blowdown with scheduled daily discharges.

TAC is the mechanism behind



Hahn Family Wines chose a template-assisted-crystallization system to improve process-water quality.

biomineralization—the growth of bone structures in the human body—and commonly is used by pharmaceutical companies to create medicines.

TAC media were submitted to DVGW (German Technical and Scientific Association for Gas and

Water), whose standard W 512 is considered the most rigorous and challenging accredited standard for certifying PWT systems for scale-reduction efficiency. The media achieved a scale-prevention efficiency of more than 99 percent for both recirculation-hot-water and single-pass-cold-water protocols.

Used in an upflow design, TAC media are not subject to low-flow channeling or high-flow pressure drops. Pressure drop at peak flow rate is less than 4 psi. Like other resins, the media are subject to water-chemistry limitations, such as chlorine, iron, manganese, tannins, and pH.

The effective life of TAC media is three years and is dependent on neither the volume nor the hardness of water.

Water Scale

Protecting a plumbing system from damaging lime deposits can incur considerable expense—both initially and throughout the life of the system—for any commercial property.

For many years, commercial-

HOTEL WEIGHS OPTIONS

In 2005, Gregg Josey, chief engineer for Embassy Suites in Tempe, Ariz., was considering replacing the failing water softener installed years earlier.

The hotel had numerous points of entry for municipally supplied water. Water hardness measured between 12 and 14 grains per gallon. As a result, water treatment was practical only on the “hot side” of the plumbing system.

The hotel needed to treat water for the domestic-water boiler, heat-exchange surfaces, and numerous point-of-use tempering valves—essentially, the entire domestic-hot-water-distribution system.

Of concern were the many showerheads: one in each of the hotel’s 224 rooms.

“Calcium deposits within the showerheads ... at many hotels often look filthy and frequently are the cause of recurring maintenance issues,” Stephen Callahan, national sales manager for Watts Water Technologies, said. “Water flow to showerheads is restricted by the deposits, and in addition to that, front-desk personnel at hotels get calls—

often at night or early in the morning—from guests who complain about unsightly, dirty-looking deposits. They think the maids aren’t doing their jobs when, in reality, the problem stems from insufficient water treatment.”

Josey decided to replace the old water-treatment system with template-assisted-crystallization (TAC) scale-control technology. His research showed TAC would be less costly upfront and save the facility nearly 70 percent in operating costs, mostly in salt- and water-purchase and discharge costs. He has enjoyed maintenance-free scale protection for five years.

“A simple media replacement once every three years is all that’s needed to keep the system running scale-free,” Josey said.

Today, the hotel’s metered water use and wastewater discharge are substantially less than they were previously, and the hotel has found it no longer needs to perform the routine maintenance and replenishing tasks it had with a salt-based system.

grade water softeners were the only proven technology for scale protection. Water softeners, however, require electricity to operate, take up precious space in mechanical rooms, demand hundreds of gallons of water for draining during backwash and regeneration cycles, and require salt or an even more expensive alternative (potassium chloride) for performance to be maintained.

TAC can be used in point-of-entry applications to protect whole buildings on the hot and the cold side and protect equipment that is more prone to scale buildup. Peak flow rate is all that is required to size a commercial TAC system.

Back at the Winery ...

The system chosen by Hahn Family Wines requires no water-consuming discharge while providing micron filtration and hard-water scale protection.

Two centrifugal micron filters remove particulate matter from well water. Microfiltered water then is passed through a hard-water scale-prevention system. The scale-prevention media operate catalytically without salt or chemicals and do not produce a waste stream.

According to the manufacturer, TAC prevents over 98 percent of the scale produced by the winery's hard water, while the only maintenance that is required is a simple media replacement after two to three years of service.

TAC technology enabled Hahn Family Wines to remove its salt-based water softeners, which preceded the boilers. The TAC system provides treated water throughout the winery's water-distribution system.

Environmental Stewardship

"With Hahn Winery's move to become more ecological, we looked at every facet of our environmental stewardship," Hahn Family Wines spokesperson Evelyn Pool said.

"Water treatment was an important part of that puzzle.

"We're delighted with our effort to become sustainably certified in the vineyards," Pool added. "Eliminating salt-based softeners while adding new (TAC) scale prevention is a real

boost to our sense of environmental responsibility."

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