

Solving Scale Problems

By John Vastyan

Template-assisted crystallization solves scale problem for California winery

The Monterey peninsula is considered by some to be the California coastline's finest area. Within it lie the Santa Lucia Highlands, home to the Hahn family's vineyard estate. It was here in the 1970s that Nicolaus "Nicky" Hahn and his wife Gaby discovered a love for California wines. Two years later, in Monterey County, they purchased two ranches on which to start a winery. Today, Hahn brand wines are among the finest produced in the region.

Though climatic conditions are ideal for the formation of perfect grapes, the water that comes from under the ground, which they use only for heat cleaning and sterilization of fermenting barrels and bottles, is about as ornery as it gets.

The subterranean water supply is rich in scale-producing minerals. Gritty deposits collect and become troublesome with the application of heat, yet hot water is a commodity in great need.

Winery Goes Green

Recently, managers of Hahn Family Wines sought out and made arrangements for the installation of an environmentally friendly water treatment system for their winery. Today, Hahn Family Wines is enjoying the fruits of environmental responsibility through their use of salt-free water treatment.

Previously, Hahn managers applied the use of salt-based water softening for critical boiler treatment applications. The winery's goal was to eliminate chemicals, salts and waste discharge while ensuring the highest quality water.

To eliminate salt in the treatment of the main water supply for the winery, they commissioned the installation of a template-assisted crystallization (TAC) central treatment system.

The system chosen by the winery requires no water-consuming discharge while providing micron filtration and hard water scale protection.

Well water is first filtered by two centrifugal micron filters to remove particulate matter. Microfiltered water is then passed through a hard water scale prevention system (Watts OneFlow). The scale prevention media operates catalytically without salt or chemicals and does not produce a waste stream.

"The [TAC] scale prevention is effective at preventing more than 98% of the scale produced by the winery's hard water," said Watts Water Technologies National Sales Manager Steve Callahan. "The only maintenance required on the system is a simple media replacement after two or three years of service."

TAC technology enabled the facility to remove its salt-based water softeners, which preceded the boilers. The TAC system now also provides treated water throughout the winery's entire water distribution system.

"With Hahn Winery's move to become more ecological, we looked

at every facet of our environmental stewardship, said Hahn spokesperson Evelyn Pool. "Water treatment was an important part of that puzzle. We're delighted with our effort to become sustainably certified in the vineyards. Eliminating salt-based softeners while adding new [TAC] scale prevention is a real boost to our sense of environmental responsibility."

Hotel Weighs Options

Gregg Josey, chief engineer at Embassy Suites in Tempe, Ariz., was faced with a similar dilemma in 2005. He considered replacing the failing water softener installed years earlier. Josey researched TAC technology, discovering that it would be less costly up front and would save the facility nearly 70% in operating costs, mostly in salt and water purchase and discharge costs.

The hotel had numerous points of entry for municipally supplied water, and water hardness measured between 12 and 14 grains per gal. 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. Another key concern at the hotel was the number of showerheads, one for each of the 224 rooms.

"Calcium deposits within the showerheads there and at many hotels often look filthy and frequently are the cause of recurring maintenance issues," explained Callahan, who visited the hotel in 2005 to properly size the TAC treatment system for the hotel.

"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



Watts OneFlow system prevents scale problems throughout the winery's distribution system.



The Santa Lucia Highlands offer ideal growing conditions for premium varietal fruit.



who complain about unsightly, dirty-looking deposits,” he added. “They think the maids aren’t doing their jobs, when in reality the problem stems from insufficient water treatment. The technology is available to end all of that.”

Ultimately, Josey decided to remove the old water treatment system and have it replaced with new TAC scale control technology.

Josey has now enjoyed maintenance-free scale protection for five years. “A simple media replacement once every three years is all that is needed to keep the system running scale-free,” he said.

Today, the hotel’s metered water use and wastewater discharge are substantially reduced and it no longer funds the routine maintenance and replenishing tasks it once had. “We never regretted the move,” Josey said.

Physical Water Treatment

TAC falls into a category of water treatment often referred to as physical water treatment (PWT). The driving force for PWT in the marketplace was to offer more environmentally friendly technology. The primary goals of PWT are to:

- Eliminate the use of chemical additives;
- Reduce or end discharge water, regenerates or wastewater;
- Have zero pollution and disposal costs; and
- Minimize capital costs and ongoing maintenance.

The technology behind leading TAC treatment systems was developed in Germany about 15 years ago and used throughout Europe for several years before coming to the U.S. about eight years ago.

TAC media starts out as polymeric beads (resin) in the 20 to 40 mesh size range. Catalytically active sites or

templates are “imprinted” or coated on the bead surface through a batch-coating process. The exact recipe, procedure and precision with which this is done is critical to manufacturing processes, assuring optimized media performance.

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

The vast majority of functional PWT devices work to promote hardness crystallization (mostly CaCO_3) in the bulk solution so it is not available to scale on downstream surfaces.

TAC is technology that influences the water solution at localized sites (on the media surface) such that hardness ions and their counter-ions (bicarbonate) combine to form inert nanometer-size “seed crystals.” This is called nucleation, and is where 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, when the remaining dissolved ions reach their solubility shift, they attach to the seed crystals and continue harmlessly downstream, eventually to be consumed or end up to drain.

While closed-loop boiler systems technically do not qualify because there is no flow-to-drain, systems that incorporate a bottom blow-down with scheduled daily discharges have

been successful in controlling scale while reducing or eliminating chemical additives.

Know Your Chemistry

Although this article mentions success in closed-loop and other applications that use chemicals downstream of the TAC treatment, it should be noted that many common chemicals used in various water-using applications can actually work against the optimal performance of TAC systems. The most common area of concern is in commercial dishwashing, where a wide variety of chemistries are used. If a targeted application also uses chemicals, be sure to identify chemical compatibility with the water treatment.

TAC has an established and convincing scientific basis because it is the mechanism behind the growth of bone structures in the human body, called bio-mineralization, and is commonly used by pharmaceutical companies to create highly effective medicines.

TAC media was submitted to DVGW, the German Technical & Scientific Assn. for Water & Gas, whose standard W512 is considered the most rigorous and challenging accredited standard to certify PWT systems for scale reduction efficiency. The media achieved a scale prevention efficiency of more than 99% for both recirculation hot water (1998) and single-pass cold water (2006) protocols.

TAC media offered by Watts is always used in an up-flow design, which makes it not subject to low-flow channeling or high-flow pressure drops. The pressure drop as measured at peak flow rate is less than 4 psi. The media is subject to water chemistry limitations like other resins, such as chlorine, iron, manganese, tannins and pH.

The effective life of the TAC media is three years and is not dependent on the volume of water or the hardness level.

Scale: A Universal Dilemma

Building owners, property managers, chief engineers and facility maintenance personnel all face the same challenge in battling the ill effects of hard water. Protecting a commercial plumbing system from damaging lime deposits, called scale buildup, can bring considerable expense, both up front and ongoing, to any commercial property.

Ignoring scale control is never a good option because eventually the cost for repairs or replacement will offset the initial savings. For many years, the installation of commercial-grade water softeners was the only proven technology for scale protection.

TAC is a media-based scale control technology that can be used in point-of-entry applications to protect whole buildings on the hot and cold sides. Selecting the appropriate size of TAC system is easily accomplished. Peak flow rate is all that is required to size a commercial system. Point-of-use systems are also offered to protect specific pieces of equipment that may be prone to scale from water hardness. *wqp*

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