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MECHANICAL CONTRACTING

An MCAA Industry
Forecast

p 57

PLUMBING

Smart Pumps

p 44

HYDRONICS

Boiler & Water Heater
Report

p 70

phc

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news

Holding down the fort

New technology
solves age-old
water problems at
Fort Sill, Oklahoma.

p 38



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PLUMBING

| WATER TREATMENT |

New technology solves age-old problems at Fort Sill, Oklahoma

Hard-water problems since 1869

phc january 2012 www.phcnews.com

38

Built during the Indian Wars of the 1870s, Fort Sill served as the base of operations against Cheyenne, Comanche and Kiowa Indians. After decades of warring with “native hostiles,” it was there, on February 17, 1909, that Geronimo, the great Apache chief, died of pneumonia. Today, Fort Sill is not only a National Historic Landmark but also one of the U.S. Army’s largest bases.

In the 1970s, initial entry training (IET) “starship barracks” were constructed on Army bases nationwide, including Fort Sill. The facilities acquired the nickname because they’re completely self-

contained, with living quarters, classrooms, mess halls and latrines all under one, star-shaped roof.

Many of the starship barracks — designed to house up to 500 troops — are being renovated, chiefly to reduce energy consumption. Ft. Sill has already renovated one starship and is now preparing to modernize four more.

Hard water has plagued maintenance crews at Ft. Sill since the addition of indoor plumbing, and the problem remains today. Unfortunately, southern Oklahoma has some of the most challenging water quality nationwide. With all new mechanical and plumbing

systems being installed during renovations, the Army Corps of Engineers has moved to eliminate domestic water scale problems before they begin.

Impressive demand

With 500 troops mobilizing, high-quantity water use is inevitable. At Fort Sill, dealing with persistent scale

The system changes the physical characteristics of the water with little or no change to the solution’s chemical composition.



OneFlow tanks appear to be standing at attention, shoulder to shoulder, waiting for instructions from their drill sergeant, when, in fact, these tanks are protecting the domestic water system in the army training barracks at Fort Sill.

is a costly problem to solve compounded by the inevitable spikes in water use. At the start of each new day, soldiers have a set routine. Wake up (still a cheerfully, piped-in, high-decibel reveille at “O-dark-hundred”) leads to a quick shuffle to the showers, where a combined 632 gpm surge through the spacious gang showers.

A daunting challenge for the mechanical contractor is how to provide scale protection for domestic water systems at a rate of 632 gallons per minute with a water quality defined as “very hard.” At 10 grains of hardness per gallon, water is considered hard and, over time, calcium and bicarbonate scale become a problem for system components. The water at Ft. Sill measures a

➔ Continued on p 40

| WATER TREATMENT |

whopping 27 grains per gallon. “One plan was to use a commercial, salt-based water softener,” said O.G.

the equipment would need to be American-made.” With those mission parameters,



Technician Rob Myers opens the outlet connection to one of 12 tanks installed at Fort Sill Army Base Lawton, Okla.

Mills, VP of Tulsa-based, Okla., sales. “But the four tanks needed wouldn’t fit through the mechanical room door and, once inside, would’ve taken up far too much space. On top of that, the sheer amount of salt used to regenerate the water softeners would have required additional storage, constant attention from a service tech and an expense to treat all the water that would have made it nearly cost prohibitive.”

Physical water treatment

Mills continued, “The Army Corps of Engineers started doing their homework, researching different means of scale removal.” What they already knew was that the system must handle a huge volume while being cost effective. Mills added, “There was the need for tolerance to huge pressure drops as well. And, according to the Buy American Act,

and after a careful study of their options, the Army Corps of Engineers chose Watts’ OneFlow® anti-scale central treatment system. This uses TAC (template-assisted crystallization) technology. TAC falls into a category of water treatment often referred to as physical water treatment (PWT). The primary goals of PWT are to eliminate the use of chemical additives, reduce or eliminate discharge and wastewater and create zero pollution, while minimizing installation and maintenance costs.

The environmentally friendly technology behind leading TAC treatment systems was developed in Germany about 15 years ago. It was used

throughout Europe for several years before coming to the U.S. and continues to be the dominant form of commercial water treatment there. 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 system changes the physical characteristics of the water with little or no change to the solution’s chemical composition. PWT is chiefly used to reduce the negative effects of water hardness (calcium carbonate) in plumbing systems, appliances and equipment, valves and other components. The template 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.” Called nucleation, this occurs when dissolved molecules or ions dispersed throughout a solution start to gather to create clusters in the sub-micron size range.

The seeds provide an enormous area for preferential growth of remaining hardness ions still in solution. “Low energy heterogeneous

➔ Continued on p 42



Four- and eight-inch Watts model 957 RPZ backflow preventers protect the domestic water system. Strainers installed upstream of the RPZs help keep debris from getting into the OneFlow system and backflow preventers.

| WATER TREATMENT |

transfer” then begins. The remaining dissolved ions reach their solubility shift, attach to the seed crystals and continue harmlessly downstream.

Out with the old...

“The Army Corps of Engineers in Lawton wasn’t impressed with the old traditional water softening system or with the service contract attached to it,” said Allen Jones at C.H. Guernsey, lead mechanical engineer on the project. The mechanical room had been built around the existing system. Two tanks, one 10 feet tall and the other five feet in height, were

explaining how TAC technology is the winner in all three categories and also uses less than half the floor space of any of the alternatives.”

TAC: Unaffected by fluctuating water demand

Another huge advantage the TAC system has over a traditional water softener is the ability to operate effectively at trickle flow rates,” said Steve Callahan, national sales manager of water treatment products at Watts Water Technologies. “TAC media is always used in an up-flow design, so it’s not subject to low flow channeling or high flow pressure

isn’t sacrificial; it doesn’t dissolve. Media lifecycle is not influenced by the amount of water being treated or by the hardness of the water. However, impurities in the water, such as chlorine, over time can degrade the template on the beads, which affects media longevity. The typical suggested media change-out is three years.

“Selecting the appropriate size system is simple. All you need to know is peak flow rate,” said Callahan.

The first phase of the Ft. Sill restoration project called for 12 OneFlow tanks, each capable of handling 75 gpm. Linked in parallel, the tanks treat up to 900 gpm. This system also affords the base the flexibility to isolate tanks if the

“For the Army Corps of Engineers...we had to meet a very strict performance standard to protect their plumbing systems.”

barracks aren’t at full capacity and to perform media change-outs one tank at a time.

Four and eight-inch Watts model 957 RPZ backflow preventers protect the domestic water system. Strainers installed upstream of the RPZs help keep debris from getting into the OneFlow system and backflow preventers.

“For the Army Corps of Engineers to review and ultimately select TAC technology over a traditional softener, it meant that we had to meet a very strict performance standard to protect their plumbing systems. We have thousands of installations, some



Technician Rob Myers checks the inlet feed connection while putting a tank into service. It’s one of 12 OneFlow tanks plumbed in parallel to provide scale protection to the Starship Barracks at Fort Sill. Archer Western Contractors provides building and facility maintenance to various government properties. At right, Myers adjusts a pipe hanger on the installation.

situated on either side of the mixing unit. The tanks were disassembled and removed.

“The Corps did their own research, looking for a better alternative financially, logistically and environmentally,” said Jones. “Mills was a bulldog when it came to

drops. With traditional [salt-based] systems, if flow is below peak rate, you can get hard-water bypass. That’s when water finds the path of least resistance through the media and comes in contact with minimal amounts of resin.”

According to Callahan, TAC media

in areas where water is even harder than at Ft. Sill, so I was certain our technology was best suited for water use at Fort Sill,” he added. “They’ll reap the benefits of zero water discharge and no salt expense for years to come.” ●

