Hats Off to CST: An Innovative Cover Solution Extends Reservoir Life

Styles come and go, and sometimes reappear. Take hats, for example. What's fashionable in the 60s went out in the 70s but may come back a few decades later. However, when it comes to municipal water facilities, yesterday's model is gone for good, replaced by a more contemporary, sustainable design.

Forbes Hill Reservoir
San Rafael, California 151' x 203'

Just ask the Marin Municipal Water District in northern California, which recently transformed a 120-year-old potable water reservoir into a 4 million gallon tank with a maintenance free roof structure.

The district serves 187,500 customers in central and southern Marin County with a mission "to manage [our] natural resources in a sustainable manner and to provide [our] customers with reliable, high quality water at a reasonable price."

One of the district's seven reservoirs sits atop Forbes Hill in the western section of San Rafael and receives potable water from three different treatment plants.

According to the district's principal engineer Carl Gowan, the reservoir's floating cover and liner were showing signs of age.

"In 2005 we considered building a new tank on the site because we had the available space," says Gowan. "But a few years later we concluded it would be more efficient to simply replace the liner and cover."

Gowan cites several issues with the old liner and cover:

- The cover's uneven surface encouraged pooling of rainwater, increasing the risk of non-potable water leaking into the clean water supply.
- Exposure to sunlight caused the cover to crack, allowing dust and debris to gather.
- The aging structure needed continual maintenance, which came at a cost.

The district brought in consulting engineer Beyaz & Patel, who looked at a number of options for a replacement cover: steel, aluminum, clear span and column supported.

"We were looking for a cost effective solution requiring little or no maintenance," says Gowan. "And it had to be aesthetically pleasing to the community around the reservoir."

After reviewing its options, the district went with the consultant's recommendation of an aluminum column supported roof: a custom-crafted OptiDome™ from CST Covers, a division of CST Industries.

"OptiDome is a next generation aluminum geodesic dome," says Hector Moreno, regional sales manager at CST Covers. "Its innovative and optimized design has features that make it an increasingly popular choice for architectural, environmental, municipal and petroleum and other applications."

Before installation could take place the project team had to overcome some unique challenges.

First, the reservoir replacement project had to be completed within the six-month winter shutdown period. That gave the contractor a relatively narrow timeframe to demolish the existing roof and liner, prepare the reservoir floor for installation of column footings, and install the new roof and liner. They were not only racing the clock but had to deal with the reservoir's unusual oval shape and determine the existing conditions by field survey.

"We had to make sure everything was properly surveyed so that the roof could be designed to match the as-built conditions," says Gary Ho, senior project engineer at Beyaz & Patel. "During pre-construction the contractor conducted a survey before CST could start the shop drawing."

Ho continues: "Most importantly, having a current survey helped us determine where to place the roof supports. Once the supports were set, CST went in and completed the final drawings."

An important consideration during design was the elevation of the roof to meet seismic standards. An earthquake causes the water to slosh, so special care was taken to place the roof high enough and at a proper slope to mitigate the threat of water coming in contact with the underside of the roof.

"It was a team effort between CST, the contractor and the construction management team," says Ho. "We all worked together to make sure the survey was properly conducted and the design was done correctly to conform to the reservoir's as-built condition."

CST manufactured the panels, battens, fasteners, gaskets and I-beams at its Conroe, Texas facility then shipped them to the site where they were assembled.

"We effectively converted a reservoir into a tank so we renamed it Forbes Hill Tank," says Gowan. "And we accomplished it for a fraction of the cost of building a new tank."

The OptiDome is one of the most versatile solutions on the market because it's applicable to a wide variety of shapes and sizes. It's built to withstand extreme conditions and meet stringent performance requirements:

- Seamless, flush batten construction increases water shedding, eliminates ponding and it's watertight.
- Enclosed gaskets are less susceptible to ultraviolet exposure and degradation.
- Excellent strength-to-weight ratio supports the weight of work crews and stands up to heavy snow loads and high winds.
- Lifespan of 50-100 years makes it a good investment, with lower life cycle costs than steel.
- It requires virtually no maintenance.

CST Covers is a division of CST Industries, Inc.
498 N Loop 336 E | Conroe, TX 77301
Phone: 936.539.1747 | Fax: 936.539.5355
www.cstcovers.com

"This was a unique challenge because the reservoir is oval and to meet the geometrical shape, primary supports had to be outside of the reservoir," says CST's Moreno. "Our engineering team along with the consulting engineer did a fantastic job in coming up with the most optimum and aesthetically pleasing design." For Marin Municipal Water District—and any water district, for that matter—the value proposition is irresistible.

"The new cover will extend the useful life of the reservoir, provide increased protection for the water supply, improve worker safety and reduce maintenance," says Gowan

Benefits of CST's Aluminum Reservoir Covers:

- Corrosion Resistance: Aluminum is inherently corrosion resistant compared to other materials. It will last the lifetime of the structure and will not need to be painted or repainted for protection from the elements.
- Low Lifetime Maintenance Cost: With no need to maintain a protective finish to prevent corrosion over time, there are little-to-no maintenance costs associated with an aluminum dome.
- Clear-Span Capability: Aluminum's lightweight characteristics allow for larger clear-span cover capability than structures utilizing steel, concrete and other materials.
- Fast & Low-Cost Construction: Creative design and lightweight components provide for installation in 1/3 the time it takes to install other cover systems. Less time, labor and equipment needs combine for a low total cost of installation.
- Design Flexibility: Aluminum's excellent strength-to-weight ratios and creative component designs yield covers and structures that cannot be achieved with other materials.
- Aluminum is a "Green Material": Not only are aluminum cover systems recyclable after their service life, but more than 50% of the aluminum used in the cover systems is made from recycled aluminum.

CST Contact Information:

CST Industries, Inc.
Kim Mathis
Global Marketing Director
713.351.3769
kmathis@cstindustries.com

CST Industries, Inc.
Hector Moreno
Regional Sales Manager
310.353.5178
hmoreno@cstcovers.com