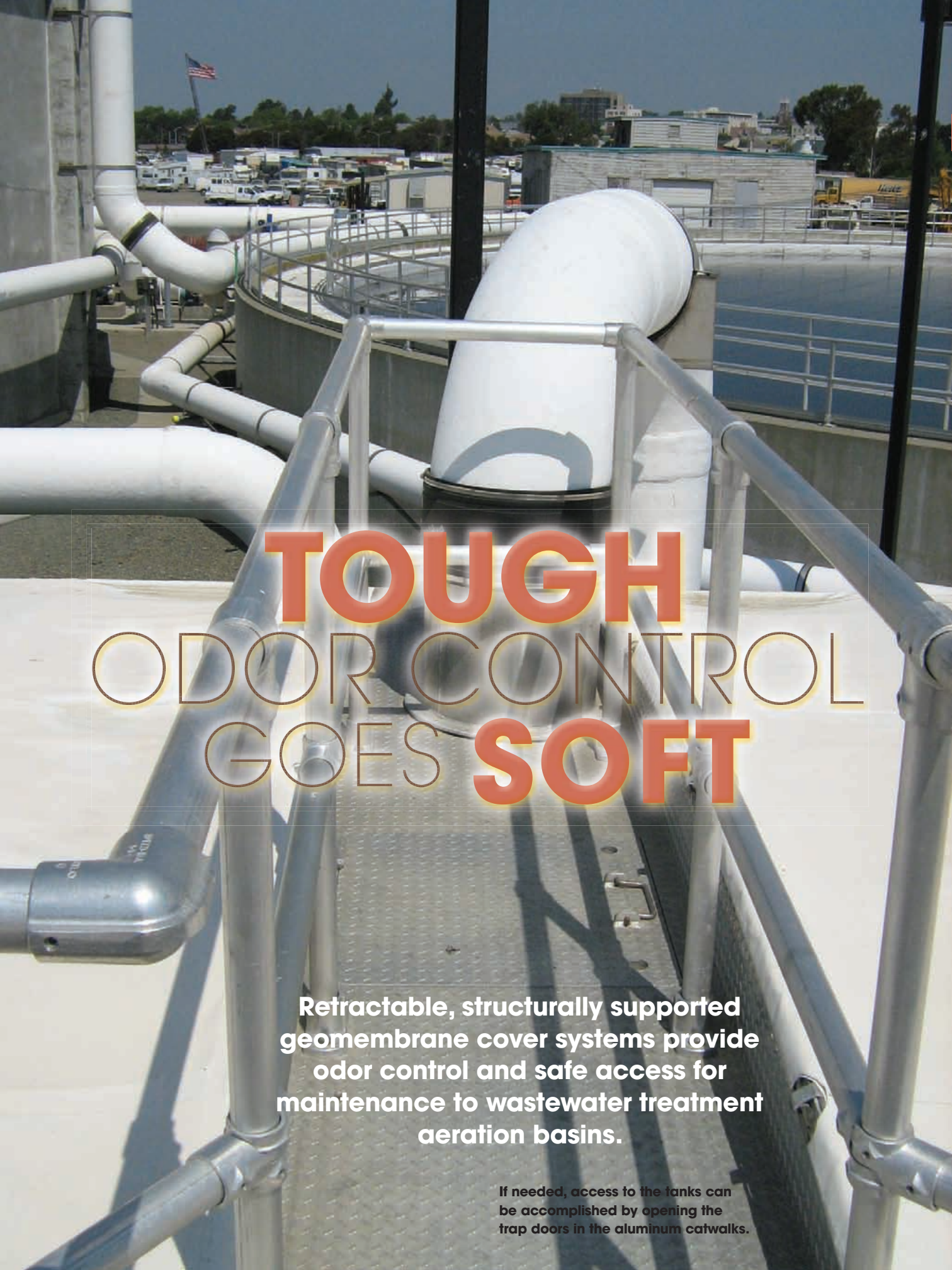

TOUGH ODOR CONTROL GOES SOFT

Retractable, structurally supported geomembrane cover systems provide odor control and safe access for maintenance to wastewater treatment aeration basins.

If needed, access to the tanks can be accomplished by opening the trap doors in the aluminum catwalks.

By **JIM McMAHON**

The Vallejo Sanitation & Flood Control District in the San Francisco Bay area has been engaged in a program to scrub off-gas odors from all aspects of its wastewater treatment plant. Early in the project, the district had covered all of the facilities in its headworks and primary treatment steps to control the off-gas. Later, it developed a novel approach for the management and disposal of its biosolids, including designing a specialized hopper for storage of the plant's dewatered solids and an automated truck-fill process for transporting the solids to a district-owned landfill – Tubbs Island – again minimizing off-gas release.

The tank above has been drained for cleaning and inspection. The aeration process can lead to odorous off—gassing and needed to be controlled.

More recently, the wastewater plant has focused on scrubbing off-gas odors from its secondary treatment processes, specifically its two open aeration basins. To contain these odors, the district opted to use a retractable, structurally supported geomembrane cover system from Geomembrane Technologies Inc., Fredericton, New Brunswick, which proved effective at containing the odorous gases, as well as tank monitoring, maintenance and repairs.

The district

The control district is an independent special organization created by the state of California to collect and treat wastewater, and to protect the community from flooding. Since 1952, the district has protected public health and the bay waters by collecting and treating the wastewater generated by more than 115,000 residents of the town and the surrounding area.

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The district has a tradition of innovative use of technology in wastewater handling. It has been recognized by the federal EPA and awarded the National First Place Award as the most outstanding project involving land application of biosolids in the United States. The plant disposes of 20,000 cu. yards of biosolids per year; the biosolids are used as a soil amendment to improve farmland. The plant differs from others in that it uses no digesters in its process.

The facility is permitted to treat 15.5 million gallons per day (MGD), but has the capacity to provide full secondary treatment of 35 MGD. During wet weather, the plant is capable of processing 25 MGD primary treatment, combined with the 35 MGD secondary treatment for a total of 60 MGD.

> "A ventilation system draws air through the tank and underneath the covers, and pulls along with it the off-gas from the aeration process."

The wastewater treatment process

Passing through the town's primary water treatment units – its headworks, grit chamber and primary clarifiers – where solids are separated and removed, the liquid portion of the waste stream flows to the plant's secondary treatment for biological processing.

The secondary treatment process is a trickling filter/solids contact process, consisting of four main treatment steps – biotowers, contact aeration basins, secondary clarifiers and disinfection. The trickling filter section of the process is provided by two biotowers, which receive effluent from the primary clarifiers. The wastewater is then sprayed down over plastic media in the filter, providing a surface for bacteria to grow and consume the organic material in the effluent. The water is run through the biotowers twice, removing 99 percent of the organic material running through the secondary treatment.

After biofiltration, the wastewater is pumped into two aeration basins. The aeration tanks condition the solids particles discharged from the biotowers, so they settle more readily in the downstream secondary clarifiers. Blowers and fine-bubble diffusers mounted on the floor of the basins introduce air that is necessary for the flocculation of particles, converting the organic solids into heavier clumps that

Vallejo - Off-gas removal piping connected directly to the GTI covers, and out to a soil filter for odor scrubbing.jpg – Odors are controlled as the gases are contained and transported via piping from under the covers to a scrubbing system.

conduct a visual inspection into the aeration tanks from the top. Once a year they drain the tanks, go down inside to conduct a physical inspection of the blowers and diffusers at the bottom, and hose down the sides of the basins.

For almost 20 years the basins remained uncovered, but as part of the plant's odor control upgrade, the district looked into options of how to cover them. Carollo Engineers, Walnut Creek, Calif.,an environmental engineering firm specializing in the planning, design and construction of water and wastewater facilities, was retained by Vallejo to handle the design and construction management for the plant odor control upgrade, and began reviewing cover options for enclosing the basins.

"We wanted the covers first for odor control, so they needed to be corrosion resistant," said Tim Tekippe, the project manager. "But we also needed the covers to be easy to open and close for access to the tanks for sampling, scheduled maintenance and repairs. We felt structurally supported covers would be the best system for the plant's needs because of the better access they provide over other systems, like floating covers. We first looked at rigid type covers such as aluminum and fiberglass, but both of these proved more glass covers we looked at were big plates, and seemed hard to handle and remove. Then we went to a water treatment plant in Colorado that was using retractable, structurally supported covers made with a geomembrane fabric. They looked like they would be very easy to remove for maintenance, and watched how easy they were to open and close. We even walked on them while they were in place over the tank, to see how strong and durable they were. Based on that trip, we decided to design these retractable covers into our aeration basins."

The retractable geomembrane cover system consisted of a composite sheets of high strength, UV protected, coated fabric that was tensioned across a series of low profile aluminum arches, which span the tank's opening. Intermediate aluminum walkways spanning the tank were used to divide the fabric cover sections into appropriate lengths for easy retractability.

The cover fabric was made up of a laminated sheet of 40 mil specialty PVC (ethylene interpolymer alloy) to act as a gastight barrier and keep the off gas from

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TOUGH ODOR CONTROL GOES SOFT

passing through. It incorporated a highly specialized weave design to provide maximum strength-to-weight ratios. Since this top sheet would be exposed to the sun, it also was equipped with advanced UV inhibitors.

The material can withstand temperatures to -30°F. The cover has exceptional seam strength, extreme puncture and tear resistance, low thermal expansion and contraction properties, a range of chemical resistance, high flexibility, and dimensional stability under high loads and temperature fluctuations.

A ventilation system draws air through the tank and underneath the covers, and pulls along with it the off-gas from the aeration process. Off-gas removal piping is directly connected to the cover system and out to a soil filter for odor scrubbing.

Although the membrane covers are gas-tight, they can be quickly detached and rolled up along the frame. This gives operators access to inspect and maintain internal components of the basins. Reattaching the membrane covers is quick and easy, making for a time-efficient and safe process. Additional hatches in the intermediate aluminum walkways allow access by plant operators without retracting the covers.

Take cover

As with any technology, various geomembrane cover designs do have some drawbacks. Polyethylene topsheets, for example, typically have a poor coefficient of expansion and contraction. The material expands in warm temperatures and contracts as it cools down. Over time, this growing and shrinking contorts the shape of the cover, creating a series of hills and valleys that can retain rainwater.

The final covers are gas tight and strong enough to walk on.

"The expected life of these retractable covers is about 15 years," said Tekippe. "And the cost is very attractive compared to other cover systems. If a cover did have to be replaced it would be easy to change out, and could be done in minimal time."

Municipalities are looking for more efficient tank cover systems to contain off-gases, reduce algae growth, simplify maintenance and repairs, and cut expenses. Retractable, structurally supported geomembrane covers have become an increasingly attractive option for streamlining wastewater plant operations. ***PE***

Jim McMahon writes on water and wastewater systems. His feature stories have appeared in hundreds of industrial and high-tech publications throughout the world and are read by more than 5 million readers monthly. He can be reached at jim.mcmahon@zebracom.net.

For more information about the materials described in the article, please contact Brennan Sisk at Geomembrane Technologies Inc. at (506) 452-7304 or by e-mail at bms@gticovers.com. Visit their website at www.gticovers.com.

To find more about Carollo Engineers, contact Tim Tekippe, P.E., at (512) 453-5383 or by e-mail at ttekippe@carollo.com.

Vallejo Sanitation & Flood Control District can be reached by contacting Barry Pomeroy, at (707) 644-8949, ext 251 or bpomeroy@vsfcd.com.