

ConShield Technologies Inc., Atlanta 30318 USA

Precast Success With Corrosion-Resistant Manholes

The Turner Company is a family-owned precast firm founded in 2001 and based in Rhome, Texas at the Northwest corner of the Dallas–Fort Worth metroplex. “This is one of the fastest growing regions in Texas,” says Sales Manager Marty Anderson. “And we’ve grown right along with it.”

Starting in 2012, Turner Company added a new product to their line of precast manholes that has become a major source of growth. “We started making some of our manholes with an anti-corrosion product called Con^{mic}Shield®, and after Dallas started specifying it, it really took off,” Anderson explains. “Now there are three more metroplex cities specifying Con^{mic}Shield® for new manholes—Irving, Rockwall, and Celina—and Fort Worth and a few others are looking at it. And one city, McKinney, has specified it for sewer lines with diameters of 18 inches or more. It’s really proving to be a high quality and cost effective solution for sewer manholes.”

Cities around the world have learned, to their cost, that conditions common in municipal wastewater systems—

warm temperatures, organic matter, turbulence, and low oxygen levels—can lead to micro-biologically induced corrosion (MIC), which destroys concrete. These conditions generate hydrogen sulfide gas, the food of various species of *Thiobacillus* bacteria. *Thiobacillus* colonies establish themselves on concrete which is exposed to air, and live by digesting hydrogen sulfide and converting it to sulfuric acid—some species of *Thiobacillus* can thrive in acid solutions as concentrated as seven-percent... and that’s when the corrosion happens. Sulfuric acid attacks concrete, turning it into crumbly calcium sulfate, also known as gypsum. If conditions are perfect—for *Thiobacillus*—even thick concrete pipes and manholes can be compromised in just a few short months.

For decades, cities have specified some form of anti-corrosion protection in new concrete sewer lines and manholes. In Dallas, until recently, that protection was usually some form of epoxy or polyurethane coating, sprayed on after manholes are installed. “The linings work... if they’re applied perfectly and don’t get nicked or damaged anytime after application,” Anderson says.



ConShield manhole stack-out



A powdered additive is used in the mix that gives the concrete a distinct terra cotta appearance without impacting performance

"But they're only an eighth of an inch thick, so damage does happen, and it only takes a small breach for *Thiobacillus* to get a foothold." The problem is, even a small opening in the coatings can allow *Thiobacillus* colonies to form and begin attacking concrete *behind* the coating. If this happens, a pipe or manhole may look fine on the coated surface, even when inspected, while the concrete substrate behind the coating is being turned to mush by sulfuric acid. Sudden, unexpected sewer failures, caused by MIC, *do* happen.

The solution Turner now uses to address MIC is a liquid antimicrobial additive which can be added to the concrete mix prior to casting to prevent MIC attack of concrete structures. It protects concrete by stopping *sulfur oxidizing bacteria* (*Thiobacillus spp.*) from forming and converting the hydrogen sulfide gas to sulfuric acid which destroys the concrete no matter how dense or water tight it may be. Bonding molecularly with concrete, the additive permanently inhibits the *Thiobacillus* bacteria that create sulfuric acid from hydrogen sulfide gas.

"You can see how this is attractive to cities like Dallas," says Anderson. "Con^{mic}Shield® treated manholes are certainly more expensive than manholes made with typical concrete, but they're cost-effective compared to coating manholes after installation with crews working in confined spaces. And they're better quality in terms of corrosion resistance, since they won't fail due to minor damage."

Con^{mic}Shield® has been in use for decades, with long term installations conclusively proving that *Thiobacillus* colonies are permanently deterred by treated concrete. This microbial resistance has also been verified in laboratories. In one study: *"... (ConShield-treated concrete) specimens were preconditioned and then inoculated with a bacterial suspension of Thiobacillus thiooxidans, Thiobacillus thioparus, and Thiobacillus denitrificans by aseptically pipetting evenly onto the surface of concrete wafers and incubated at 25°C for 24 hours. Each test approximates 7 to 10 years of severe sewer environment service. Viable counts were then obtained using a modified NETAC method. Four test replicates were made per set and incubated at 25°C for 26 days. Virtually all of the organisms were killed by the test material within 24 hours. In addition to the viable counts (recovered from concrete surfaces) a pH change did not occur and no growth was detected microscopically. This test has been replicated four times with each six-month interval representing another 7 to 10 years of service with identical performance."* (from a laboratory report commissioned by Con^{mic}Shield® Technologies)

As a bonus for those working with Con^{mic}Shield® in precast plants, the product is essentially non-toxic, containing no phenols, heavy metals, or formaldehyde.

The Right Mix

Turner Company's production of MIC-resistant precast manholes has continued to increase. But this growth wasn't automatic—substantial effort was required on the part of

Turner Company, and on the part of Con^{mic}Shield® Technologies, the makers of Con^{mic}Shield®. "When it came to getting Con^{mic}Shield® approved and specified for use in the metroplex, that was basically all up to them," Anderson says. "But meanwhile, we were also learning how to use the product effectively."

That learning process began with a thorough review, by Con^{mic}Shield® Technologies, of Turner's mix design. "Before we started, they wanted to be sure our process was compatible with their solution and they have high standards," Anderson explains. "I'm happy to say it was, and that we're very consistent with it." Another factor was Turner's emphasis on quality control. The suppliers wanted high standards to be maintained, and it was important that Turner Company has its own in-house QC department, regularly performing break tests with their own equipment. Outside labs are also used as needed.

One challenge emerged shortly after the first several Con^{mic}Shield®-treated manholes were cast and shipped. Simply put, the manholes looked too ordinary. "Con^{mic}Shield® is basically a clear liquid," Anderson explains. "And doesn't noticeably affect the look or texture of the cured concrete. Which is fine, except that it's also a bit expensive... and customers want to know they're getting what they paid for. And even here at the plant, it's good to have a way to quickly identify the treated material." At first, Turner Company painted the interiors of corrosion-resistant manholes with CS Identifier/Sealer supplied by Con^{mic}Shield® Technologies, but that was tedious and not an ideal solution. Eventually, Con^{mic}Shield® worked with two other firms, McIntire Management Group and A+ Engineering Services, to develop ConTint®, a powdered additive to be used in the mix that gives the treated concrete a distinct terra cotta appearance without affecting performance. "Going to the trouble is worth it," Anderson says. "It's convenient for us, and reassuring for customers."

Business is looking up. As more and more cities in the Dallas–Fort Worth metroplex begin to specify ConShield as an approved corrosion-resistance measure, Turner Company's manhole business continues to grow. "Most cities still accept liners, and of course engineers are often conservative about new solutions—maybe 60% of the manholes we ship now are not treated with ConShield," Anderson says. "But that's changing. Especially when a city like Dallas, that has seen a lot of corrosion, begins to view this method as high quality and cost-effective, we feel sure Con^{mic}Shield® use will continue to grow."

And so, for precast plants like Turner Company, the future is bright, and corrosion-free. ■

FURTHER INFORMATION



ConShield Technologies Inc.
541 Tenth Street NW #233, Atlanta, 30318, USA
T +1 877 543 2094, F +1 404 420 2160
info@conshield.com, www.conshield.com