Coating System Ensures Airport's De-Icing Tanks Stay Leak-Free

Crews working in an underground tank at the Minneapolis-St. Paul International Airport use special spray equipment to apply a polyurea tank-lining system.

Aircraft at the Minneapolis-St. Paul International Airport (MSP) are routinely treated with propylene glycol to prevent and remove ice formation in winter. Recent improvements at the facility, part of a $3.1 billion expansion, include the construction of three aircraft de-icing pads (for a total of five), plus new storage and reclamation facilities to make plane de-icing more efficient.

The de-icing pads and glycol detention ponds are designed to contain spent glycol fluid. The spent fluid is then piped or transported to a reclamation and storage facility. Three new 3.7 million-gal. underground storage tanks were constructed in the summer of 2001, and designed to hold spent glycol fluid from the entire airport prior to recycling.

Before the tanks were put into service, however, tests revealed cracks. To address the problem, the airport opted for a polyurea tank-lining system. Pure polyurea coatings offer ultra-high film build, resistance to propylene glycol, and rapid dry time. Their elasticity and low permeability make them suitable as tank linings for below-grade concrete substrates in immersion service.

"The conditions at the Minneapolis-St. Paul Airport required a tough, flexible, spray-applied coating that would be compatible with the stored propylene glycol concentrations," says Bill Deitner, a vice president at TKDA, a St. Paul-based provider of engineering services for MSP airport. The polyurea lining system was chosen for its extreme elasticity, particularly on concrete substrates that tend to move, shrink, crack, leak or absorb water.

Envirolastic AR 425 from The Sherwin-Williams Co. ControlTech family of products was selected. This 100% solids, no-VOC, aromatic polyurea coating and lining system has high tensile strength and elastomeric performance characteristics. The material can stretch without tearing and bridge gaps up to 1/8 in. It can also withstand the detrimental effects of freeze-thaw climates, as well as resist trace amounts of hydraulic oil, jet fuel, diesel fuel and other chemicals that may be recovered off the deicing pads. The cracks that threatened to allow glycol to escape into the soil surrounding the tanks would also allow groundwater to enter the tanks. Before rehabilitation could begin, the tanks needed to be dried out.

"It was important to control the groundwater levels to minimize vapor transmission that could adversely affect coating performance," says Deitner. Six dewatering wells were installed on-site to temporarily lower the water table and keep groundwater away from the storage tanks. The wells ran continuously throughout the project to ensure that the surfaces to be coated remained dry. The wells also helped keep humidity levels below the 80% maximum allowable for coating application and adhesion.

Preliminary work began in April 2003. Visible cracks were routed and sealed with polyurethane caulk. To achieve sufficient profile, the walls, columns and vertical

surfaces along with the sump pit were abrasive blasted; the deck areas and horizontal floors were steel shotblasted. Next, Sherwin-Williams Corobond Conductive Epoxy Primer was applied. The coating is a 100% solids primer formulated for use on concrete to provide uniform electrical conductivity. It is used in immersion for tank-lining systems or secondary containment when high-voltage holiday (discontinuity) detection is performed.

"To ensure integrity, spark testing is recommended for lining systems that will be immersed," says Deitner. "A conductive primer allows you to more readily identify discontinuities to ultimately achieve a pinhole-free surface."

After priming, Envirolastic AR 425 was applied to all interior tank surfaces. As it cures, the coating forms an impervious, chemical-resistant, flexible lining with excellent adhesion. The product was spray-applied at 110 mils dry film thickness. Surface cracks received an extra 30 mils. Two crews used special equipment to accurately proportion the polyurea spray and maintain pressure, temperature and output.

A benefit of 100% solids polyurea is high-film build (thicknesses ranging from 30 to 250 mils) in a single application. Because only a single application of the high-build material is required, costs associated with application, including rental costs for scaffolding and other equipment, are reduced. Envirolastic AR 425 dries to the touch in as little as 45 seconds. When coated with polyurea, concrete can be returned to full service in 24 hours.

To ensure the tanks' integrity, project engineers administered conductivity testing and 30-day full-scale water testing for each tank. Testing was completed in August 2003, after which, says Deitner, "The tanks recorded a zero leak rate. They passed with flying colors."

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