The Story of a Tankage Project that Could Fill Volumes

Despite Alberta's cold and wet weather, operational interruptions, and revised specs as well as revisions to the project timeline, a Canadian contractor completed what is to date the country's largest tank coatings project, and the contractor did so ahead of schedule and with no lost time accidents in 153,000 hours. The project was undertaken for Calgary-based oil storage and distributor Enbridge, which moves approximately two-thirds of Canada's oil, about two million barrels a day. Coating and lining of the Enbridge Hardisty Contract Tankage Project began in July 2008 and was completed in September 2010.

The project called for internal linings and external coatings for the shells and roofs of 19 new merchant tanks that Enbridge added to its existing tank main-line operation in Hardisty, Alberta. With the largest of the tanks capable of holding 530,000 barrels of oil, the 19 new tanks can contain a combined volume of 7.5 million barrels of oil, enough, according to Enbridge, to fill 48,000 Olympic-sized swimming pools. The coating and lining project was undertaken for oil vapor emission reduction, corrosion prevention, and aesthetics.

Safety challenges were prominent. The floating roofs and internal floors were determined to be permit-required confined spaces, the contractor said. All workers were required to have confined space and H_2S Alive—training about hazards of working in environments where hydrogen sulfide might be present and training in rescue operations if needed in such environments. (H_2S Alive was required of all crews because Enbridge started filling tanks once they were completed. Most of the external shell was coated when the tanks were in service.) The covered tanks met the criteria for permit-required confined spaces. The roof work also required confined space training and H_2S Alive because the crews' main means of access and egress for the roof work was through openings in the floating roofs of the tanks, noted Ken Carriere, the contractor's coatings division field operations manager. Crews working on the externals of the tanks—walls and floating roofs—also needed manlift training. In addition, the contractor ran day and night shifts.

Roof crews also had to contend with rain, wind, and snow in the winter, to the point of shoveling snow from the roof before blasting and priming, the contractor noted. Once the snow was shoveled, the roofs needed to be warm and dry enough for blasting and painting. The tank interior was heated with up to 13 million BTUs of heat, Carriere said. Pumped

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Below: The coating and lining began in July 2008 when 19 tanks were added to Enbridge's existing main-line operation in Hardisty, Alberta, making the Enbridge Hardisty Contract Tankage Project the largest tank coating and lining job in Canada to date.
Right: Overview of the expanded tank main-line operation after the project was completed ahead of schedule, in September 2010. (Dark spots on some tank roofs are either from windblown sand from the surrounding area or minor algae growth.)
Photos courtesy of Enbridge

internally and radiated up through the roof, the heat increased the temperature of the roof exterior by as much as 20 degrees Celsius, enough to dry and warm the roof exteriors for blasting and painting.

The specs themselves were straightforward enough. The abrasive blasting crews prepared the floating roofs to an SSPC-SP 6, Commercial Blast, with a surface profile of 2 to 3 mils. The contractor used copper slag and then nickel slag, both of which were specified, but later, with Enbridge's approval, switched to staurolite for productivity advantages, according to Carriere. Paint crews applied a three-coat system of an epoxy primer (4-6 mils), an epoxy intermediate (4-6 mils), and a urethane finish coat (1.5 to 2.5 mils).

Worker spray painting roof
Courtesy of Park Derochie Coatings Ltd.

A third-party inspection firm that Enbridge hired inspected the blast cleaning before crews began to apply the coating. During application, each coat was checked for defects and for its compliance with the specified coating thickness. Once the system was fully applied, the third-party inspector and the contractor's own NACE-certified staff did a final inspection of the entire system.

In addition to requiring confined space training, the tank floors brought other challenges. Because of rain, cold, and humidity, heaters and dehumidifiers were needed to control the environment inside the tank to maintain the correct ambient conditions for blasting and coating. An SSPC-SP 5, White Metal Blast, with a 3- to 4-mil profile, was specified for the internal floor and first 30 in. above the floor of each tank; one coat of a 100% solids epoxy lining was specified at 30 mils, said Carriere. Above the 30-inch point, the internal

Tank interior
Courtesy of Park Derochie Coatings Ltd.

walls were not coated.

Once each floor was blast-cleaned, a third-party inspector verified that the surface preparation met the spec. The coating crew then stripe-coated welds and edges before applying the 100% solids epoxy lining by plural-component spray. The contractor's NACE-certified inspector and the facility owner's third-party inspector conducted holiday detection testing and final inspection of each lining.

The new tanks, with coatings and linings performing well
Courtesy of Enbridge

For the external shells of the tanks, Enbridge's specification allowed either brush blasting or high-pressure water washing at least 10,000 psi to remove all loose rust and mill scale, according to Carriere. No profile was specified. The contractor chose water washing to ensure that the surface would be free of dust contamination as well as loose rust and mill scale, Carriere added. Third-party inspection verified that the surface preparation spec had been met. The crew then spray-applied a direct-to-metal acrylic primer at 3 mils' dft. The contractor checked the primer for defects and proper thickness. After the contractor approved the primer, the crew applied a direct-to-metal acrylic finish, also at 3 mils' dft. (The primer and finish coat were different products but could be applied 'direct to metal.' The primer had extra rust inhibitors.) The contractor checked the finish coat for defects and thickness, also. The contractor and the third-party inspector conducted a final inspection of the completely applied system.

The roofs, coated first, show no rust after two years. The tank exteriors show no rust after one year. With the job completed in September 2010, the tanks are now in service.

The contractor was Edmonton, Alberta-based Park Derochie Coatings Ltd., which is certified to SSPC-QP 1, QP 3, and QP 6. Enbridge's third-party inspection team was from Colts Inspection Ltd. (Sherwood Park, AB). Sherwin-Williams (Cleveland, OH) manufactured the systems for the roofs and tank externals. Enviroline (International Paint) manufactured the linings for the tank floors.

From Park Derochie Coatings Ltd. and Enbridge