How Faster Throughput Pipe Coatings Can Shave Days Off Application

From *JPCL*, October 2021

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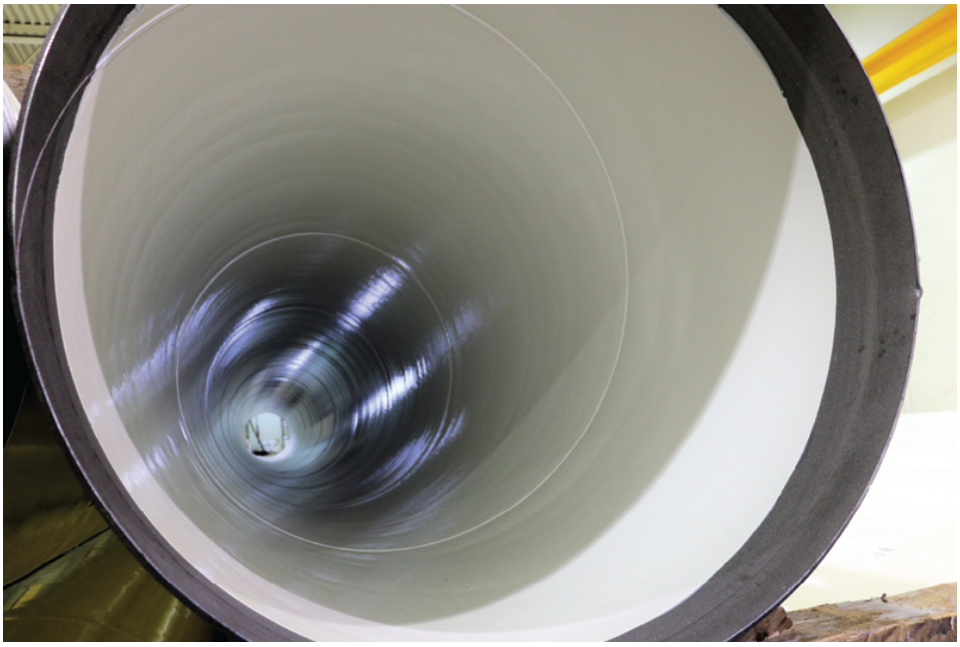

Fig. 1: The ultra-high-solids epoxy interior lining system featured resistance to amine blushing and a longer recoat window, both of which enabled streamlined touch-ups and faster throughput for the coatings contractor. *Photos courtesy of Sherwin-Williams Protective & Marine*

From start to finish, the preparation and installation of three miles (five kilometers) of water transmission pipes resembles a giant assembly line, spanning multiple sites separated by geography. Like any assembly line, efficiencies are critical at every step—from making the steel pipes, to coating them, to burying them in the ground. Any upstream bottleneck may cause delays downstream that could threaten the entire project schedule—and everyone's bottom line.

Delays were not an option when the time came to coat the interior and exterior of 276 pipe sections that make up a new three-mile, 42-inch-diameter steel treated water transmission main for the Comox Valley Regional District (CVRD) in British Columbia, Canada. Therefore, the industrial coatings and linings applicator tasked with the job was determined not to be a bottleneck in the full "assembly line." That meant that the application contractor needed to choose coating systems wisely, focusing on efficiencies.

Fig. 2: Applicators sprayed a quick-setting polyurethane coating direct to metal at a minimum DFT of 25 mils on the pipe exteriors. Following inspections, they could respray any repair areas right on the line due to the coating's two-hour recoat window.

The contractor's goal was to realize a rapid production line cadence through its shop for preparing pipe surfaces, applying coatings, inspecting the applications and loading pipe sections for delivery. Slow and steady would not win this race, as the contractor had just 16 weeks to coat all 276 pipe sections.

Seeking efficiencies, the company worked with water and wastewater specialists from the coating manufacturer to specify an interior lining and exterior coating system that enabled a three- to five-day cycle for completing pipe sections. The contractor hadn't used either material before, but the completion schedule was up to 40% faster than if the company had chosen the coatings it traditionally used. This accelerated schedule would help the contractor ensure timely completion of coated pipe sections so that the pipe supplier could deliver them to the project site on schedule. Efficiencies continued into the field, where installers were able to easily touch up the coatings after welding pipes together.

Fig. 3: Inspectors were able to begin holiday testing and DFT checks minutes after applicators sprayed the polyurethane on the pipe exteriors.

The CVRD initiated the Comox Valley Water Treatment Project in fall 2019 to improve the district's reliable supply of high-quality drinking water. It included building new intake infrastructure, a filtration facility, transmission mains and more. The coatings and linings applicator lined and coated the three-mile transmission main that transports treated water from the new plant to approximately 45,000 residents.

Given the investments made to enhance drinking water quality, the CVRD wanted to ensure that quality would hold all the way from the new treatment plant to customers' taps. That meant specifying a robust lining to protect the pipeline interior from corrosion and minimize the growth of microbial bacteria. It also meant the exterior coating would need to deliver long-term corrosion protection to maximize pipe performance and service life.

Fig. 4: The quick-set polyurethane exterior coating allowed the contractor to move completed pipes off its coating line and into staging areas for loading onto trucks in as little as 30–40 minutes, enabling timely deliveries to the pipeline installation site.

INTERIOR LINING ACCELERATES SCHEDULE

The applicator faced a late April to early September 2020 timeline to line and coat the 276 pipe sections. That schedule required completing multiple loads of pipe per week over 16 weeks. Using the combination of a streamlined lining system and a fast-setting exterior coating, the applicator was able to maintain this pace, providing the required amount of fully coated 60-foot-long, 42-inch-diameter water conveyance pipes each week.

Given the tight schedule, the contractor needed to ensure that the selected coatings would enable fast throughput of completed pipes. There would be no room for delays inside the company's more than 40,000-square-foot shop space. With past experience of encountering five- to seven-day cycles to line and coat pipes, the contractor wanted to accelerate that timeline. To start, water and wastewater specialists from the coating manufacturers suggested transitioning to an ultra-high-solids epoxy amine coating for the interior lining. This shift reduced the contractor's production time by up to 40% to realize a three- to five-day cycle.

Fig. 5a-c: Fully lined and coated pipes await installation at the pipeline construction site. The coatings will protect the pipes from corrosion—inside and out.

The epoxy lining offered two primary benefits compared to the lining material the applicator typically used: resistance to amine blushing and a longer recoat window. Both traits enabled streamlined touch-ups and faster throughput.

On a pipe section's first day through the contractor's coating assembly line, applicators prepared its interior surface using abrasive blast-cleaning methods to the SSPC-SP 10/NACE No. 2, Near White Metal standard. Using an automated line, applicators then sprayed the two-component lining direct to metal on the pipe interiors at a high build of 30–35 mils' dry film thickness in a single coat. The lining hung well and provided a smooth coated surface for the pipe interiors.

Fig. 6: The interior epoxy lining will protect the pipeline interior from corrosion and minimize the growth of microbial bacteria to maintain drinking water quality.

The next day, inspectors checked DFT readings to confirm the lining's thickness and did holiday spark testing to ensure that it was free of pinholes and voids. If any repairs were needed, applicators could make them that day and recheck them the next day before moving the pipe to the exterior coating process. However, most pipe sections passed inspection and were able to move directly to staging for the exterior coating application on day two, accelerating their run through the shop.

For pipe sections that required repairs, primarily for quality-control areas, the contractor realized significant time, material and labor savings with this new coating compared to the lining system it replaced. This was due to a double-whammy bottleneck the competitive lining created. It was especially prone to amine blushing, despite being applied in a climate-controlled shop, forcing applicators to remove the waxy film from the lining's surface before making touch-ups. Further complicating the schedule, the time required to clean the blushing would push the contractor past the previous lining material's 24-hour recoat window. That meant applicators would also need to brush-blast the cleaned areas before finally completing the repairs.

Fig. 7: The impact- and abrasion-resistant exterior polyurethane coating allowed installers to lay and bury pipes without worrying about damaging the coating.

Because the new epoxy coating resists amine blushing, it was less prone to requiring any cleaning before making repairs. In addition, the lining has a 14-day recoat window. Therefore, when the contractor needed to make lining repairs after the initial spray, applicators faced minimal, if any, cleaning needs—and no brush blasting—prior to touch-ups. Removing both of these bottlenecks saved the contractor 24–48 hours on each pipe repaired.

FAST-SET EXTERIOR COATING

For the pipe exteriors, the coating manufacturer recommended a fast-set coating system that would allow the applicator to move sprayed and inspected pipes off its coating line and onto trucks in as little as 30–40 minutes after application. The two-component, aromatic polyurethane coating provides optimal film build properties in a single coat, while also curing rapidly.

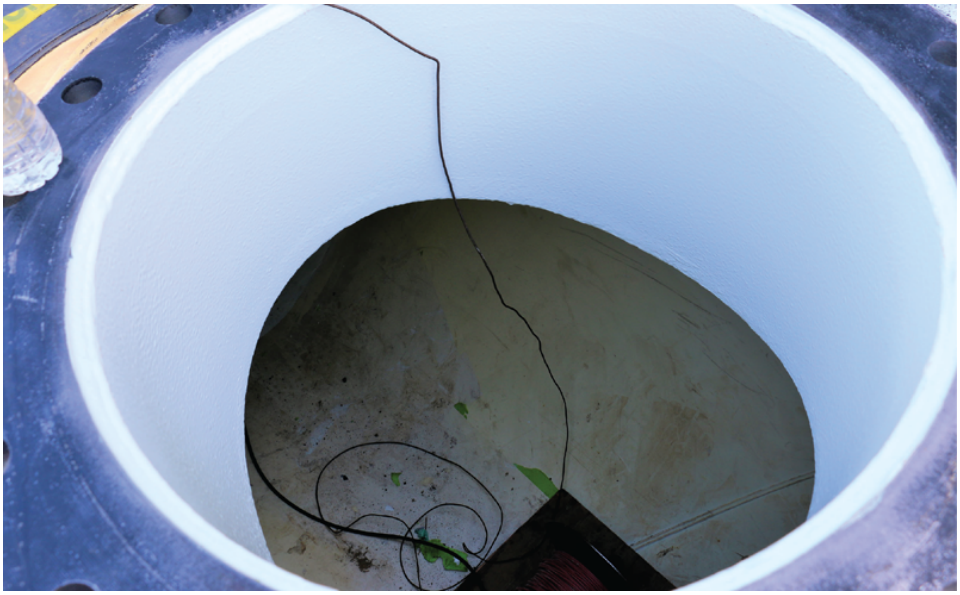

Fig. 8: After installers welded pipes together, applicators entered the pipeline to apply the epoxy lining material on coating "hold-back" areas using dual cartridge technology and brushes.

On either the third or fourth day of a pipe's journey through the coating assembly line, applicators loaded the pipe into the shop's blasting and coating machine. Following a thorough exterior abrasive blast to the SSPC-SP 10/NACE No. 2, Near White Metal standard, applicators sprayed the polyurethane coating direct to metal at a minimum DFT of 30–35 mils. Due to the quick-setting nature of the coating, inspectors were able to begin holiday testing and DFT checks minutes later. If they discovered any repair needs, they could quickly respray those areas right on the line due to the coating's two-hour recoat window.

Once a pipe passed inspection, whether from the initial application or following touch-ups, the contractor was able to immediately load it onto a truck or move it to the shop floor for staging. Thereafter, the western Canada-based pipe supplier that supplied uncoated pipes to the coatings and linings contractor, would deliver the coated pipes to the installation site, advancing the pipeline installation line.

Fig. 9: An applicator brushes a quick-set polyurethane on the exterior of a pipeline access manway that was added in the field.

CARTRIDGES FOR FINAL TOUCH-UPS

At the pipeline installation site, a less involved coatings cadence picked back up again following welding. The contractor purposely left a 6-inch-wide unlined and uncoated area at the ends of each pipe—inside and out—to enable onsite welding. After installers welded the pipes, applicators from a British Columbia-based civil contractor entered the pipeline to line these interior “hold-back” areas. Inside the pipe, they applied the ultra-high-solids epoxy lining using dual-cartridge technology and brushes. Using the compact cartridges provided a major efficiency by eliminating the need for, and cost of, using plural-component spraying equipment. To protect the exterior of the uncoated weld joints, the crew used heat-shrinkable sleeves.

The civil contracting crew also had to coat areas of the pipe that were cut open and welded in the field to add access manways throughout the pipeline. In these areas, the crew used cartridges and brushes to reline the pipe interior with the ultra-high-solids epoxy where any damage occurred from cutting and welding activities. Applicators also applied a flexible polyurethane coating to the exterior welds and access manway flanges.

When installers buried the welded pipe sections, they realized additional advantages of the exterior coating system—including its resistance to abrasions and impacts. First, applicators had hardly any areas to repair following transportation of the coated pipes. Second, they were able to lay and bury the pipes without worrying about damaging the coating. Both factors contributed to an efficient installation process.

CONCLUSION

Efficiencies were critical throughout the entire project. Thanks to timely deliveries of coated and lined pipe sections and streamlined field touch-ups, construction remained on schedule, and the CVRD water treatment plant is now fully operational as of fall 2021.

For its role in the project, the coatings and linings applicator was able to dial in the process to move each pipe through both interior and exterior applications and out the door for delivery within five days or less—with some pipes able to move through in as few as three days. The choice of coating systems made all the difference in accelerating that timeline—which was one to two days faster per pipe than if the contractor had used other products.

ABOUT THE AUTHORS

Gino Sincovich is Market Manager – Water Transmission for Sherwin-Williams Protective & Marine. During his 17 years in the coatings industry, Sincovich has primarily specialized in high-solids coatings and linings for water transmission, as well as other high-value infrastructure applications. He holds several NACE International certifications and is active on several NACE and American Water Works Association (AWWA) subcommittees.

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