

CIRCULAR LOGIC

A robotic manhole rehabilitation system from Remote Orbital Installations applies spray coatings evenly and quickly without confined-space entry

By Ted J. Rulseh

Manholes can be a major source of infiltration to sewer systems, contributing, by some estimates, as much groundwater as do leaky laterals. On the other hand, manholes are relatively inexpensive to rehabilitate.

The rehabilitation process often includes sealing of the concrete or masonry structure. One common method, the application of spray-on coatings, is effective and relatively efficient, but it typically requires confined-space entry with all the equipment, personnel and labor.

Remote Orbital Installations LLC, based in Verona, Wis., offers the TranSPOD robotic manhole spray application system, a portable unit that operates from a trailer or truck body, or can be removed for projects on off-road rights-of-way.

Robotic operation means workers

do not need to enter the manholes. Instead, they observe the process from the surface, controlling the applicator remotely. The TranSPOD unit uses a rotary spray head that dispenses two component spray systems for accurate coating application to meet project specifications.

On June 14, Remote Orbital president Mike Kronz demonstrated the equipment on a city street in Verona. Assisting were Rick Jacobs, an engineer with Remote Orbital; and Eric Rennerfeldt, a senior area manager with Graco Inc., which built the trailer that houses the TranSPOD system. Observing was Greg Denner, street superintendent with the City of Verona.

Walk-Around

The spray system was housed in a 28-foot gooseneck trailer with an 8-foot ceiling, double I-beam construction,

and walls, floor and ceiling insulated with foam to protect the chemicals and equipment. The trailer is also air conditioned.

A door on the right front exterior of the trailer opened to reveal a 4-cylinder, 40 kW John Deere diesel generator set, a 7.5-hp electric/hydraulic pump that powers the coating proportioners, and a 10-hp electric air compressor. A toolbox and workbench were located at the front of the trailer, and under the bench was a Graco Reactor heat pack for heating the sealant materials.

On the trailer's right side were four drums containing the primer and sealant components. Two drums held the urethane primer, mixed in a 1:1 resin-to-hardener ratio; the other two held SherFlex polyurethane sealant, a 100 percent solids product from Sherwin-Williams Co., mixed in 3:1 resin-to-hardener ratio.

From the drums, the materials are piped up and along the ceiling to proportioners on the left side of the trailer that pressurize the materials in the proper amounts. Analog gauges on these units display operating pressures. From there, the materials are pumped to the reactor and heated to approxi-



The TranSPOD unit applies a coat of primer to the manhole interior.



TECHNOLOGY TEST DRIVE

EQUIPMENT:

TranSPOD robotic manhole spray coating system

MANUFACTURER:

Remote Orbital Installations LLC, Verona, Wis. 608/845-0360 www.roi360.com

LOCATION OF DEMO:

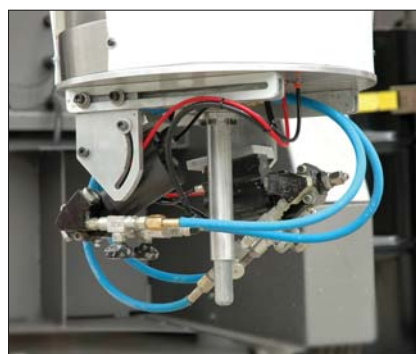
Verona, Wis.

DEMONSTRATED BY:

Mike Kronz, president

LIST PRICE:

\$139,000 as demonstrated



A close-up view shows the spray heads.



A wireless remote controls the major system functions.



Above, ROI president Mike Kronz deploys the spray unit to start the sealing process. At left, the sprayer unit is deployed down the manhole.

the manhole. Hand cranks control in/out and side-to-side boom movement; up/down adjustment is powered and joystick-controlled.

Most manholes are lined with the unit inside the trailer. For manholes off the street and in areas the trailer cannot reach, the spray unit can be rolled out of the trailer using manually deployed ramps and pushed or pulled to the work site. A remote-controlled winch is mounted under the work bench to retrieve the TransPOD. The unit as demonstrated had 50 feet of hose cluster for the spray vehicle; additional sections can be added, up to a total of 400 feet.

The cylindrical spray unit has a stainless-steel housing with side-mounted

mately 140 F. A hose cluster conveys all four streams of material to the spray unit.

The TransPOD unit itself is a four-wheeled vehicle; the two rear wheels are closely spaced and are designed to pivot in the manner of a hand truck for ease of maneuvering. A boom on the unit enables the operator to extend the spray unit out over the street to access

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Mike Kronz

lights to illuminate the coated surfaces. At the bottom are two adjustable spray guns, one for the primer and the other for the sealant. The material components are mixed in chambers in the heads of the guns, within one inch of the nozzle tip.

The guns spray the material at 2,500 to 3,000 psi while rotating at an average speed of 60 rpm (speeds from 0 to 300 rpm are possible). A powered winch raises and lowers the spray unit, which can coat manholes up to 100 feet deep.

The operator uses a panel in the trailer to program in rotation speeds and the speeds of the winch that lowers and raises the spray unit. Spray unit operation is controlled with a handheld wireless remote. Functions are auto up/down motion for primer, auto up/down motion for the sealant, and manual up/down winch control. The operator also can select clockwise or counterclockwise rotation, activate the spray heads for spot application, and operate the lights.

Operation

Kronz demonstrated the technology on a 10-foot-deep, 4-foot-diameter concrete block manhole structure with a 2-foot-diameter brick chimney. In preparation, Kronz had performed a proper confined-space entry to waterblast the manhole structure with a 3,500-psi pressure washer and had dried the structure with a portable indirect-fired diesel-fueled heater manufactured by Heat Wagon.

A reverse ventilator set up on the next manhole drew air through to expedite drying; later it aided in ventilation during application of the coatings.

The first step was to apply primer to the cleaned and dried surfaces. Kronz backed the trailer to the manhole, used the cranks to position the boom with the spray unit directly over the manhole, and used the remote control to lower the spray unit to just above street level. After testing the primer



Prime and sealant components are dispensed automatically from drums.



Proportioners deliver material in appropriate amounts.



Material components are heated in a reactor before spraying.

spray head by spraying into a corrugated box, he adjusted the head and used the remote control to lower the spray unit to the bottom of the manhole.

At the touch of a button on the

remote control, the spray head began spinning while the unit ascended at the programmed speed, applying an even coat of primer. The lights attached to the housing made it possible to check for proper coverage. After about 30 seconds, the unit had reached and sprayed the chimney, where Kronz stopped it.

While the primer dried (15 minutes), Kronz injected grease into a zerk fitting on the spray gun head to isolate the mix chamber during non-use. "We recommend using carburetor cleaner to clean the spray tips at the end of the work day," Kronz noted. "No other solvents or cleaning steps are required."

The next step was to apply the SherFlex sealant. "This is a very dense material that can be built up to 3 inches thick with no sag," Kronz observed. "It also can be spread with a trowel for about 15 minutes after application, making it possible to fill in gaps manually if necessary."

Kronz repeated the test spray procedure and again lowered the spray unit to the bottom of the manhole. The unit ascended at a much slower rate than for the primer, applying a 40-mil coat to the structure in about five minutes. Kronz then reversed the direction, spraying down the structure and up again at the same speed. The application left a heavy coating of cream-colored sealant over the entire structure.

Kronz used a trowel to spread material into gaps in the chimney area, then used the spray unit in a manual mode to fill gaps farther down in the structure. He then completed two more passes with the spray unit in the auto-



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matic mode. The final coating thickness was about 200 mils.

Observer comments

In watching this system, it was easy to imagine the contrast with manual spray application, in which a technician would spend a long time inside the manhole, in a hot, confining environment, breathing supplied air. Sealant application with the TranSPOD unit was essentially effortless, and the lights on the sides of the applicator

made it easy to watch the progress of the work.

There appears to be significant potential to automate the process further. For example, a camera mounted on the applicator would enable close inspection of the structure, making it easier to locate areas needing spot treatments — especially when sealing deep manholes. The boom could be powered to extend/retract at the touch of a button instead of with hand cranks.

A monitor panel mounted at the rear of the trailer would allow the operator to observe operating pressures and other parameters without having to enter the trailer. The TranSPOD unit itself could be powered so that it would not need to be pulled or pushed to off-street locations.

Those readily correctable issues aside, this system appears to give cities or contractors an efficient, reliable way to seal manholes against infiltration, and technicians a method of applying sealants that is much more pleasant than manual spraying.

Manufacturer comments

Kronz notes that the improvements described above are either in development or already available as options.

For example, the TranSPOD unit can be powered with an air-drive motor run off the trailer-mounted air compressor. Remote Orbital is also investigating the addition of a canopy to the back of the trailer to protect operators from long exposure to the sun.

The TranSPOD can be used to seal not only round structures, such as manholes and stacks, but also square structures, such as lift stations, Kronz observes. A manual spray gun (not demonstrated) is included for structures that cannot be sprayed with the rotary unit; it also can be used for touch-up work after rotary-spray jobs.

"A key advantage of this system is the consistency of application," Kronz says. "It can be used to apply a coating reliably according to a coating thickness specification. That is in addition to being able to seal structures without subjecting employees to the harsh conditions inside manholes."

Kronz notes that as in any coating application, surface preparation is the most crucial step. All surfaces to be coated should be hydroblasted to remove any laitance, calcium deposits, fats and other contaminants. Care should be taken to keep large debris from entering the lateral. Visible leaks can be eliminated by drilling and injection of expanding grout.

"An efficient way of tackling a project with multiple structures is to perform the cleaning and leak repair a day or two before the final coating process," says Kronz. "This allows the spray crew to dry the structure with minimal effort before coating. With two teams leapfrogging in this fashion, we have seen contractors complete from six to 10 manhole rehabs per day." ♦

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