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by **Jeff Griffin** Senior Editor

3M Systems Locate Plastic Pipes



Left to right: Placement of 3M™ EMS Path Locating Tape over a gas pipeline.; Placing and mapping a 3M™ RFID Marker at a street crossing.; Placement of RFID markers at utility crossings and in change of directions and fittings is an excellent application.; EMS path marking tape and RFID ballmarkers complement each other for marking both the path of a facility and points of special interest.

A practical and cost-efficient method to accurately locate buried plastic pipe has been developed by 3M, addressing the inability of conventional locating equipment to detect HDPE, MDPE and PVC pipe and conduit that does not contain tracer wire.

The 3M technology uses passive electronic markers packaged with a carrier similar to caution tape or a rope which is placed near or above the pipe. An operator on the ground above the pipe uses a handheld locator to generate a radio signal which is received by the marker and reflected back to the transmitter, identifying the marker's exact location, type of utility, depth and path.

Positioned at intervals along the pipe, a crew member can quickly identify and mark the path of the pipe.

Locating plastic pipe is a continuing challenge because the primary utility locating tool – a two-component electromagnetic system – can locate plastic pipe only if tracer wire is attached. For years, utility owners and operators have used tracer wire to make plastic facilities locatable. However, there are thousands of miles of plastic pipe in the ground without tracer wire, with wire that is incorrectly installed or has been corroded and is considered unlocatable by electromagnetic equipment.

Ground penetrating radar is an option for pipe location, but the present technology's inability to penetrate dense soils limits its effectiveness.

"The use of passive radio frequency identification (RFID) markers to locate buried pipe and facilities is not new – indeed, 3M has offered electronic marker balls for more than 29 years," said Corey Willson, national sales manager of the 3M Electrical Markets Division. "Markers are attached at various points to pipe during installation or during maintenance. The marker is easily and accurately located using a handheld locator which identifies the marker's exact position. Most of the major locator manufacturers make radio frequency (RF) locators. Unique to 3M is the ability to read/write to RFID markers."

Willson said as RF marking evolved with the addition of read/write capability, facility owners began using them to mark the path of pipelines. Typically when ID ball markers are used for path marking, they are placed between 40 to 150 feet apart.

"Using our knowledge and experience with RF marking systems," said Willson, "we developed a product package with marker spacing of less than 10 feet, addressing unmet needs for locating non-metallic facilities."

Drop-in

Willson said path marking is designed to be a drop-in alternative to replace existing caution tape and tracer wire installations. One benefit to the technology is that it does not require continuity to operate – marker strings can be separated or a section removed without affecting locating capabilities.

Benefits Of Path Markers

For locating buried plastic pipes and conduits, 3M's EMS path marking technology offers many advantages compared to electromagnetic and ground penetrating radar methods:

- Simple to install, making locates quick, easy and accurate;
- No-maintenance markers are corrosion resistant and last as long as the pipe;
- Unlike conventional tracer wire locating, no transmitter is needed;
- Markers have no electric components and do not provide a path for lightning;
- Tolerant to congestion, nearby utilities do not interfere with RF signal;
- Continuity is not required – removing a segment of markers does not prevent location of other markers; and
- Reduced complexity of locator makes it easy to learn. With dual frequencies, locators can receive signals from both ball and path markers.

In many ways, EMS path locating is similar to RF marking technology, but with important differences.

"Custom path markers are packaged in a carrier such as caution tape or rope, rather than individual markers," Willson explained. "The markers are not electrical devices and no electrical currents flow inside them. They are made of mechanically resonant magnetic materials that can couple to nearby magnetic fields. Markers are placed with an antenna's axis positioned horizontally, thus providing an elongated detection field that creates a path for marking the underground assets."

When a locator generates a magnetic field near a marker at its mechanical resonant frequency, the marker's ribbon-like magnetic element starts to vibrate stored energy. When the transmitter shuts off, the stored energy in the ribbon is dissipated while generating its own magnetic field at its resonant frequency and is detected by the locator.

"We recognized the value in differentiating between point and path markers – point markers still can be used to identify locations of valves, splices or fittings," Willson said. "Therefore, we created unique frequencies for path markers and point markers. To properly receive signals, the RF locator must be configured to those frequencies."

Pipe with tape containing path markers can be laid in open trench or plowed in.

"Maximum detection depth is 36 inches," said Willson, "but we recommend burying no deeper than 30 inches and the best practice is 24 inches below grade."

"For directional drilling installations," Willson said, "rope is pulled back with the pipe during product pullback, as is done with tracer wire."

For legacy installations, marker rope simply is pulled through empty conduit.

Easy path

A pipe's path is located simply by following the markers.

"At this time," said Willson, "we recommend using only 3M Model 7000 series locators that are specially engineered to provide maximum performance for EMS path locating. A feature designed into the locator allows the field technician to determine path direction. Rotating the wrist finds the maximum signal pointing to the next marker, usually about 70-inches away. This locator also has the ability to scan simultaneously for ball markers."

Facility owners determine when and in what situations to use path markers.

"Currently," Willson said, "we are seeing adoption of the path locating system in Greenfield applications where facility owners use the technology to mark all its facilities in a particular area or development, eliminating the need to switch back and forth between conventional electromagnetic locating and RF technology."

In conclusion, Willson observed that an industry trend is to use more plastic pipe for underground assets at a time when costs and liability of unintentional strikes also have increased significantly. Previously, available methods have not addressed all of the challenges and difficulties of finding buried plastic pipe. Path markers offer a new approach that provides quicker and more accurate locates, reduced interruptions and lower costs.

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