

Electronic Markers Simplify Construction Of New Underground Gas Lines

New street and residential construction projects commonly involve conflict between marking newly placed underground gas mains and the surface grading required for landscaping and road building. The painted lines and flags that temporarily mark new pipeline features such as stubs and line ends are not permanent and may be disturbed before crews can return to make new service connections.

Relocating and remarking these pipeline components is time-consuming and costly, and unmarked features may present safety hazards. Southwest Gas Corporation, which operates in Arizona, most of Nevada and portions of California, has adopted an electronic marking process to solve this challenge.

This utility delivers natural gas to several of the highest population growth areas in the country, notably the Las Vegas and Phoenix regions. "We have 1.7 million customers in three states and are in a period of accelerating growth," said Michael Gruenberg, manager of operations support staff for Southwest Gas.

Gruenberg explains, "We need to pinpoint service laterals, service stubs and the ends of the mains in order to easily bring service to new customers. Permanent marking of features such as pressure control fittings, excess flow valves, main shutoff valves and squeeze points is also important. These ele-



ments are sometimes difficult to find with traditional methods and we now mark them electronically as pipelines are installed or excavated for repair."

Southwest Gas main and service connections are installed by contractors who pressure-test new segments and then drop electronic marker balls at key points be-

fore backfilling. When these locations are excavated for service connection or main line extensions, markers are removed for re-use at other locations, Gruenberg notes. However, markers for gas control fittings, squeeze points, or the change in pipe direction are typically left in place for permanent marking.

"In 2005 alone, Southwest Gas installed more than 70,000 new meters across our service area," said Gruenberg. "We expect that number to exceed 80,000 for 2006. With the large number of new service connections we're making each year, the ability to efficiently find and accurately excavate service stubs and other components using electronic marking saves the company substantial time as well as expense."

Marker operation

Buried electronic markers such as those used by Southwest Gas reflect a radio signal back to a hand-held locator device on the surface to precisely pinpoint the marked component. Using this locating technology, crews can accurately expose a stub or other feature with vacuum excavation or even using a post-hole digger. Gruenberg notes that electronic markers are rugged, and because they require no external power source, they function indefinitely, and give a very precise rather than a general indication of marker location.

Electronic Marker Options

Electronic markers contain a passive antenna that reflects an interrogating radio signal back to a hand-held locator, which allows the buried marker to be precisely pinpointed. These devices are supplied in various colors according to the marked utility, and in near-surface, mid-range and full-range models.

For example, small three-inch long near-surface units are used down to about two feet (0.61m) below the surface, and the four-inch diameter self-leveling marker balls used by Southwest Gas can be placed in holes or trenches at depths of five feet or less. Another type of marker is intended for objects up to six feet (1.8m) below grade, and even larger markers can pinpoint underground facilities as deep as eight feet (2.44m) below grade.

The newest underground electronic markers use radio frequency identification (RFID), which records and saves information on marker balls, such as the nature of the buried component, its owner, date of placement, GPS coordinates and exact marker depth. This data is activated and displayed on the locating device as markers are interrogated. RFID markers require no source of power and will function indefinitely.



The four-inch ball markers used by Southwest Gas can be located using a 3M 1264 EMS II Marker Locator or a 3M Dynatel 2200 Series Locator. Distinctive marker colors and operating frequencies are assigned for each utility in accordance with American Public Works Association standards.

Electronic Markers

Electronic marking was first adopted by telcos and power companies and subsequently by water and gas utilities across the country, driven in part by the expanding use of non-metallic pipelines. Specific marker versions are provided for every utility category, with individual colors and interrogation frequencies to distinguish between utilities, as assigned by the American Public Works Association.

Some gas and oil companies also use buried markers to permanently mark pipe routes and road crossings. This option is especially valuable for plastic lines in areas where ground conditions are not hospitable to tracer wire.

The passive antenna inside an electronic marker is suspended in a liquid that keeps the antenna properly oriented for maximum signal strength and accuracy, regard-

less of the position of the ball. Portable, hand-held equipment is used to find electronic markers by transmitting a radio frequency signal into the ground. This signal is reflected back to the same equipment from the marker ball, giving an exact and unambiguous indication of marker position.

Conventional locating equipment gives only an approximation of position and depth, said Gruenberg, "and when there are high power lines overhead, a high water table, or other pipes or metal objects in close proximity it can be very difficult to pinpoint specific buried facilities with conventional locating equipment.

"In contrast, we find that an electronic marker provides a very precise and dependable indication of both the location and depth of buried gas line features. The selective frequency of electronic markers is not affected by nearby metal objects, electrical power fields, or even the adjacent markers of another utility."

According to Gruenberg, Southwest Gas crews have found that the electronic marking and locating process can be learned in just a few minutes and no complex interpretation of results is required. When a marker is found, the reflected signal causes the receiver to give the operator both a visual reading and an audible tone.

Excavation safety continues to be the primary goal of Southwest Gas as the company focuses on materials and methods that will protect workers and the general public. The Southwest Gas manager notes that electronic marking improves excavation safety and speeds up service connections because crews can move quickly from location-to-location as work proceeds. The same is true for subsequent work on marked components such as pressure control fittings and shutoff valves. The precision of electronic marking allows crews to identify buried items quickly and then excavate accurately and safely.

FOR MORE INFORMATION:

Underground utility markers:

3M, (800) 426-8688, 3m.com

Gas utility:

Southwest Gas Corporation, (702) 876-7011, swgas.com



Michael Gruenberg is Manager of Operations Support Staff for Southwest Gas, which operates in Arizona, most of Nevada and portions of California.