Pipeline Perspectives

# Gas Distribution Pipeline Entanglement

By Todd Porter

Gas distribution owners and operators are entangled within the complex and congested underground utility infrastructure of municipal districts. This poses a growing challenge for system maintenance, rehabilitation, expansion and now to comply with the requirements of the distribution integrity management plan (or DIMP rule).

As participants and professionals in the pipeline industry, most of us have earned our stripes having implemented the U.S. Pipeline and Hazardous Materials Safety Administration's mandates for gas transmission and hazardous liquid pipelines. With amendments to the Federal Pipeline Safety Regulations (49 CFR, Part 192), operators of gas distribution pipelines are now required to develop and implement integrity management programs, known as DIMP.

These programs are intended to enhance safety by identifying and reducing pipeline integrity risks, similar to those regulations for gas transmission and hazardous liquid pipelines. The rules are tailored to distribution pipelines and based on required risk assessments and enhanced controls, with risk-based adjustment of prescribed intervals for leak detection surveys and other fixed-interval requirements in the agency's existing regulations. Much like small hazardous liquid operators, there are simpler requirements for master meter and small liquefied petroleum gas (LPG) operators to reflect the relative lower risk.

As noted, the DIMP rule is similar to gas transmission and hazardous liquid pipelines, but makes an exception for the different operating environments. A major difference is that the gas distribution systems lie generally within populated metropolitan and urban service areas, making them 100 percent high consequence areas (or HCA), whereas the gas transmission and hazardous liquid pipelines were segmented and prioritized based on class location and HCA, resulting in a much smaller component of their system total. Therefore, the associated risk for distribution systems is largely due to population exposure to the threat of failure caused by surrounding construction activity.

This all seems quite obvious. However, the situation has become very complex, with many utility services competing for very limited space. Good data is the foundation for meaningful analysis and subsequent management for optimizing performance and safety. So what do I know about my system and the surrounding utility space? How can I comply with DIMP regulations and make the most effective use of operating and investment capital? Let's review some existing technologies and processes that may be new to some pipeline operators to help understand the entanglement.

My background includes a decade of inline condition inspection, geometry and mapping of operating oil and gas pipelines. The technology and process is mature and most, if not all, pipeline owners and operators employ these services to satisfy regulators and corporate performance objectives. The gas distribution component of our pipeline industry is the same, but different, so let's contrast the differences and walk through how we can gain knowledge of the distribution system from a utility management approach.

First off, many distribution pipelines are not steel, nor are they set up for pigging. Therefore, condition assessment and mapping with inline tools is difficult and focused more on identifying leaks than material degradation. So how accurate and complete is my distribution system map? Can an inventory of pipe material, installation data and operations data be made? Can system maintenance, rehabilitation or expansion be done in an effective and optimal way? Will the design for expansion and new construction consider all adjacent and intersecting utilities?

In 2003, the American Society of Civil Engineers (ASCE) published and distributed the "Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data." This "SUE" standard presents a system of classifying the quality of existing subsurface utility data for project owners, engineers and constructors to develop strategies to reduce or allocate risks due to existing subsurface utilities in a defined manner. It is an effective, structured process, which combines a number of technologies in the most effective way to locate and identify utilities.

The first step involves a records search and GIS baseline development, considered Quality Level D (QL-D) information. Making field survey observations to identify visible aboveground utility features is Quality Level C (QL-C) information, correlated with the records information (QL-D). When records and features information do not agree, discrepancies are resolved. The next level, Quality Level B (QL-B) uses appropriate surface geophysical methods (such as pipe and cable locators, terrain conductivity methods, resistive measurements, metal detectors and ground penetrating radar) to designate existing subsurface utilities or to trace a particular utility system in 2D horizontal location only. More sophisticated radar tomography and in-pipe XYZ Probe mapping systems are available to provide accurate and complete 3D renderings of large areas, further reducing cost and risk. Finally, selected subsurface utilities can be exposed for verification and validating 3D information. Minimally intrusive excavation methods are used such as vacuum excavation. This is Quality Level A (QL-A) information.

Gas distribution systems are 70 percent owned and operated by municipal utility districts, the remaining 30 percent are investor or public owned. These are complex systems due largely to the location within densely populated areas and within congested underground utility space. In order to make informed decisions and satisfy regulatory compliance, we need knowledge of our systems and those other utilities in proximity. There is no substitute for an accurate and complete 3D map for which the SUE process offers a structured approach and proven economic return.

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