OTD Operations Technology Development

Intelligent Utility Installation Process

A research team developed an Intelligent Utility Installation Process to provide a methodology, field process, and a data model for capturing data during new utility installations.

Project Description

New installations, replacement programs, and extension projects are ideal opportunities for capturing and documenting asset and related gas-system information. However, many operators are using outdated methods to collect this information or are not collecting it at all.

Existing and future requirements obligate local distribution companies to maintain complete and accurate data that will be important for Distribution Integrity Management (DIM) compliance, risk analysis, and future system use considerations.

The objective of this project was to develop an Intelligent Utility Installation Process that provides a methodology, field process, and a data model for capturing data during new installations. The process is used to capture information regarding the location, materials, installation process, environmental considerations, and other factors.

Deliverables

Deliverables for this project include data-collection guidelines; a data model; field-data-collection procedures for GPS; smart tag programming protocols and installation procedures; a methodology for determining and documenting data quality; technology recommendations; and regional workshops.

Benefits

There are many existing and future beneficial uses for the type of data to be collected through the Intelligent Installation Process, including:

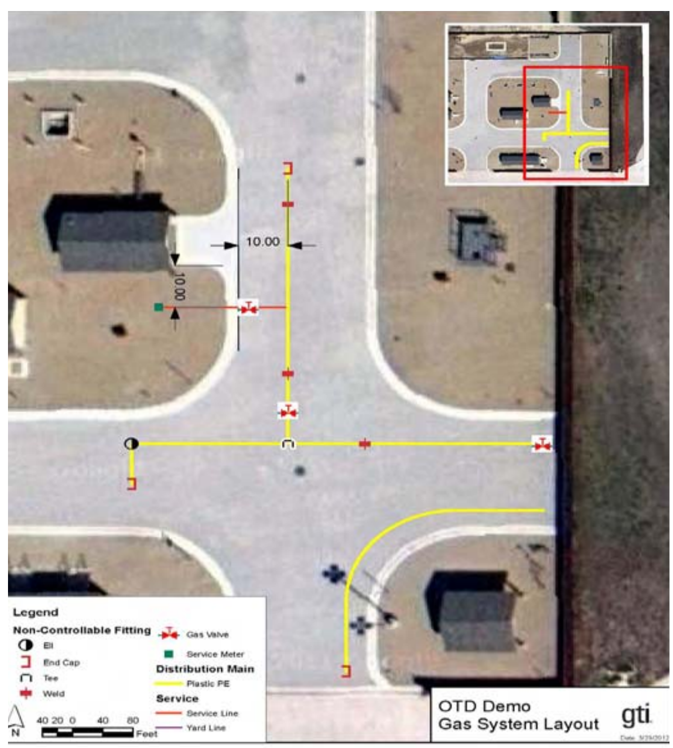
- **DIM Compliance** – New DIM regulations will require operators to collect information during new installations and exposures to facilitate the execution of a DIM program.
- **Analysis** – Increased and improved data will facilitate a full and proper risk analysis and optimization of risk management efforts.
- **Industry Standardization and Adoption** – The development of industry standards in data collection will enable widespread adoption and use by utilities and their contractors.
- **Future Considerations** – Gathering information during construction will ensure that future issues or opportunities can be evaluated with quality data without incurring the cost of collecting it.

Technical Concept & Approach

The Intelligent Utility Installation Process provides a methodology to collect information during new installations (as well as exposures during routine maintenance). The methodology includes field-data-collection procedures, as-built drawing guidelines, and data model formats.

Examples of information to be collected include:

- Location
- Changes in direction
- Location of abandoned facilities



- Material properties
- Installation method
- Environmental conditions
- Supporting assets (e.g., tracer wire, marker balls, and warning tape)
- Coupling and joining information
- Contractor and field personnel information
- Pressure test records
- Inspection records.

The research team provided recommendations for such technologies as GPS, RFID and smart tags, laser scanning, barcode scanning, and other field-data-collection devices.

Results

Several assumptions were required to develop the recommended logical data model and high-level processes for capturing data during field installations. It was important to realize that this is a data-capture process that would be used for all future field work and must be capable of providing full tracking and traceability, trend analysis, risk identification, and threat mitigation.

A geographic information system (GIS) was recommended to be the data repository, providing a spatially enabled relational database. It was also important to develop a data-capture process with the flexibility of "turning on" features as they are needed to make the data acquisition possible.

The data modeling development progressed in parallel with the development of the data-capture process with the model becoming more complex and detailed, transitioning from a conceptual data model to a logical model. The logical model is an abstract representation of the things that are most important and how they relate to one another. The logical model will be the foundation of the physical model.

Activities focused on:

- Providing high-level summaries and flowcharts of the data-collection processes
- Providing a Logical Data Model that would serve as the framework for the final data model, and
- Providing recommendations on the technologies needed to collect the proposed data.

Barcoding technology integrated with high-accuracy GPS and a hand-held field-data-collection device was chosen as the first combination of technologies to demonstrate.

A set of guidelines for operators and manufacturers is recommended to support the implementation of the material and manufacturing marking standards described in ASTM F2897-11. The recommended guidelines would address the issues related to the permanency and durability of the barcode markings, how frequently the markings should be made, how the various fittings and appurtenances should be marked, and what type of marking techniques should be used. The development of the guidelines will be included Phase 2 of this project.

Other technologies and information that were investigated include:

- An automated polyethylene-pipe-welding machine
- GIS
- GIS barcode decoding tools
- Groundbed and backfill sensing devices
- Hand-held field-data-collection devices
- High-accuracy GPS
- Life-cycle tracking of specifications and procedures
- Long-term traceability
- Mobile device area networks
- Publically available data integrated in the GIS.

Status

Phase 1 of the project is completed. A report was issued in September 2012.

High-level summaries as well as graphically illustrated flowcharts were presented to provide clear descriptions and show the inter-relationships of each step and sub-process. The report also identifies the technologies to be used during field-data collection to automate data capture while reducing or eliminating the opportunity for human error.

For more information:

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