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THE CHALLENGES AND APPROACHES TO MANAGING PRESSURE PIPELINES

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Management of sanitary force mains provides significant challenges to owners as the ability to shut down or expose the pipeline for a thorough inspection is often impractical due to operational considerations. Inspection techniques of gravity pipelines do not always transfer easily to their pressure pipe counterparts as visual assessments do not provide data on the structural condition of the pipe. Therefore, a different set of tools and assessment techniques is required for managing pressure pipes.

Challenges

NASSCO's Pressure Pipe Committee has developed a comprehensive Force Main Technology Summary Matrix, available at nassco.org/publications. This matrix provides a step-by-step plan based on specific factors, each of which narrows down the options, based on the following questions:

- Can it be taken out of service?
- What is the pipe size?
- What is the material?
- Do we need screening or direct assessment?



Approach

Historically, force main management strategies have focused on repair and replacement programs based on failures or the age of the pipeline. However, given the financial, environmental, and regulatory impacts of force main failures, a more holistic approach to managing these critical assets is necessary.

The most effective strategy to pressure pipeline management is to implement a risk-based approach for data collection, inspection, condition assessment, and management techniques. Risk is determined by evaluating both the likelihood and consequence of failure of an asset. Using asset risk to guide the management strategies, an owner can ensure they implement the right approach, at the right time, with the lowest financial impact. Through the use of various non-destructive evaluation techniques, inspection of pressure pipes can be conducted with subsequent structural analysis of the data allowing for a comprehensive condition assessment of the pipeline. By utilizing industry standards along with hydraulic and pipe condition data, it is possible to pinpoint problematic areas along a pipeline for targeted repairs.

Pressure pipe inspection technology selection is a key part of any management program and requires

a sound technical understanding of the various tools available in the industry. Prior to developing any inspection and assessment planning protocols, it is critical for key stakeholders to understand the available technologies used for destructive and non-destructive testing of pressure pipelines. Some variables that must be evaluated when selecting technologies for assessing a pipeline may include:

- Risk
- Material
- Diameter and length
- Operating and surge pressures
- Operational constraints
- Pipeline inspectability
- Cost efficiency of technologies
- Technology limitations
- Ability to provide actionable information

Solution

The management of force mains has significantly advanced over the past decade. The development of inspection techniques and technologies as well as the analytical and engineering support behind these tools can now offer owners a broad range of resolution and reliability when managing their force main inventory. While many tools now exist to provide a snapshot of a force main condition, not all technologies provide the necessary information. Thus, technology selection and subsequent analysis should be based on the risk associated with the force main.

By understanding the risk of failure of the force main along with the benefits and limitations of assessment techniques and technologies, a sound, defensible management strategy can be implemented to maintain and extend the life of the asset. It is important to note that defects and deterioration of pressure pipelines can vary greatly from one pipe to another. To identify different defects, it is often prudent to use multiple technologies. Too often, assessment strategies are implemented without consideration of the particular pipeline characteristics, failure consequence, and informational needs for the pipeline. Using the correct approach for assessment will help the utility obtain the necessary information for managing the pipeline.

Therefore, by approaching force main management with a risk-based strategy, these assets can provide continued service at an optimized life-cycle cost. By identifying and repairing only those pipes that have the highest consequence and likelihood of failure, a utility can realize major capital program savings over replacement or large-scale rehabilitation.