



U.S. Department
of Transportation

INTERNAL CORROSION DIRECT ASSESSMENT OF GAS TRANSMISSION, GATHERING, AND STORAGE

OPS ACCOMPLISHMENTS

Pipeline Safety
Research and
Development
for Enhanced
Operations,
Controls, &
Monitoring

Challenge

Internal corrosion monitoring for timely remedial measures needs to be performed. However, it is underscored by pipeline failures. Direct, visual examination of internal corrosion of entire pipelines is impractical. Significant amounts of pipes can't be inspected using in-line inspection (ILI) tools. Corrosion monitoring tools require appropriate placement to detect corrosion at susceptible locations. A simple method, based on flow modeling, was developed for dry gas, transmission systems to identify locations most likely to suffer internal corrosion. This method, called Internal Corrosion Direct Assessment (ICDA) needs to be validated. Also, this method isn't directly applicable to wet gas systems, where significant volumes of water can exist. A method that encompasses both wet and dry gas lines needs to be developed.

Technology Description

Flow modeling determines the critical pipe angle of inclination in the direction of gas flow above which water will collect. If the actual pipeline inclination derived from pipeline elevation maps exceeds the critical angle at any location, water holdup is predicted at that location. If direct examination at some of those locations doesn't indicate internal corrosion, then locations downstream aren't likely to suffer internal corrosion unless conditions change. If the selected locations indicate corrosion, then corrosion mitigation measures can be taken. Field data from pipeline companies will validate this method. Wet gas ICDA will require: collect internal corrosion distribution data from pipeline examination, predict with a probabilistic model the most likely locations for corrosion, excavate and inspect for corrosion, then use the results as feedback for the next group.



Ruptured pipeline determined to have failed due to internal corrosion

Accomplishments

- ◆ The first phase of the project identified a protocol for validation of the ICDA method for dry gas systems.
- ◆ This protocol was presented to industry and regulatory experts to obtain consent.
- ◆ Three companies have volunteered data thus far for the validation. More validation data will be sought.



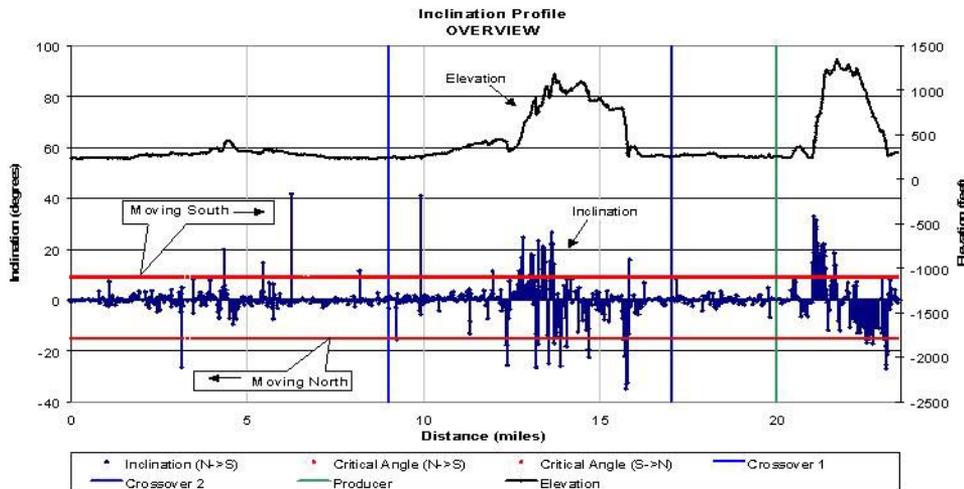
Internal surface of the ruptured pipe showing corrosion

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Research & Special Programs Administration



Actual elevation profile of pipeline & calculated inclination angles are compared to critical angle of inclination to determine likely locations of water holdup.

Benefits

- ◆ This R&D effort will enhance the safety of pipelines and the ability of pipeline operators to maintain the integrity of pipelines with respect to internal corrosion. It will provide a practical alternative to integrity assessment when ILI is not possible and provide better future assessment of corrosion effects than hydrotesting. Validation of the dry gas ICDA approach will add confidence to the use of the approach.
- ◆ Although operational and commercial factors drive gas quality considerations, internal corrosion is an important factor in decisions to accept a gas of given quality. The ICDA methodology may provide a quantitative input to such decisions.

Future Activities

- ◆ Validation of the dry gas ICDA method will be performed
- ◆ A prototype method will be developed for wet gas ICDA and demonstrated

Partners in Success

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- ◆ CC Technologies www.cctlabs.com
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