Working Group #3
Utilization of Inspection Tools on Hydrogen Pipelines

Working Group Leaders:

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Top 5 Identified R&D Gaps

Gap #1 – Changes to Threat/Threat levels to H2 or blend pipelines compared to the ASME B31.8S threats (e.g.mfg, corrosion, laminations, inclusions, hook cracks that have survived a hydrotest, etc) and the effects of various blends of Hydrogen and Natural Gas (5% up to 100% H2, SMYS) (Output type: Technology Development)(Infrastructure type: Pipelines)

Gap #2 – Leak detection for methane and hydrogen blended pipelines and facilities. We have been heavily discussing transmission and upstream/midstream pipelines. Thinking about distribution systems (meter sets @ customer's building wall, regulator stations, distribution pipelines) – Audience believes is not directly related to ILI inspections of transmission pipelines. We believe it is covered under Workgroup #4 (Output type: Technology Development)(Infrastructure type: Pipelines)

Gap #3 – Research into damage mechanisms to determine inspection intervals for ILI tools (Output type: General Knowledge)(Infrastructure type: Pipelines)

Gap #4 – Develop inline inspection tools for distribution mains that are intended for hydrogen service. (Output type: Technology Development)(Infrastructure type: Pipelines)

Gap #5 – Research all anomalies on the ability of current ILI technology to accurately detect and size injurious anomalies caused by or changed by the introduction of hydrogen to pipelines. (Output type: Technology Development & Genera; Knowledge)(Infrastructure type: Pipelines)

NOTE: RED Text Means Possible Academic Focus

Gap #1 Associated Details

Title: Changes to Threat/Threat levels to H2 or blend pipelines compared to the ASME B31.8S threats (for example manufacturing, corrosion, laminations, inclusions, hook cracks that have survived a hydrotest, etc) and the effects of various blends of Hydrogen and Natural Gas (5% up to 100% H2, SMYS) and start a collection process for future repository database.

Main Objective: Identification of changes to existing threats and possible new threats caused by the presence of hydrogen.

Research gap suggests creating new “knowledge” and “development/deployment” of new standards.
Gap addresses related consensus standards or best practices.
Review of ASME B31.8S threat algorithms, tool selection, repair criteria, acceptance limits etc.
Will revisions be required to ASME B31.8S/B31.12 and 49CFR Part 192 Subpart O
Timeline is a 18-24 month for research and followed by 5-year field validation testing.
Additional field testing will require additional time.
Estimated funding $300K paper study followed by $2-3 million for field validation testing

Gap #2 Associated Details

Title: Leak detection for methane and hydrogen blended pipelines and facilities. We have been heavily discussing transmission and upstream/midstream pipelines. Thinking about distribution systems (meter sets @ customer's building wall, regulator stations, distribution pipelines).

Objective: Review of existing leak detection technologies and refitting them for hydrogen service.

Research gap suggests creating new “technology” and algorithms for leak detection software.
May be unrelated to ILI inspection of hydrogen pipelines.
Gap addresses related “Technology” or best practices.
Timeline is 18 - 24 months study for research and study.
Estimated funding $300-400K

Gap #3 Associated Details

Title: Research into damage mechanisms to determine inspection intervals for ILI tools

Main Objective: Determine the level of degradation of an in-service pipeline after an ILI inspection and determine the time to failure based on analysis of the characteristics of the features. Not all anomalies discovered during an ILI inspection require immediate repair. This study will identify the remaining anomalies in the pipeline and the estimated reinspection interval

Research gap suggests creating new “knowledge”.
Gap addresses related consensus standards or best practices and may rely on data obtained from Gap #1
Review of ASME B31.8S Table 3 Integrity Assessment Intervals and other risk assessment tools.
Will revisions be required to ASME B31.8S/B31.12 and 49CFR Part 192 Subpart O
Timeline is a 18-24 months for initial research and study only.
Estimated funding $300-400K

Gap #4 Associated Details

Title: Develop ILI tools for distribution mains that are intended for hydrogen service.

Main Objective: Develop ILI tools to inspect distribution pipelines. This requires design of new tools to negotiate pipeline features in distribution piping. (Audience believes that this study should be part of Workgroup #4 but was included because quite a few audience members voted for it).

Research Gap suggests New or Improved Technology
The technology operates inside a pipeline in gas service
The roadblock to development of this tool is technical and cost as the cost of developing new tools or modifying existing tools to operate in small size distribution pipelines could be high.
PHMSA has funded research to inspect un-piggable pipelines.
Cost Unknown but could exceed $5million and take from 5-10 years.

Gap #5 Associated Details

Title: Research all anomalies on the ability of current ILI technology to accurately detect and size injurious anomalies caused by or changed by the introduction of hydrogen to pipelines. .

Main Objective: Conduct a study into the ability of current ILI technology to accurately detect and size injurious anomalies caused or changed by hydrogen service.

Research Gap suggests New or Improved “Knowledge” and “Technology”
The technology operates inside a pipeline in gas service
The roadblock to development of this tool is technical and cost as the cost of developing new tools or modifying existing tools to operate in hydrogen service could be cost prohibitive.
Timeline is a 18-24 month for research and followed by 5-year field validation testing. Additional field testing will require additional time.
Estimated funding $300K paper study followed by $2-3 million for field validation testing

Additional Identified Gaps

1. Desktop study on past, present, near-term R&D data that is available and that have a direct influence on the subject of pipeline conversion to hydrogen service or introduction of Hydrogen.
   This is a desk-top study for academia and requires collection of currently available published research data.
   Cost $150-300K
   Time duration 6-12 months

2. Research all anomalies on the ability of current ILI technology to accurately detect and size injurious anomalies caused by or changed by the introduction of hydrogen to pipelines.
   This is a desk-top study for academia requiring collection of data from pipeline operators and ILI vendors.
   Cost $150-300K.
   Time duration 6-12 months

NOTE: Highlighted RED Means Possible Academic Focus

Thank You!/Questions?