Supporting the energy transition

Accurate and reliable data are key to delivering safe hydrogen transportation

Baker Hughes, Process & Pipeline Services (PPS) is committed to assisting operators through the ongoing period of energy transition.

Through the provision of accurate and reliable in-line inspection (ILI) data, as well as associated engineering services, PPS can help operators make informed decisions about introducing different products into their pipelines.

Existing threats

Pipelines are under attack. Whether it's from the product the pipeline is carrying, the condition of the pipeline's coating, or an excavator digging a trench, the threats are ever present. PPS has a long history of providing accurate and reliable data on the condition of pipelines, using industry leading ILI technology to help operators understand and mitigate these threats.

In addition to providing information on the current condition of a pipeline, ILI data can be used (along with other data points) to predict the future condition of the pipeline. This process can take into account the pipeline remaining in its current mode of operation, or changes to its future operation. And things are changing.

What is happening?

As the globe targets significant reductions in carbon emissions, the energy industry is adapting at an ever-increasing pace. Hydrogen has long been identified as a zero-carbon fuel source and now things are taking shape.

Like any other fuel, hydrogen will need to be transported from its place of production to the location it is required. Pipelines are a highly cost-effective method of transportation, and the existing global pipeline infrastructure is mature and sizeable. Clearly it makes sense to utilize this network to transport hydrogen around the globe.

What about the threats?

The impact of introducing hydrogen into carbon steel pipelines is currently under significant investigation. In trying to understand the risks of doing so, many factors must be taken into consideration:

- Pipeline
  - Construction year
  - Hydrostatic pressure test history
  - Pipe type and steel grade
  - Pipe and weld fracture toughness properties
  - Past service
  - Failure history
  - Current condition
  - Pipeline length
- Planned operating conditions
  - Percentage of hydrogen in product
  - Intended operating pressure and cyclic regime
  - Flow rate
  - Temperature

Such pipeline and operational considerations are important because the presence and severity of threats will vary depending on these factors. Looking at pipeline threats by category, the following observations can be made.

Material

In comparison with hydrocarbon operation, carbon steel has inferior fracture toughness and fatigue properties even at low concentrations of H_2. In addition, severe bulging laminations can occur due to H_2 accumulation in seamless linepipe material.

Cracks
The reduction in fracture toughness can lead to the possible failure of smaller cracks in H_2 operation than would typically fail under previous hydrocarbon operation. The presence of H_2 puts both base metal and welds at increased risk of accelerated fatigue crack growth.

Ground movement
Ground movement induces additional strain on pipelines and has been the cause of many pipeline failures. After H_2 introduction, the strain capacity of both base material and girth welds will be reduced by H_2 embrittlement, further increasing the risk of failure.

Third-party damage
Pipelines containing H_2 will have a lower tolerance to third-party damage. This threat is one of the leading causes of pipeline failures.

Hard spots
The inferior fracture toughness and fatigue properties previously referenced could increase the integrity threat of existing hard spots in the pipeline.

How can Baker Hughes, Process & Pipeline Services help?

As previously covered, PPS has a wide variety of ILI tools designed to help detect and monitor all of the previously referenced threats and you can rest assured that we will be ready for hydrogen services when you need them. Through either advanced screening of pipelines prior to hydrogen transition or, regular inspection of pipelines transporting hydrogen, PPS can support you with your integrity requirements.

Furthermore, with an integrity engineering team containing hundreds of combined years of pipeline experience, we can provide detailed advice and guidance on how to ensure your network is safely prepared and maintained prior to and during the energy transition.

Please contact your local sales representative for more information.

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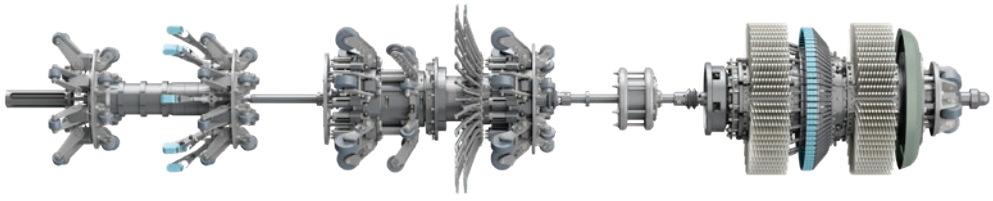

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