High Tech Solutions Near for Inspecting Unpiggable Natural Gas Pipelines

Investments in research and development have played an integral role in America’s economic and industrial success, supporting our way of life, and maintaining our status as a leader among the world’s nations. Results include military advancements, new and improved medicines and vaccines for ailments once thought to be incurable, and of course smarter and more efficient transportation systems.

Ten years ago, with the passage of the Pipeline Safety Improvement Act of 2002, Congress decided to ensure similar results from research and development investments in the nation’s energy pipeline network. The Act required the Department of Transportation to join forces with the Department of Energy and the National Institute of Standards and Technology to carry out a program of research, development, demonstration and standardization to ensure the integrity of pipeline facilities.

Since the Act’s passage, PHMSA has been at the forefront of R&D investment, searching for new and improved ways to make the nation’s 2.6 million mile pipeline transportation system safer, more reliable, and the best in the world. PHMSA’s investment in new technologies has helped find solutions to some of the challenges pipeline operators face in operating, inspecting, and testing their systems.

In 2004, new requirements for integrity management became effective for natural gas pipelines, presenting compliance challenges for some operators in areas of greatest consequence, including high population centers. To live up to the challenge, pipeline operators needed new tools to meet or exceed federal requirements, especially for natural gas pipelines that were unable to receive internal inspection devices, or pigs, as they were designed at the time.

To address the need, PHMSA’s pipeline safety research program worked with members of the Northeast Gas Association/NYSEARCH to bring to market needed technology solutions for unpiggable natural gas pipelines. The effort is now paying off with the introduction of a new, state of the art inspection device for larger unpiggable pipelines.

The Explorer 20/26 robot is a second generation commercial prototype that is 14 feet long and weighs over 800 lbs. With cameras installed on each end, the device contains a high resolution Magnetic Flux Leakage sensor for pipeline inspection activities. Its tetherless design allows the robot to be controlled wirelessly and can articulate and transform its orientation to traverse valves and other obstructions that cause certain pipelines to be unpiggable. Work on the Explorer 20/26 follows the same development path of the Explorer 6/8, another technology project co-sponsored by PHMSA and the Northeast Gas Association/NYSEARCH. The Explorer 6/8’s smaller design allows it to be used to inspect smaller diameter unpiggable pipelines. Once available for purchase, the Explorer 20/26 will be the nation’s second robotic solution for inspecting unpiggable natural gas pipelines.
How the Explorer Works

A series of final field demonstrations are wrapping up research on the Explorer 20/26 robot and its deployment into the market. The tool was recently demonstrated for the first time in a Burbank, California natural gas pipeline to gather data and offer developers the opportunity to test the robot’s launching and receiving capabilities.

To conduct a robotic inspection using the Explorer 20/26, a flange fitting is installed on the pipeline allowing the launch tube to be attached. After the robot is driven into the launch tube, the tube is then sealed and pressurized. Valves within these apparatus are opened allowing the robot to enter the pipeline. A 2” opening, or hot tap, is also installed near the flange and every two-thirds of a mile to allow for robot operators to communicate with the device via a small antenna and inspect the pipeline for several miles. Induction probes are also inserted within the hot taps to re-charge the batteries of the Explorer 20/26 to facilitate extended inspection distances.

A Graphic User Interface (GUI) was developed to allow technicians to operate the robot, conduct the inspection, and collect inspection information. Displayed information on this GUI includes live video from both cameras, the current orientation of the robot and several other operational aspects and parameters.
Partnerships are a hallmark of PHMSA’s pipeline safety research program – they help increase the likelihood that future PHMSA co-sponsored technology developments will be commercialized for usage among the pipeline industry. Since the program’s establishment, PHMSA has provided over $67 million for 183 projects addressing better diagnostic tools, testing of pipelines, stronger materials, improved pipeline locating and mapping, prevention of outside force damage, and effective leak detection.

You too can take part in efforts to make the nation’s pipeline transportation network safer and more efficient through new innovations and technological improvements. Join PHMSA and the National Association of Pipeline Safety Representatives at our next Government-Industry Pipeline R&D Forum on July 18, 2012 at the Westin Arlington Gateway - - 801 North Glebe Road, Arlington, VA  22203. The forum will not only give us an opportunity to discuss the effects of recently developed technologies but will also allow us to share insight about current R&D research efforts and needs to address key technological challenges for pipeline facilities and components. We look forward to seeing you there.

For more information on this project, please visit https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=353.