Study finds gas pipelines could serve as wireless links

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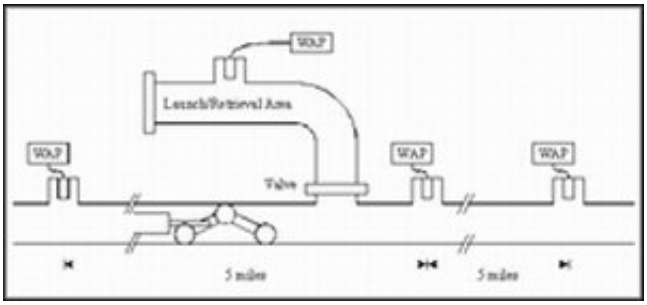

Detecting leaks and conducting maintenance in America's aging network of natural gas pipelines will eventually be a job for wireless robots, according to researchers at the University of Missouri-Rolla.

Image: Wireless network with pipeline robot.

"As the existing natural gas pipeline ages, it is critical that these pipelines be periodically inspected for corrosion, cracking, and other problems that can eventually cause a failure of the pipeline," says Dr. Kelvin Erickson, chair and professor of electrical and computer engineering at UMR. "For larger transmission lines, passive flow-powered platforms -- also known as pigs -- are used to carry an array of inspection sensors. However, in smaller, lower-pressure distribution mains, 'pigs' are inappropriate and so robotic devices are currently under development for

the inspection and repair of these pipelines. Secure, reliable communication is needed to support these robotic devices."

In a Department of Energy-funded study, a team of UMR faculty found that the 1.2 million miles of natural gas distribution and transmission pipelines that crisscross the United States could be used to build wireless networks. Known as 802.11 or Wi-Fi, wireless networks use radio links instead of cables to communicate between computers.

Initial tests were conducted on a small pipeline loop at UMR, with subsequent field testing on a much longer pipeline loop at the Battelle Pipeline Simulation Facility near Columbus, Ohio.

"We found that we could communicate over a little less than a mile with a 24-inch pipe," Erickson says. "It did well, even around U-shaped curves."

The wireless network could support un-tethered inspection technologies, like the RoboScan™ and Explorer™ robots, for the evaluation of pipeline conditions. The pipeline can transmit a radio signal and deliver gas at the same time, Erickson says.

"The robots would try to detect a problem within a pipeline before it became a problem," Erickson adds. "There could be hundreds of these miniature robots that reside in the nation's pipelines, roaming and looking for deterioration."

The robots can currently send back visuals from inside the pipeline as well as conduct electronic scans of the pipe. Eventually, the robots would not only inspect but also repair pipelines, Erickson says.

"This is even more important in the northeast, where it's denser," Erickson says. "Repairing pipelines there can be difficult because the

pipes are often under buildings. The robots may one day be able to fix the problem without having to dig down to the pipeline."

Working with Erickson on the project were Dr. Shari Dunn-Norman, associate professor of geological sciences and engineering; Dr. Ann Miller, the Cynthia Tang Missouri Distinguished Professor of Computer Engineering; Dr. Keith Stanek, professor of electrical and computer engineering; and Dr. Cheng-Hsaio Wu, professor of electrical and computer engineering.

Source: University of Missouri-Rolla