Northeast GAS ASSOCIATION

NYSEARCH

Technology Brief

GASNET™

Description: *GASNET™* is a sensor network for the real-time monitoring of pipeline data that is capable of transmitting information wirelessly through the pipe network.

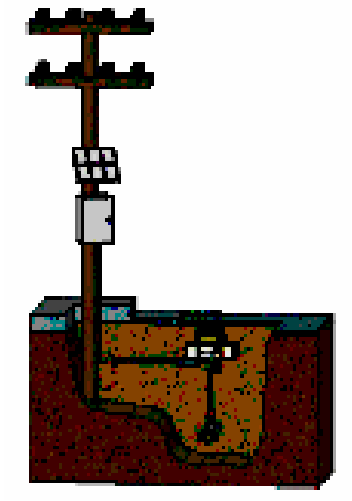
Status: Currently addressing problems encountered during field demonstrations – Commercial manufactures to be sought in near future.

BENEFITS

Gas utilities have limited information regarding operational and process variables in their gas distribution networks. In many instances this hampers gas distribution infrastructure management efforts. GASNET™ is a stand-alone sensor network system for real-time monitoring of live distribution gas mains. The system consists of a set of sensor pods capable of measuring in-situ process variables in real-time and transmitting that information wirelessly back to a monitoring station. The system is being developed to provide gas distribution manager the ability to: (a) detect certain types of third party damage, (b) enable detection of leaks, (c) enhance the accuracy of SCADA net work models used for gas system analysis, and, (d) acquire improved and cost effective system monitoring and control. Information gathered through GASNET can be used among other things as a validation tool for network simulation programs (such as the Stoner software), through measurements over space and time at critical locations, and as a capital-project planning tool, by serving as a wired and/or autonomous data-logger to better support engineering decisions.

BACKGROUND

During the last decade a substantial growth in the use of wireless technologies has been experienced, in addition to the continuous decrease in size and cost of computing chips as well as the availability of a new generation of miniaturized sensors. Recent advances in wireless technology along with miniature data processing sensors allows for the development of tools for interactive, real-time network communications for utility personnel. This provides live information on the condition of the pipeline and the gas system that can be sent directly to a Gas Control Center. This opens the possibility for a truly interactive, real-time communication for distribution and transmission operators and will allow more efficient management of the infrastructure.



Networked configuration: "master" pod on left, "slave" on right

Stand-alone operation (above)

TECHNICAL APPROACH

NYSEARCH, the research, development, and demonstration organization within the Northeast Gas Association, with cofunding from the National Energy Technology Laboratory of the US Department of Energy, is funding Automatika, Inc. to develop GASNET™. GASNET is a wireless, self-powered network of sensor pods capable of measuring, and communicating wirelessly through the pipe. Key process variables such as pressure, temperature, flow, flow-direction, humidity, and pipe vibrations can be remotely

monitored and sent in real-time to a utility's central-control station. The pod design is flexible as to allow for the exchange of sensors and can be easily installed via a keyhole. The pod consists of a printed circuit board carrying the sensors and the wireless communication module. This board is attached to a completion plug that is installed on the pipe using a commercially available fitting under no-blow conditions. The system is flexible and allows addition of sensor pods to the GASNET™ network without changing central station hardware and/ or software.

GASNET™ Pods can be used in various configurations. In its simpler form, a single pod can be installed to collect data at a certain point of the network over a period of time, serving more or less as a data-logger. Power can be supplied via batteries, solar cells, or through hardwiring to a power supply. It can be used to feed key process variables to the operators under live conditions using a wide option of communication means, including telephone lines and wireless communication. In its full network implementation, a number of pods are deployed collecting information and transmitting wirelessly through the piping network to a "Master" pod. The "Master" collects the information from all other pods and transmits it to the operator, using any one of a variety of communication options. This feature eliminates the need to have a communication link between each pod and the operator, thus significantly reducing the cost to operate the system.

PROJECT STATUS

After completion of laboratory testing with the latest hardware and software, GASNET™ units were tested in distribution gas systems by NYSEARCH member utilities. Utility field testing uncovered technical issues related to communications and data retrieval that needed to be resolved. Upon completion of the troubleshooting phase, field demonstrations will continue and a commercial manufacturer will be sought.

HIGHLIGHTS

GASNET™ is a versatile system for the deployment of a network of sensors featuring ability to:

- measure key network operating variables such as flow rate, flow direction, pressure, temperature, and humidity
- communicate data to the operator via a number of means, including wireless communication through the pipe
- power itself from a number of sources, including batteries and solar cells

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