Northeast GAS ASSOCIATION Technology Brief

NYSEARCH

Gas Interchangeability Study For LDC Infrastructure Integrity

Description: A multi-phase study investigating LDC coupling components of interest, their associated materials and whether varying gas compositions in a range of temperatures and pressures can create leakage in these couplings.

Status: Laboratory testing ongoing for most frequently encountered couplings.

BENEFITS

The objective of this program is to study the effects of varying natural gas compositions on various components of the gas distribution infrastructure. Prior experience with changes in gas supplies indicates that some components of the infrastructure might be affected by the introduction and/or absence of several constituents in the gas supply, thus necessitating potentially costly response measures.

Understanding these effects will allow Local Distribution Companies (LDCs) and other stakeholders involved to better plan for the introduction and/or management of diverse gas supplies in the nation's distribution system.

BACKGROUND

As gas supply in the United States gets increasingly diversified, the composition of the gas supplied through the distribution network to the end user is experiencing an increasingly greater variation. Both distribution system components and end-use equipment have been designed and operated over the last decades based on a more stable and well defined gas composition. The Natural Gas Council Plus (NGC+), a working group representing all stakeholders, has prepared a White Paper on Gas Interchangeability, which outlines a broad and rather comprehensive strategy for dealing with the issue. NYSEARCH has decided to move forward with addressing a specific, but most critical issue from among those discussed in NGC+'s white paper, that is the effect of varying gas composition on the operating components of the gas distribution network.

Testing setup with environmental chamber in the background

TECHNICAL APPROACH

NYSEARCH, the research, development, and demonstration organization within the Northeast Gas Association, retained the Gas Technology Institute to carry out a systematic study of varying gas composition effects on various infrastructure components. The program has been structured as a multi-phase effort designed to understand the underlying scientific and engineering basis of these effects.

Phase I of this effort was initiated in late 2005 by carrying out a series of tasks aimed at defin

ing the program. These tasks included: (a) collecting via a survey the gas compositions and infrastructure materials and components that the members would like to test as part of this program, (b) conducting a review of literature on background work, and, (c) developing a testing protocol to determine the response of the elastomeric materials found in these components to changing gas compositions (for the gases identified through the survey). Six classes of elastomeric materials were identified as integral to all the infrastructure components to be considered. Two sets of detailed testing protocols were then developed in order to test these materials. Once the tests are completed for all vintages, those that are indeed substantially different from earlier or later vintages will be tested using the second set of testing protocols, the comparative tests. These tests will allow us to determine the change in the mechanical and thermal properties of these materials when exposed to varying gas compositions, thus allowing us to determine the class of materials that would potentially result in changes in the performance characteristics of the infrastructure components they are found in.

Following the completion of this early work, which established the framework of the entire program, a second phase was initiated. In the second phase, a small number of compression couplings that are very common in the distribution networks of LDCs, are being tested under various pressure, temperature and gas composition conditions in order to provide industry with a first indication of the behavior of these components under these varying operating conditions. The information obtained will also allow us to better plan the future phases of this program. All couplings under testing were extracted from the piping network of member utilities.

In order to carry out this phase of the program, extraction protocols were developed detailing the process through which the couplings were to be extracted from the piping network. This issue is of the utmost importance, since any coupling tested cannot be disturbed during the extraction process.

In order to establish the conditioning times of these couplings, i.e. the time required for the elastomer in the coupling's seal to reach an equilibrium state in terms of the gases diffused into the seal, a series of tests have been initiated using new couplings. These tests will determine the length of time needed for a coupling to remain under a certain pressure, temperature and gas composition prior to the elastomer reaching equilibrium state under those conditions. With this knowledge established, the leak tests can proceed. In the leak tests, the extracted couplings will be placed in an environmental chamber and will undergo a systematic exposure to temperature, pressure and gas composition variations, representative of those that the couplings encounter in the field. The couplings are monitored for leakage through pressure and methane detection sensors.

At the conclusion of this second phase of the program, a report will be issued detailing the results of the testing of these specific couplings tested under varying gas compositions. It is envisioned that the program will then proceed with the next phases. The third phase involves the systematic testing of all elastomeric materials encountered in the field, as per the testing protocols developed in Phase I. The infrastructure components that include elastomeric materials determined in the third phase to respond significantly to changes in gas compositions, will be tested fully to determine whether their operation is negatively affected under certain natural gas compositions.

PROJECT STATUS

The second phase of the project is currently underway. Tests are on-going to determine the conditioning times of compression couplings. Initial tests indicate that these conditioning times are much longer than initially anticipated.

FOR ADDITIONAL INFORMATION

Daphne D'Zurko
Executive Director,NYSEARCH
Vice President, RD&D
Northeast Gas Association
1515 Broadway, 43rd Floor
New York, NY 10036
ddzurko@northeastgas.org

Daniel Ersoy
Gas Technology Institute
1700 South Mount Prospect Rd.
Des Plaines, IL 60018
Daniel.ersoy@gastechnology.org