Northeast GAS ASSOCIATION

NYSEARCH

Technology Brief

Gas Interchangeability Study for Installed Residential Appliances

Description: **A comprehensive, geographically diverse study that determines the impacts of varying gas compositions on performance of installed residential appliances.**

Status: **Research, field testing, and laboratory testing complete. Program team is completing analysis of results.**

BENEFITS

The addition of new gas supplies (imported LNG, non-conventional gas) is expected to accelerate, leading to wider ranges of natural gas compositions. The goals of this NYSEARCH study are to perform a comprehensive and geographically diverse evaluation of the impact of varying gas composition on the performance of residential appliances as adjusted in customer homes and to determine the extent to which potentially sensitive appliances exist. With this additional information, gas companies, manufacturers and installers can optimize appliance adjustments for the current and future gas supplies and further promote regular maintenance as well as advance a full understanding of how a wide range of gas compositions can be managed. In the broad-based NYSEARCH consortium, gas companies can work together to assess risk, evaluate new supply opportunities, and determine protocols or other changes within each company or as an industry that could further enhance safety. Once the study is completed, major findings will be communicated to the industry at large.

BACKGROUND

Natural gas utilities and their customers are benefiting from a new diversity in supply sources. Production rates for shale gases, coal-bed methane, and bio-derived gases are increasing. Infrastructure is in place to accommodate imported LNGs from a variety of countries. These sources often have compositions that differ somewhat from the natural gases historically distributed throughout North America. Since composition changes can affect the performance of end-use equipment, the gas industry has been implementing gas quality guidelines to ensure that the new supplies are interchangeable with historic gases. For combustion equipment, interchangeability means that the new supplies will not materially change operational safety, efficiency, and performance and will not materially increase air pollutant emissions.

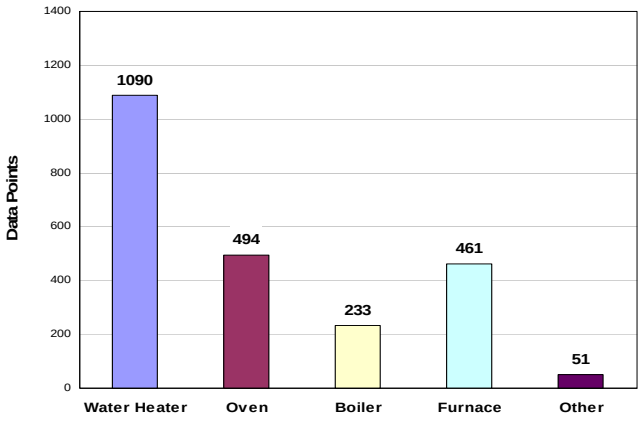

Figure 1: Types of Appliances Tested

TECHNICAL APPROACH

The overall goal of the NYSEARCH project is to evaluate the impact of changing gas compositions on the performance, including flame characteristics and flue gas emissions of in-service residential appliances. The test work is being conducted in two phases. In the first phase, the performance of about (2300) appliances operating in customers' homes has been measured. In Phase 2, laboratory tests were performed on (20) appliances that were representative of what was found during the customer field tests but were expected to show sensitivity to changes in fuel quality. The performance of each unit was measured when

operating on a wide variety of gas compositions. The influence of appliance adjustments, such as air shutter position, was also determined.

The appliances that were tested in Phase 2 represent five categories: water heaters, boilers, ovens, furnaces, and space heaters. (Figure 1) In selecting the appliances, emphasis was placed on testing units that are commonly found in service areas and that are potentially sensitive to gas composition changes.

In the Phase 2 effort, the funding group selected (14) different gases to include in the testing. These are representative of traditional supplies, unconventional supplies (including shale gas, coal-bed methane, and LNG), stretch gases having compositions that extend beyond the range of expected deliveries, and several gases constructed to evaluate analytical methods for assessing interchangeability. The latter gases are two-component blends that could also serve as limit gases in possible future appliance certification tests.

Figure 2: Stove-top Flame Variations with Wide-Ranging Settings.

In the laboratory testing phase, appliance testing was conducted in three steps; each step focusing on different states of adjustment that included: 1) as-received condition from the field, 2) problematic appliances were tested with a typical range of adjustments (e.g. air adjustment) and 3) specific appliance performance problems were diagnosed and corrected and then tested over full gas composition range. In each case, the appliances were tested over a full gas composition range. Examples of tests are illustrated in Figures 2 and 3; Figure 2 representing a stove-top and Figure 3 representing a furnace test using a furnace that had been tested in a prior program at both elevation and sea level.

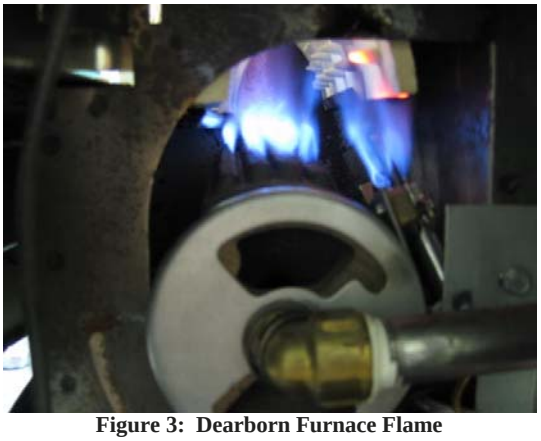

Figure 3: Dearborn Furnace Flame

Through analysis of the Phase 1 and Phase 2 test results, guidelines are being developed for accommodating changing gas compositions. By combining the field test results with the laboratory results, the impact of specific gas changes on the performance of entire populations of in-service appliances can be determined. In addition, the best interchange-ability indices for evaluating in-service appli-ances can be identified.

PROGRAM STATUS

Phase 1 was completed in late 2009 and Phase 2 is currently near complete. It has been found that statistically-valid field test performance results can be combined well with more focused laboratory test results to assess appliance performance over a wide range of gases.

Eta/Environ was able to extrapolate data from both phases to predict the overall performance of the population of appliances tested. Further, a spreadsheet has been developed based on the program data to help funders consider their own gas composition circumstances and predict performance of the appliance at the flue.

The project results are being analyzed and once fully reviewed, the team will work with industry constituents to fully examine the implications of results toward installation and maintenance practices as well as gas quality standards.

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