

Executive Summary

High Efficiency Dual Speed Condensing Residential Forced Air Unit (FAU)

1. Gas Quality and LNG Research Study Objectives

This research study was designed to assess how residential and small commercial/industrial end-use equipment responded to changes in gas quality and to determine if Southern California Gas Company (SCG) needs to modify its current Gas Quality Standards (Rule 30).

The purpose of the test conducted is to evaluate how the FAU will react to both PLG and LNG. The test consisted of running the appliance on one gas for 30 minutes, then switching off to the other gas for another 30 minutes, with this process being repeated twice. The major objectives of the study were as follows:

- Evaluate the FAU to determine any issues relating to equipment safety and performance. Equipment safety includes changes in carbon monoxide (CO) levels, flame lifting, flame stability, flashback and yellow tipping. Equipment performance includes ignition, combustion and output stability.
- Collect NO_x emissions data during testing.

2. Selection Criteria

This unit was selected due the following concerns by manufacturers and industry experts:

- Potential for the heat exchangers to crack due to over firing.
- Complexity of the unit – high efficiency dual speed condensing residential FAU with an induced combustion system.
- Complexity in meeting SCAQMD Rule 1111 while adhering to the Gas-Fired Central Furnace standards (ANSI Z21.47) when operating on rich gases.

3. Test Results and Findings

The forced air unit (FAU) was tested at low and high fire settings using PLG 1014 and LNG 1106 according to developed test protocols¹. Switching to LNG did not result in significant changes to the combustion characteristics of the FAU but flame, ambient, flue and heated air temperatures increased slightly. However, these changes did not cause unsafe or unstable conditions. The emission changes noticed when switching to LNG were:

- On high fire, CO and HC emissions decreased by 37% and 23% and NO_x emissions increased by 1.9%. Even though the NO_x emissions increased only slightly, this may be a concern because Rule 1111 from the SCAQMD is difficult to meet.
- On low fire, CO and HC emissions decreased by 23% and 12.6% and NO_x emission increased by 1.1%. Also, on low fire the flame became a little yellow.

4. Equipment Specifications

- **Description:** High Efficiency Dual Speed Condensing Residential Forced Air Unit (FAU)
- **Input rate:** High Fire - 61,128 (Btu/cf)
Low Fire - 30,000 (Btu/cf)
- **Type of fuel:** Natural Gas
- **Required gas supply pressure:** 7.0 in. w.c.

¹ Testing protocols used in this program were derived from industry standards and regulatory test procedures. Note, however, that based on the needs of this program and the operating and design characteristics of equipment tested, adherence to the industry and regulatory testing standards was not literal. The reader is cautioned that no inference can nor should be drawn as regards certification of these devices to the industry or regulatory requirements as a result of this program.