

## Executive Summary

### Heat Treating Industrial Furnace

#### 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).

Four tests were conducted for the purpose of evaluating how the appliance will react to both PLG and LNG under warm up and the high fire cycles. The major objectives of the study during these four tests were as follows:

- Evaluate the furnace 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<sub>x</sub> emissions data during testing.

#### 2. Selection Criteria

This unit was selected due to the following factors:

- Most are custom built and the final product is not tested or certified by an independent facility.
- They can generate high emission levels if the low NO<sub>x</sub> burners are not working properly.
- It is complex for the low NO<sub>x</sub> burners to achieve the high operating temperatures (~1,800 °F) while not exceeding the NO<sub>x</sub> requirements<sup>1</sup>.

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<sup>1</sup> NO<sub>x</sub> requirements from the SCAQMD are 50 ppm @ 30% O<sub>2</sub> for any metal heating furnaces which includes metal aging, annealing, forging, heat treating and homogenizing.

### 3. Test Results and Findings

Four tests were performed on the industrial furnace using both PLG and LNG according to developed test protocols<sup>2</sup>. Two warm up runs were conducted, as well as two high fire runs. Prior to each test, burners were slightly adjusted to lower the NO<sub>x</sub> level below 50 ppm and input was increased closer to the rated input (1,600,000 Btu/hr). Results obtained from the tests conducted revealed that:

- When the total input of the four burners was set at or above ~1,390,000 Btu/hr using Base (pipeline) Gas, the introduction of LNG created CO emissions higher than what the CO emissions analyzer could measure (20,000 ppm).
- When the total input rate of the four burners was lowered to or below ~1,390,000 Btu/hr using Base Gas, the introduction of LNG did not create any considerable changes in emissions.

### 4. Equipment Specifications

- **Description:** Heat Treating Industrial Furnace
- **Application:** Preheating titanium billets
- **Burner description:** Nozzle-mix, Low NO<sub>x</sub>, and modulating with a turndown of 50:1
- **Input rate:** 400,000 Btu/hr per burner (four burners)
- **Type of fuel:** Natural Gas
- **Required gas supply pressure:** 5.0 psig.

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<sup>2</sup> 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.