

# ETV Canada Verified



## Jupiter Oxy-Fuel Combustion

Technology Fact Sheet for Greenhouse Gas Separation Systems Inc.

### Performance Claim

“In a utility boiler using Jupiter Oxygen’s Oxy-Fuel technology operated accordant to vendor’s specifications with combustion at stoichiometry (+/-) 5% and using natural gas as the fuel source:

1. NOx produced by the boiler was reduced from 0.095 (+/-0.011) lb/MMBtu<sup>1</sup> under conventional operation, to 0.051 (+/- 0.010) lb/MMBtu under Oxy-Fuel operation, with an average NOx reduction of at least 37%;
2. Combustion efficiency was increased by at least 12% based on products of combustion, with a corresponding reduction in fossil fuel usage; and,
3. Concentration of CO<sub>2</sub> gas of 9.1% (+/- 0.15) under conventional operation increased to 92.3% (+/- 2.3) under Oxy-Fuel operation, to ease gas capture and sequestration.”

<sup>1</sup> All figures significant at 95% level of confidence.

### Technology Application

GGSSI’s Jupiter Oxy-Fuel combustion system can be applied to a furnace (boiler, process oven, afterburner etc.) where the system usually includes one or more burners using fossil fuel burned with oxygen having a pre-determined purity at a stoichiometric proportion (+/-) 5%.

### Performance Conditions

Performance assessment is based on data from the results of three tests using conventional combustion technology and six tests using the Oxy-Burn technology at Jupiter Aluminum Corp. Test data sheets were provided for the operation of a steam boiler using conventional and Oxy-Burn technology and consisted of measuring and recording data for periods of 30 minutes to an hour. GGSSI’s claim is based on a comparison of the baseline test results to the Oxy-Burn test results. The results were based on sound engineering calculations and stack emission measurements made by Clean Air Engineering. The methodologies followed by Clean Air Engineering were those as detailed in U.S. Environmental Protection Agency (EPA) Methods 1-4, 3A, 7E and 10. These methods appear in detail in Title 40 of the Code of Federal Regulations (CFR).

### Technology Description

GGSSI’s Jupiter Oxy-Fuel Patented Combustion technology utilizes several techniques learned from years of industrial application and testing. The invention and process particularly pertains to the reduction of fossil fuels due to efficiency increases while the production of greenhouse producing gases is reduced.

## Technology Description (cont'd)

Specifically, the production of greenhouse gas nitrous oxides (NO<sub>x</sub>) is reduced as no nitrogen is available from the oxidizing source, because air is excluded. Conventional boilers use air for the oxidizing agent, which contains 79% nitrogen. This nitrogen, by virtue of its availability, creates NO<sub>x</sub>, which is exhausted to the atmosphere. By applying the Oxy-Fuel process and eliminating the air source nitrogen oxidation, the production of this greenhouse gas is greatly reduced to where any remaining NO<sub>x</sub> formed is from the fuel born nitrogen. In applications where there is a very low level of fuel born nitrogen, such as natural gas, the rate at which NO<sub>x</sub> is formed is substantially reduced.

With the reduction of fossil fuel due to the increased combustion efficiency, an overall decrease in greenhouse gas pollutants is realized. Furthermore, using the techniques developed to date, the volume of flue gas is reduced in comparison to the original volume with air firing. This permits the concentration, capture and conditioning of flue gases to be accomplished with reduced equipment sizes and the ability to run at higher efficiencies.

## Verification

The performance claim verification was based on the following data and information provided by GGSSI:

1. Test report along with data tables prepared by NELS Engineering;
2. Excel worksheets of test data during runs; and
3. Test reports from Clean Air Engineering.

The data include the results of three tests using conventional combustion technology and six tests using the Oxy-Burn technology. GGSSI's claim is based on a comparison of the baseline test results to the Oxy-Burn test results. The verification was completed by Bodycote Material Testing Canada Inc. (BMT) (Mississauga, Ontario) using ETV Canada's General Verification Protocol (March, 2000).

## What is the ETV Program?

The Environmental Technology Verification (ETV) Program is delivered by ETV Canada under a license agreement from Environment Canada. The ETV Program is designed to support Canada's environment industry by providing credible and independent verification of technology performance claims.

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