



January 27, 2025

Reducing Greenhouse Gas Emissions by up to 62% Compared to Conventional Methods Development of Hydrogen-Mixed Oxygen-Enriched Burner for a Cullet Melting Furnace

Taiyo Nippon Sanso Corporation (Headquarters: Shinagawa-ku, Tokyo; President Kenji Nagata; hereinafter “TNSC”), a Japanese industrial gas business company in the Nippon Sanso Holdings Group, and Ohara Inc. (President and CEO Hirokazu Saito) have jointly developed a hydrogen-mixed oxygen-enriched burner for a new type of cullet*¹ melting furnace to reduce greenhouse gas (GHG) emissions. This development can reduce GHG emissions by up to 62% compared to conventional air burners. TNSC will continue to develop technology with the aim of applying oxygen combustion technology to various industrial furnace processes in the pursuit of carbon neutrality.

*1: Cullet is finely broken pieces of glass.

1. Outline of development

The developed hydrogen-mixed oxygen-enriched burner is used for combustion in cullet melting furnaces and allows the oxygen concentration and the mixing ratio of natural gas and hydrogen to be switched as required. Tests with a simulated cullet melting furnace were conducted at three oxygen concentrations (25%, 30%, and 40%) and three hydrogen mixing ratios (10%, 20%, and 30%), and in all cases, GHG emission reductions of 29% or more up to 62% compared to air burners were achieved (see Fig. 1 for details). The new burner has the same heating performance (temperature rise and uniform heating) as conventional air burners, and the NO_x concentration in the exhaust gas is below the emission regulation.

To achieve carbon neutrality, we are working to reduce our customers' GHG emissions through our Group company's environmentally friendly products and are proposing to reduce CO₂ emissions in industrial furnace processes through oxygen and oxygen-enriched combustion technology. Oxygen and oxygen-enriched combustion is more energy efficient than air combustion and requires much less fuel than conventional methods, reducing CO₂ emissions when using fossil fuels such as heavy oil and natural gas.

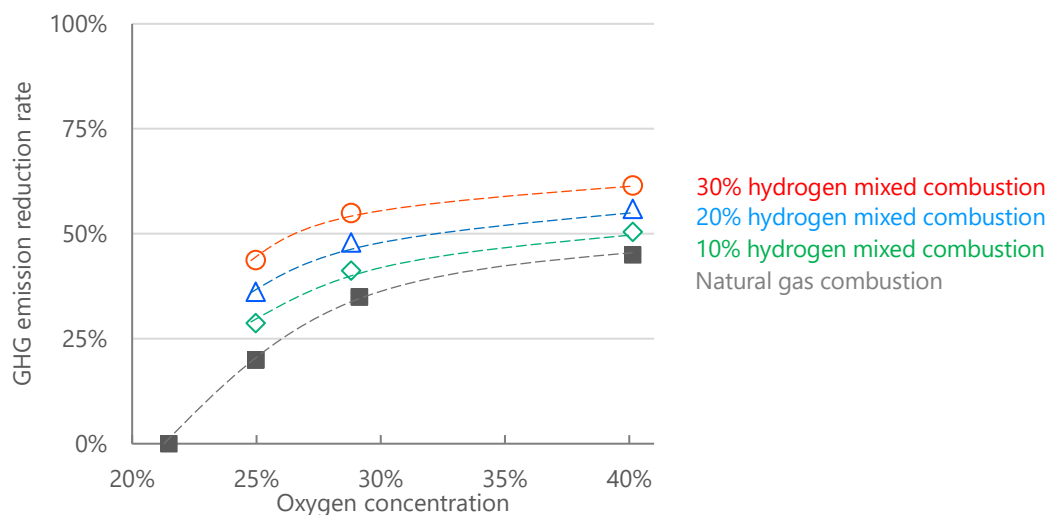


Fig. 1 Oxygen concentration in oxidizing gas and GHG emission reduction rate in a simulated cullet melting furnace (Furnace temperature: 1200°C)

2. Development background

Of the approximately 1.12 billion tons of CO₂ emitted annually in Japan, 35% comes from the industrial sector, including emissions from many industrial furnaces (as of fiscal 2019). In order to achieve carbon neutrality by 2050, it is necessary to take measures to reduce GHG emissions from the estimated 37,000 industrial furnaces in Japan, and oxygen combustion technology is considered an effective means to achieve this.

We are developing combustion technologies using hydrogen and ammonia, which are carbon-free fuels, and are committed to providing our customers with various options for reducing GHG emissions in the industrial furnace sector. In this regard, we have developed a hydrogen-mixed oxygen-enriched burner for a new type of cullet melting furnace*² in collaboration with Ohara Inc.

*²: Ohara's optical glass is melted in two stages to improve quality and production efficiency. The glass obtained in the first stage of the melting process is not used as a finished product, but is ground into cullet, or finely broken pieces of glass. Two types of cullet with different refractive indices are then prepared and melted in the second stage. The advantage of this process is that the composition of the glass is less likely to vary during the second stage of melting, and glass with the desired refractive index can be produced accurately.

【Company Overview】

Taiyo Nippon Sanso Corporation

Business description: Manufacture and sale of various industrial gases such as oxygen, nitrogen, argon, LP gas, gas for medical uses, and specialty gases, manufacture and sale of welding equipment and materials, gas-related devices, and, air

separation equipment, assembly, processing, inspection of electrical components, and equipment maintenance

Established: October 30, 1910
Incorporated: February 4, 2020
Capital: 1.5 billion yen
Shareholder: Nippon Sanso Holdings Corporation (Investment ratio: 100%)
Revenue: 414.3 billion yen*

*Note: This figure shows the revenue of Japan for Nippon Sanso Holdings Corporation in FYE2024

Taiyo Nippon Sanso Corporation

Tnsc.Info@tn-sanso.co.jp