



## **Notice Regarding World's First Successful Trial Demonstration of Using Fuel Ammonia for Combustion in a Glass Melting Furnace**

Taiyo Nippon Sanso Corporation (“TNSC,” President Kenji Nagata), a Japanese industrial gas company in Nippon Sanso Holdings Group, conducted the world’s first trial demonstration of using fuel ammonia for combustion in a glass melting furnace from June 18 to 19 under the development of ammonia combustion technology for industrial furnaces project (“Project”) commissioned by New Energy and Industrial Technology Development Organization (NEDO).

The trial demonstration was carried out using an ammonia-oxygen combustion (\*1) burner installed in the architectural glass production facility at AGC Inc.’s AGC Yokohama Technical Center. The demonstration evaluated glass quality and the impact on furnace materials, and also verified items such as flame temperature (\*2), furnace temperature (\*3) and NOx suppression effects. The demonstration obtained the result that NOx concentration in the exhaust gas was below the environmental standard even while maintaining the glass furnace temperature.

In fiscal 2023, the Project plans to verify the technology by conducting ammonia fuel equipment testing under various conditions on multiple occasions. From fiscal 2024 onward, testing will be in scaled-up burners and through trial demonstration in glass melting furnaces at other AGC bases to determine the scope that ammonia fuel technology can be used, and aims are for fully-fledged introduction in glass melting furnaces from fiscal 2026 onward.

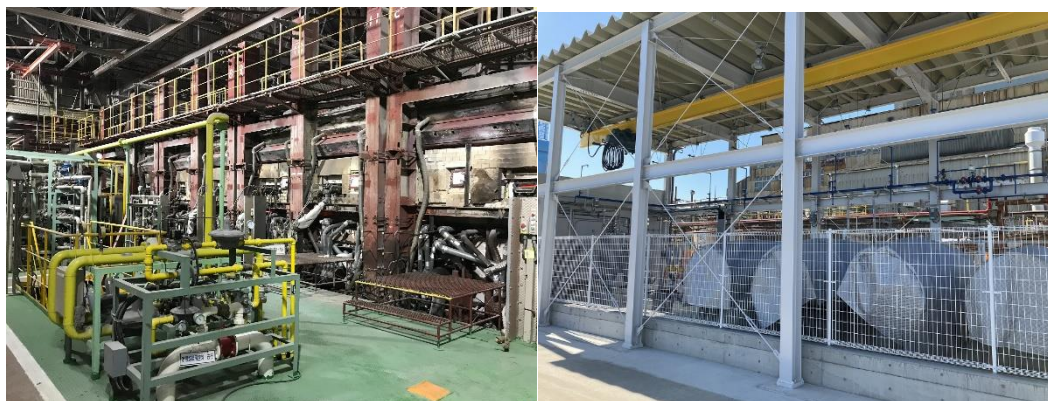


Figure 1: The glass melting furnace used in this trial demonstration (left) and the fuel ammonia storage tank (right).

### 1. Background

Japan has set a goal to become carbon neutral by 2050 and one of the issues in realizing this is whether it can reduce CO<sub>2</sub> emissions in production processes in the materials industry. The current raw material melting process in glass manufacture uses fossil fuels such as natural gas and heavy oil to maintain furnace temperatures at 1,600°C or higher, so developing an innovative glass melting technology that enables use of a fuel with a light environmental burden is urgent.

Against this background, NEDO has been working on the Project (\*4) since fiscal 2021 to develop fuel ammonia combustion technology for industrial furnaces. The Project period is from the end of December 2021 through to March 2026 and AGC, TNSC, NEDO and Tohoku University are working jointly on technological development.

2. Results

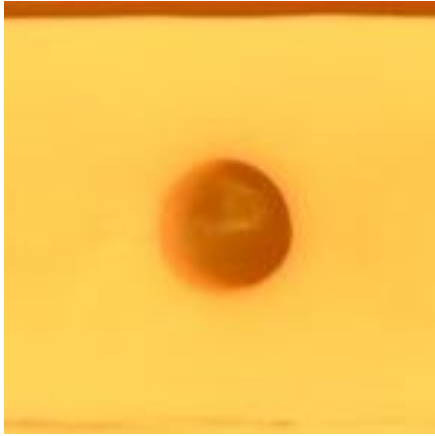
Ammonia is a fuel that does not emit CO<sub>2</sub> as only nitrogen and water are produced during combustion. A supply chain has already been built for ammonia, mainly for chemical fertilizer applications, and there are no significant technical challenges regarding its storage or transportation. On the other hand, issues regarding the use of ammonia for combustion include that it has a low flame temperature and when combustion occurs with use of excessive oxygen, NO<sub>x</sub> emissions increase.

To resolve this issue, mainly Tohoku University and NEDO have worked to develop a low NO<sub>x</sub> combustion technology by moving ahead on lab testing and various types of evaluation to elucidate NO<sub>x</sub> formation characteristics in ammonia-oxygen combustion. TNSC is developing an ammonia-oxygen burner capable of achieving low NO<sub>x</sub> combustion technology.

This world first trial demonstration was carried out over two days on June 18 and 19, 2023, in the architectural glass production facility at the AGC Yokohama Technical Center in Yokohama, Kanagawa Prefecture where a dedicated ammonia-oxygen combustion burner had been installed. Tests were carried out under various conditions and compared with existing combustion methods, and verification was made regarding the impact on glass quality and furnace materials, flame temperature, furnace temperature, NO<sub>x</sub> suppression effects and more.



100% city gas - pure oxygen combustion



100% ammonia - pure oxygen combustion

Figure 2: Burner flames inside a glass melting furnace

### 3. Future Plans

For fiscal 2023, the plan is to continue using the actual furnace in the architectural glass production facility at the AGC Yokohama Technical Center and verify the technology while conducting trial demonstrations using fuel ammonia under various conditions. From fiscal 2024 onward, testing is planned to be carried out in scaled-up burners and through trial demonstrations in glass melting furnaces at other AGC bases to determine the scope that ammonia fuel technology can be used, and aims are for fully-fledged introduction from fiscal 2026 onward. In the future, consideration will be given to deploying the technology in materials other than glass, such as steel or aluminum, so that it can contribute to reducing greenhouse gas emissions in production processes broadly across the materials industry.

Notes:

\*1 Oxygen combustion

Combustion using oxygen, or gas with a higher concentration of oxygen, as the combustion-supporting gas.

\*2 Flame temperature

Temperature of flame burning at burner tip installed in furnace

\*3 Furnace temperature

Temperature of gas inside the furnace and inner wall surface

\*4 Project

Project name: Technology Development for the Utilization and Production of Ammonia as Fuel

Project period: From fiscal 2021 to fiscal 2025 (five years)

Project overview: [https://www.nedo.go.jp/english/activities/activities\\_ZZJP\\_100204.html](https://www.nedo.go.jp/english/activities/activities_ZZJP_100204.html)

### [Company Overview]

#### Taiyo Nippon Sanso Corporation

**Business description:** Manufacture and sale of various industrial gases such as oxygen, nitrogen, and 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:** 420.4 billion yen\*

\*Note: This figure shows the revenue of Japan for Nippon Sanso Holdings Corporation in FYE2023

Taiyo Nippon Sanso Corporation

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