

First Stable Combustion of Ammonia in Japan with a Co-firing Ratio of 0–100% in a Heat Exchanger-equipped Exhaust Heat Recovery Burner

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Osaka Gas Co., Ltd.
Daigas Energy Co., Ltd.

Daigas Energy Co., Ltd. (President: Hiroyoshi Fukutani, hereinafter referred to as “Daigas Energy”), a wholly owned subsidiary of Osaka Gas Co., Ltd. (President: Masataka Fujiwara), in collaboration with Shoei Mfg Co., Ltd. (President: Shota Habaki, hereinafter referred to as “Shoei Mfg”), has successfully achieved the first^{*1} stable combustion of city gas and ammonia in Japan, with a co-firing ratio^{*2} of 0 to 100% using an exhaust heat recovery burner with built-in heat exchanger.^{*3}

The industrial furnaces used in factories for heating metals and other materials consume a lot of energy, so reducing CO₂ emissions has become an important issue. Ammonia, which does not produce CO₂ when burned, is regarded as one of the promising source of decarbonized energy. However, ammonia has several issues, such as its slow combustion speed making it difficult to burn it stably, and the large amount of nitrogen oxides (NO_x) it produces during combustion.

Taking advantage of Daigas Energy’s combustion technology and Shoei Mfg’s burner development knowledge, the two companies have now developed an ammonia co-firing nozzle dedicated to Shoei Mfg’s heat exchanger-equipped exhaust heat recovery burner.

There is a property that the higher the temperature of the combustion air, the faster the combustion speed. Therefore, we utilized the feature of the burner that preheats the combustion air by exchanging heat with the exhaust heat from the furnace within the burner body. In addition, the specially developed nozzle optimizes the method of mixing the fuel gas and air, achieving stable combustion over a wide range of ammonia co-firing ratios from 0 to 100% at a combustion heat input of 50 kW.

From now on, we will work to resolve remaining issues, such as reducing NO_x, with the aim of early commercialization.

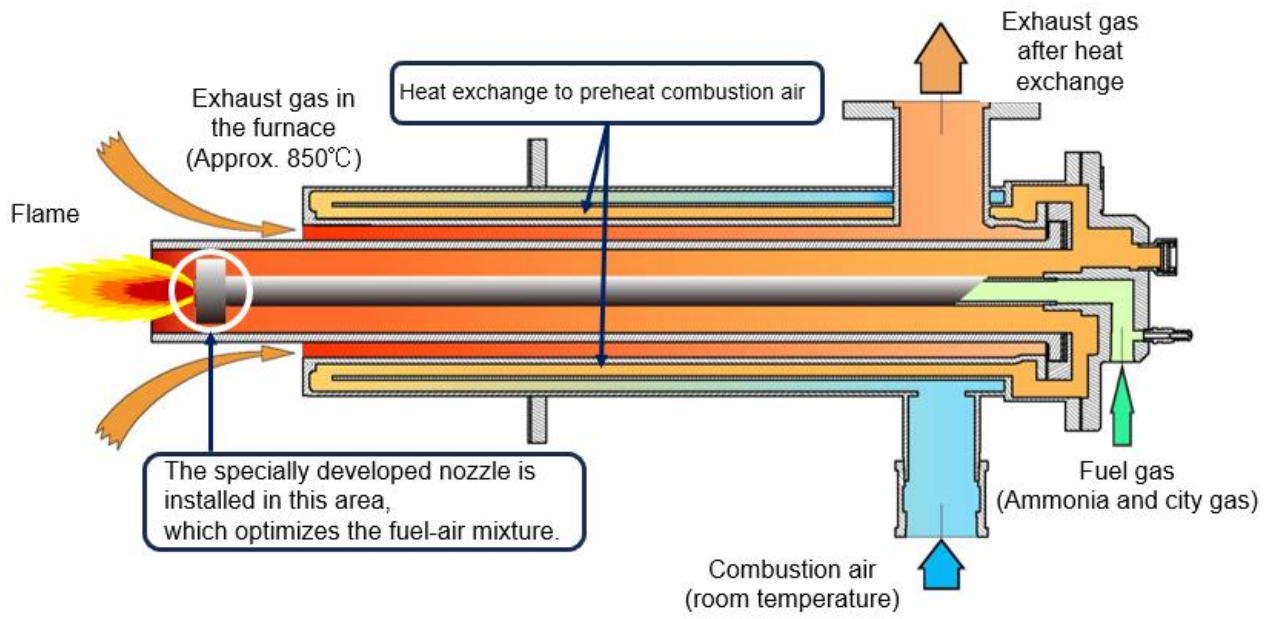
Daigas Energy is committed to developing an optimal gas burner for each customer and has developed approximately 1,600 types of gas burners in-house to date. Going forward, we will continue to promote the development of energy-saving technologies for industrial furnaces and the development of burners for various applications utilizing next-generation fuels, such as hydrogen and ammonia, thereby contributing to low carbonization and decarbonization of the industrial heat sector.

The Daigas Group, under the “Carbon Neutral Vision” announced in January 2021 and the “Energy Transition 2030” released in March 2023, remains committed to developing technologies and services that contribute to a carbon-free society and solving social issues, including climate change, in order to become a corporate group that helps customers in terms of both livelihoods and business toward their “further evolution.”

*1 According to Daigas Energy research (as of February 2025)

*2 The percentage of ammonia in the total calorific value of city gas and ammonia (0% co-firing = 100% city gas). Achieved stable combustion with either city gas-exclusive or ammonia-exclusive combustion

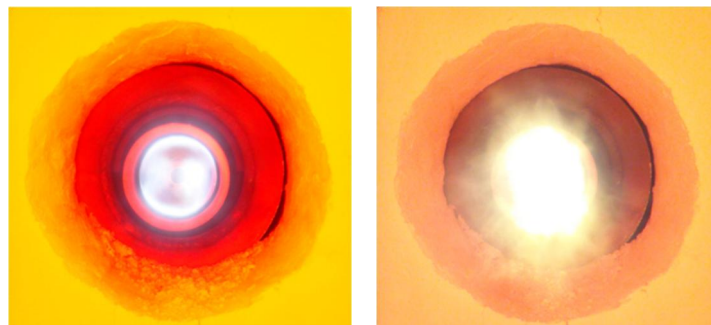
*3 A burner equipped with a heat exchanger in its body that achieves highly efficient combustion by exchanging heat between the combustion exhaust gas and the combustion air



Conceptual illustration of the exhaust heat recovery burner with built-in heat exchanger



Photo of the heat exchanger-equipped exhaust heat recovery burner installed in a test furnace at a Daigas Energy experimental facility



Front view of the burner (left: 100% city gas, right: 100% ammonia)