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Heating & Ventilation A/C Company, Panasonic Corporation
Osaka Gas Co., Ltd.
Daigas Energy Co., Ltd.

Multi-fuel compatible, with a co-firing ratio of 0–100%

Panasonic and Osaka Gas/Daigas Energy develop an industry-first[*1] absorption chiller compatible with hydrogen and city gas co-firing

Updating existing equipment to be hydrogen-compatible by simply replacing parts

Panasonic Corporation's Heating & Ventilation A/C Company, (hereinafter "Panasonic"), Osaka Gas Co., Ltd., and Daigas Energy Co., Ltd. (hereinafter "Daigas Energy"), a wholly owned subsidiary of Osaka Gas, have developed the industry's first (*1) absorption chiller compatible with co-firing of hydrogen and city gas. The multi-fuel compatible equipment allows a co-firing ratio of 0–100%. Existing city gas-fueled types can be upgraded to be hydrogen-compatible simply by replacing parts. The three companies will continue to conduct verification aimed at commercialization in order to help realize a carbon-neutral society through the use of hydrogen, which does not emit CO_2 when burned.

The absorption chiller developed and sold by Panasonic is an energy-saving, highly efficient air conditioning system with over 50 years of history, which boasts one of the highest market shares in Japan(*2). It does not use specific CFCs or CFC substitutes and instead uses water, a natural substance, as a refrigerant, so it is known as an environmentally friendly system that has a minor impact on ozone layer depletion and global warming. Since it mainly uses gas and waste heat as its energy source, it is considered useful for leveling out power loads and strengthening resilience in the event of power outages or disasters.

The Daigas Group has been selling absorption chillers to office buildings and other facilities since 1970. Daigas Energy has also developed and sold numerous city gas burners for commercial equipment and industrial furnaces and has accumulated knowledge in areas such as combustion technology and air ratio control technology for burning fuel efficiently and safely. In recent years, in response to customer requests, the company has also been working on developing combustion technologies that can accommodate next-generation fuels such as hydrogen and ammonia.

These days, hydrogen, which does not emit CO_2 when burned, has been attracting attention as a "clean energy" source. On the other hand, hydrogen has characteristics such as a faster combustion rate and higher flame temperature than city gas, which poses the issue of generating large amounts of NOx (nitrogen oxides) during combustion. As an effort to respond to this issue, the three companies have jointly developed an absorption chiller that is capable of operating with a hydrogen/city gas co-firing ratio of 0–100% by establishing technology to optimally control the combustion air flow rate according to the hydrogen/city gas co-firing ratio and air conditioning load. Furthermore, by combining it with a burner that reduces the flame temperature during

hydrogen combustion, the NOx level in the exhaust gas is suppressed below 40 ppm. In addition, existing city gas-fueled equipment can be upgraded to hydrogen-compatible units by simply replacing some parts, such as the burner and fuel piping. This allows a quick response to customer needs such as the reduction of CO_2 emissions because there is no need to replace the entire absorption chiller unit.

Toward the realization of a carbon-neutral society, Panasonic promotes the Panasonic GREEN IMPACT initiative while the Daigas Group advances the Energy Transition 2050 plan. Panasonic and the Daigas Group will continue to combine their respective strengths to contribute to a decarbonized society and develop solutions that meet customer needs.

*1: Regarding the development of technology for absorption chillers that are compatible with co-firing of hydrogen and city gas. As of August 7, 2025. (Research by Panasonic and Daigas Energy)

*2: Estimate by Panasonic based on the Japan Refrigeration and Air Conditioning Industry Association's "FY2024 domestic shipments of absorption chillers (ton of refrigeration basis)."

[Features]

1. Multi-fuel compatible, with a co-firing ratio of 0–100%

The newly developed absorption chiller is an industry first in that it can operate on a combination of hydrogen and city gas in addition to being capable of operating on either hydrogen or city gas. Conventionally, due to the differences in combustion characteristics of each fuel, it was necessary to use a dedicated burner and adjust the combustion air flow rate for each fuel, but these issues have been resolved with the newly developed "hydrogen/city gas dual-use burner" and "combustion control unit." Through a simple operation of setting the fuel mixture ratio, multi-fuel compatibility is achieved, allowing operation at a co-firing ratio of 0–100%. Going forward, customers who currently use city gas while considering the use of hydrogen fuel will be able to use absorption chillers with peace of mind.

2. Achieving low NOx (less than 40 ppm) and highly efficient operation

NOx is produced by the reaction of nitrogen and oxygen in the air. Hydrogen burns faster than city gas, creating localized high-temperature areas within the flame, which increases the likelihood of NOx formation. However, the newly developed hydrogen/city gas dual-use burner has succeeded in mitigating the rapid expansion of combustion and suppressing NOx emissions to less than 40 ppm, equivalent to city gas only combustion. Meanwhile, excessive combustion air results in energy loss due to heat loss in the exhaust gases. However, by precisely controlling the air flow rate for hydrogen and city gas using the combustion control unit and combustion control panel, heat loss in the exhaust gases is minimized, achieving highly efficient operation and low NOx emissions across the entire combustion range. To reduce NOx emissions and achieve highly efficient operation, precise control of the amount of combustion air is required based on

the co-firing ratio and heating/cooling output. In this project, NOx emissions and heating/cooling efficiency were checked and improved under all conditions of co-firing ratio and heating/cooling output, and technical issues were overcome under all conditions, achieving stable operation.

Hydrogen/city gas co-firing ratio	100%/0% (Hydrogen-only firing)	50%/50% (Hydrogen/city gas co-firing)	0%/100% (City gas-only firing)
Flame image (Near the burner nozzle)			
NOx＜40 ppm	Achieved at all ratios		

3. Existing equipment can be converted to be hydrogen-compatible by simply replacing combustion-related parts.

Even existing city gas-fueled equipment can be upgraded to hydrogen-compatible equipment by simply replacing and adding the burner and combustion control unit, without the need to replace the main body or make major modifications. Even if a customer currently selects an absorption chiller that operates on city gas, when the customer decides to use hydrogen fuel in the future, the unit can be converted to be compatible with hydrogen fuel through a simple replacement and addition of parts. This enables a quick response to changes in the external environment or customers' GX needs.

<Panasonic Group's Environmental Initiatives>

Panasonic GREEN IMPACT

The Panasonic Group has established its long-term environmental vision, "Panasonic GREEN IMPACT (PGI)," to achieve both a better life and a sustainable global environment. The Group is working to achieve net-zero CO_2 emissions at all of its operating company locations by 2030 and to have a great impact by contributing to a reduction of at least 300 million tons per year(*3), which is approximately 1% of total global emissions, by 2050. It is also working on business activities aimed at realizing a circular economy in which resource efficiency contributes to decarbonization and reduces the consumption of limited natural resources.

*3: 300 million tons or more per year, which is approximately 1% of the total global emissions.
Based on global energy-related CO_2 emissions in 2020 (source: IEA), which is the starting point for PGI. (The CO_2 emission factor for avoided emissions is based on 2020.)

Panasonic GREEN IMPACT - Company Information - Panasonic Holdings (holdings.panasonic)

<Daigas Group's efforts to achieve carbon neutrality>

The Daigas Group aims to achieve carbon neutrality by 2050 by decarbonizing the raw materials for city gas through technological developments such as methanation, which recycles CO_2 to produce carbon-neutral city gas (e-methane), and by decarbonizing power sources mainly through the introduction of renewable energy. In the meantime, as it is essential to continue efforts to steadily reduce CO_2 emissions, the Group is working to help decrease CO_2 emissions across society by, for example, switching fuels from oil and coal to natural gas, which has a lower environmental impact than other fossil fuels.

・Carbon Neutral Vision (Announced in January 2021)
(https://www.osakagas.co.jp/en/whatsnew/pdf/210125_3_1.pdf)
・Energy Transition 2030 (Announced in March 2023)
(https://www.osakagas.co.jp/en/whatsnew/pdf/230309_4_1.pdf)
・Energy Transition 2050 (Announced in February 2025)
（https://www.daigasgroup.com/en/files/data/sustainability/reportpolicy/sustainability_report/energy_transition.pdf ）