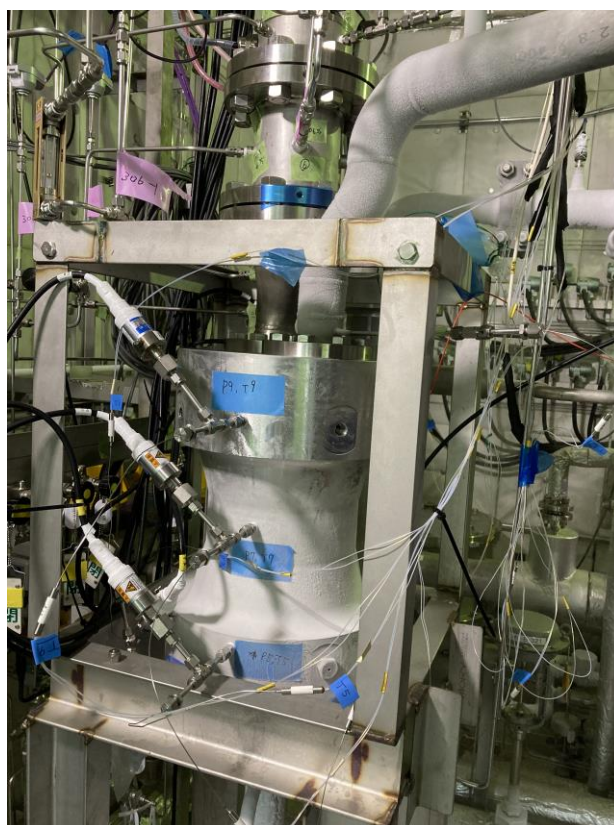


October 4th, 2023

Success in performance testing of a liquefied hydrogen pump for hydrogen aircraft

The first case of the high speed operation with submersible condition in the world

Nikkiso Co., Ltd. (Head Office: Shibuya-ku, Tokyo, hereinafter called "Nikkiso") has successfully conducted the performance testing of the pump with liquefied hydrogen for hydrogen aircraft. This is the first case in the world that a motor-integrated pump unit succeeded in delivering liquified hydrogen by realizing high-speed rotation with small electric motor in a cryogenic condition (submerged condition) filled with liquefied hydrogen (-253°C). Nikkiso has been commissioned to develop a liquefied hydrogen pump by Kawasaki Heavy Industries, Ltd. (Head Office: Kobe City, Hyogo Prefecture, hereinafter referred to as "Kawasaki Heavy Industries"), which is engaged in research and development for hydrogen aircraft. Nikkiso aims to achieve deliver the pump in fiscal 2025.



■ Background

Hydrogen aircraft uses liquefied hydrogen for fuel, which does not emit carbon dioxide during combustion. They are seen as a likely candidate for the next generation of aircraft, as a measure for decarbonization in the aviation sector. Liquefied hydrogen is used as the fuel because liquification makes it possible to compress the volume down to 1/800 the volume that of the gas state.

Kawasaki Heavy Industries proposed the "Development of core technologies for hydrogen aircraft" for the Green Innovation Fund Projects of the New Energy and Industrial Technology Development Organization (NEDO), and the proposal was adopted in November 2021. Nikkiso has been commissioned by Kawasaki Heavy Industries to perform the development of a liquefied hydrogen pump.

■ Characteristics of the liquefied hydrogen pump

The liquefied hydrogen pump being developed by Nikkiso is a booster pump to further pressurize and deliver liquefied hydrogen from a fuel tank to an engine pump. Aircraft pumps are required to be small and lightweight, and also hydrogen is low in density and difficult to boost, so Nikkiso developed an electric motor that rotates at a higher speed than conventional pump designs, to aim to ensure the necessary pressure and flow rate.

When a pump is made of materials with different thermal shrinkage rates, high technical capability is required to rotate the pump at high speeds with cryogenic liquefied hydrogen. However, Nikkiso has extensive experience in the manufacturing of special industrial pumps for cryogenic fluids such as LNG (-163°C). The know-how gained from these experiences are being utilized to design and develop motors that can rotate at high speeds even when they are at cryogenic temperatures, bearings that can withstand the high-speed rotation, and highly efficient pumps.

■ Results of experiment and future development

The experiment was conducted at JAXA Kakuda Space Center in Kakuda City, Miyagi Prefecture, in June and good results were observed as designed. The results obtained from the experiments now are being analyzed and the prototype will be improved to aim for a further small and lightweight and for a longer lifespan. Nikkiso will contribute to the realization of a decarbonized society through research and development to create liquefied hydrogen pumps for hydrogen aircraft.

<About Nikkiso>

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Date of Establishment: December 26, 1953
President & CEO: Toshihiko Kai
Business Overview: Nikkiso provides specialized pumps and systems in the Industrial Business, CFRP (carbon fiber reinforced plastic) aircraft parts in the Aerospace Business and hemodialysis, and healthcare related products in the Medical Business.
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