

## World's First Successful Hydrogen Combustion Operation with a Large Marine Engine

MITSUI E&S Co., Ltd. (Headquarters: Chuo-ku, Tokyo, President: Takayuki Takahashi, hereinafter "the Company") and licensor MAN Energy Solutions SE (Headquarters: Augsburg, Germany Uwe Lauber, hereinafter referred to as "MAN ES") have achieved a world first with a successful hydrogen combustion operation of a large marine 2-stroke test engine with a bore size of 50 cm of the Company's Tamano Factory, aiming for the early launch of hydrogen-related businesses in maritime industry.

This initiative utilizes the Ministry of Land, Infrastructure, Transport and Tourism subsidy project "Maritime Industry Aggregation and Coordination Promotion Technology Development Support adopted jointly with Daihatsu Diesel Co., Ltd. in fiscal 2021.

One of the four cylinders of the test engine 4S50ME-T (output 7 MW, rated speed 117 rpm, MEP = 2.10 MPa) was converted to a hydrogen operation, based on the LNG-fired ME-GI engine and hydrogen gas was supplied from the hydrogen gas supply facility (liquid hydrogen tank, hydrogen gas compressor, etc.) completed\*2 in October last year. The coupling operation was successful test engine at 100% load without any problems such as hydrogen leakage.

In this 100% engine load operation using hydrogen fuel, which ignites easily and requires proper combustion control, the Company succeeded in covering the equivalent of 95% of the heat and the cylinder pressure curve was equivalent to that of the other three cylinders operated with conventional fuel. The Company also confirmed that the hydrogen gas supply facility is capable of high-pressure hydrogen required from the engine. This is the world's first success in hydrogen combustion operation of a large marine 2-stroke engine with a bore size of 50 cm, and the Company aims to provide marine propulsion systems that can greatly contribute to the GHG reduction of the maritime industry with the success of the combustion test.

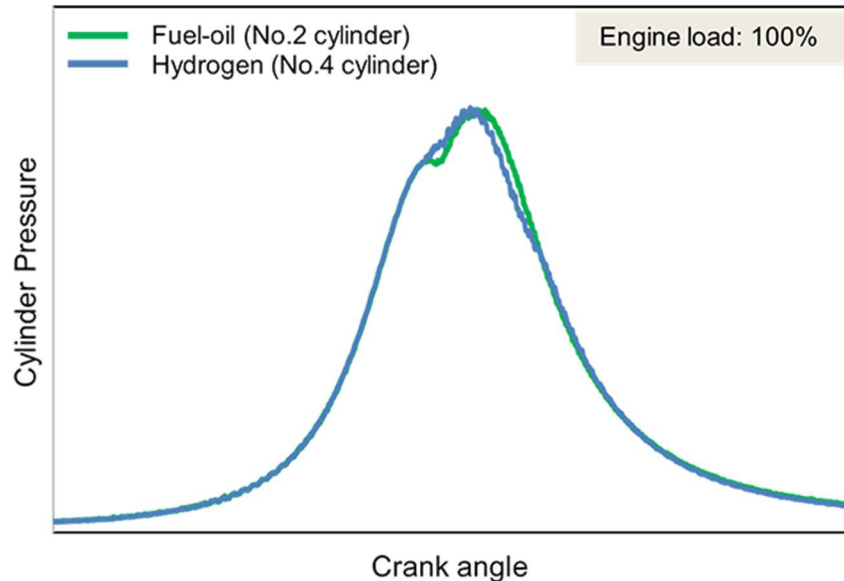


Fig. Cylinder pressure curve on hydrogen and conventional fuel

The Group will acquire technologies and know-how related to the storage, supply and utilization of hydrogen, which is a next-generation fuel, through the development of hydrogen fuel propulsion system technologies and hydrogen supply infrastructure-related technologies, and will contribute to the realization of a decarbonized society.

\*1: June 16, 2022 "Construction of Hydrogen Supply Facility for Development of Hydrogen-Related Products"

\*2: October 23, 2023 "Completion of Construction of Hydrogen Supply Facility for Development of Hydrogen-Related Products"



Hydrogen combustion test on MAN B&W 4S50ME-T

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