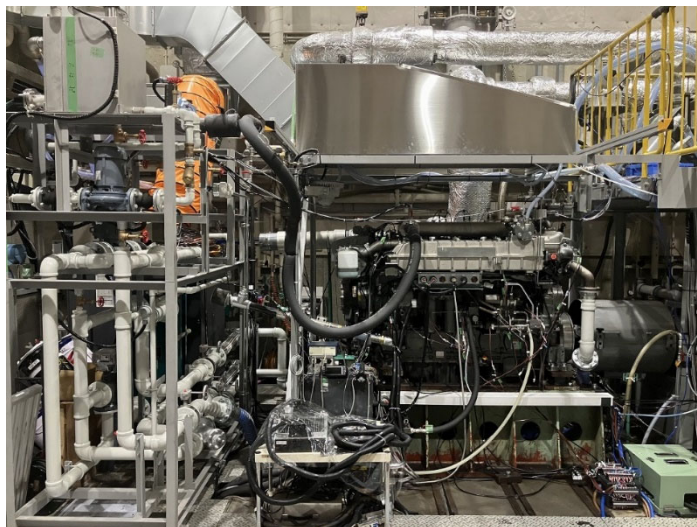




Successful Operation at Rated Output in the Trial of a Hydrogen 4-Stroke High-Speed Engine for Coastal Vessels



The Test Bench for Pilot-Ignition Hydrogen 4-stroke High-speed Engine (6-cylinders)

Osaka, Japan (October 30, 2024) – Yanmar Power Technology Co., Ltd., (Yanmar Power Technology), a group company of Yanmar Holdings Co., Ltd., has successfully completed a land-based demonstration test of a pilot-ignition hydrogen 4-stroke high-speed engine for power generation in coastal vessels, achieving operation at a rated output of approximately 500kW. This trial was conducted as part of the Nippon Foundation's zero emission ship demonstration experiment.

The tested pilot-ignition hydrogen engine operates by using a small amount of diesel oil as the ignition source (pilot fuel) to burn a premixture of hydrogen and air. With this operation, the engine achieved the world's highest hydrogen fuel ratio and an output of approximately 500 kW, leading the industry (according to Yanmar's research).

Going forward, Yanmar Power Technology plans to continue zero-emission trials using biofuel as the pilot fuel, while also working towards obtaining class certification for demonstration operations scheduled for 2026.

About the Zero-Emission Ship Project

This project, led by the Nippon Foundation, focuses on the development of hydrogen-powered, zero-emission ships, and supports related technology development. In addition to hydrogen engine development, the project is currently working on a hydrogen engine-compatible hybrid electric propulsion vessel, combining hydrogen engine generators with batteries. The vessel design incorporates a container unit-type hydrogen power generation system on its upper deck. Uyeno Transtech Co., Ltd., a shipping company under the Uyeno Group, is responsible for the vessel's development and construction.

Yanmar Power Technology's Role

In addition to the diesel pilot-ignition hydrogen engine, Yanmar Power Technology is developing a similar "pilot-ignition" engine that will achieve zero emissions by co-firing a small amount of biofuel for ignition with hydrogen, and a "spark-ignition" engine that will burn hydrogen exclusively in consideration of vessel operation until the hydrogen infrastructure becomes widely available. Land-based demonstration tests using this pilot-ignition 6-cylinder hydrogen engine are scheduled to begin in 2024, with demonstration operations planned for 2026.

Yanmar Power Technology is also conducting parallel land-based tests for the spark-ignition engine, aiming to lead the adoption of hydrogen engine-compatible electric propulsion vessels. This work is part of Yanmar's broader efforts to contribute to achieving zero-emission for coastal vessels based on hydrogen energy from around 2030.



CG Image of Pilot-Ignition Hydrogen 4-Stroke High-Speed Engine

Consortium Members (as of September 2024):

1. Yanmar Power Technology Co., Ltd. (Lead)
2. Ueno Transtech Co., Ltd.
3. Kyoto University
4. Fukuoka Shipbuilding Co., Ltd.
5. Mitsui E&S Shipbuilding Co., Ltd.
6. Mirai Shipbuilding Co., Ltd.
7. National Maritime Research Institute, National Institute of Maritime, Port and Aviation Technology, Japan

CO₂ 排出ゼロの未来へ出航



Responsibilities: 4. detailed vessel design and construction, 5. basic planning, 6. design and construction of hydrogen engine container generation units. 7. Technical development of the spark-ignition hydrogen engine.



Rendering of hydrogen fuel engine electric propulsion ship. (Ship color to be decided.)

For more information on the Nippon Foundation's Zero Emission Ship Project, visit:

<https://www.nippon-foundation.or.jp/what/projects/zeroemission2050?site=hl21201041>

<https://www.nippon-foundation.or.jp/what/projects/zeroemission2050/consortium03>

(Japanese)

About Yanmar

With beginnings in Osaka, Japan, in 1912, Yanmar was the first ever to succeed in making a compact diesel engine of a practical size in 1933. A pioneer in diesel engine technology, Yanmar is a global innovator in a wide range of industrial equipment, from small and large engines, agricultural machinery and facilities, construction equipment, energy systems, marine, to machine tools, and components — Yanmar's global business operations span seven domains. On land, at sea, and in the city, Yanmar provides advanced solutions to the challenges customers face, towards realizing A Sustainable Future. For more details, please visit the official website of Yanmar Holdings Co., Ltd.

<https://www.yanmar.com/global/about/>

About the Uyeno Group

The Uyeno group is comprised of 35 companies engaged in the transportation, storage and sales of petroleum and chemical products essential for industrial and civic life, as well as being engaged in ventures related to solar energy and marine environments. Since our establishment in 1869, we have made vast contributions to societal development stretching over a variety of business fields and have accumulated a wealth of experience and expertise over a span of more than 150 years.

Release from Uyeno Transtech (Japanese):

<https://www.uyeno-group.co.jp/news/index.html>

About the Nippon Foundation

Share the pain. Share the hope. Share the future.

Since its founding in 1962, The Nippon Foundation, Japan's largest philanthropic foundation, funded by the proceeds of Japanese motorboat racing, has pursued activities in a wide range of fields including support for children and persons with disabilities, disaster relief, ocean affairs, and humanitarian aid across racial and national borders.

<https://www.nippon-foundation.or.jp/> (Japanese)

Note: Information contained in the news release is valid at the time of publication and may differ from the most recently available information.

Inquiries

Corporate Communications, Yanmar

newsroom@yanmar.com