PROJECT MEET NEWS

Mitsubishi Marine Energy & Environment Technical Solution-System

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The Path to Decarbonization of the Maritime Industries – *Season 10*

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MOVE THE WORLD FORWARD

MITSUBISHI HEAVY INDUSTRIES GROUP

MITSUBISHI HEAVY INDUSTRIES

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd.

Special Feature

The Path to Decarbonization of the Maritime Industries

- Season 10 -

Development of Methane Oxidation Catalyst System

Start Demonstration Testing of Methane Oxidation Catalyst System for Marine LNG Engines

The International Maritime Organization (IMO) aims to achieve net-zero greenhouse gas (GHG) emissions by around 2050. Under the mid-term measures discussed by IMO's Marine Environment Protection Committee (MEPC), regulations are expanding beyond CO_2 to include all GHGs, including slip methane. Slip methane has a high global warming potential (GWP (*1) = 28) among GHGs, and reducing its emissions offers significant benefits.

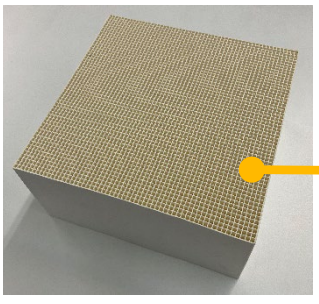
Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. is developing a "Methane Oxidation Catalyst System for Marine LNG Engines" to enable the post-treatment of slip methane emitted from LNG-fueled engines.

This system is jointly developed by integrating our catalytic device design and manufacturing technology with Mitsubishi Shipbuilding Co., Ltd.'s installation engineering expertise and Daihatsu Infinearth MFG. Co., Ltd.'s engine optimization technology. Initial performance tests conducted on land have confirmed a methane oxidation rate of over 70%, and demonstration testing will continue for one year starting in May 2025. The demonstration tests are being carried out on the LNG bunkering vessel (*2) "KEYS Azalea" operated by KEYS Bunkering West Japan Co., Ltd., with the cooperation of Nippon Yusen Kabushiki Kaisha (NYK Line).

By consistently working to reduce GHG emissions from ships, we aim to continue contributing to the global enhancement of ships' environmental performance.

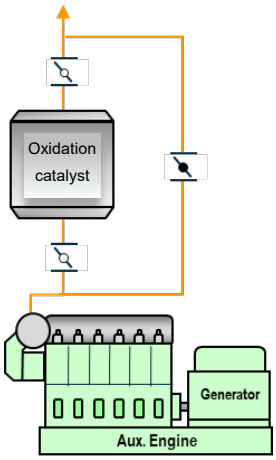
(*1) GWP: Abbreviation for Global Warming Potential, a measure of how much heat a greenhouse gas traps in the atmosphere compared to CO_2, which has a baseline value of 1.

(*2) LNG bunkering vessel: A small vessel that supplies LNG fuel to ships powered by LNG.



Catalyst Element Sample

Land-Based Test Equipment



Land-Based Test Equipment for Methane Oxidation Catalyst Device for Marine LNG Engines

Market Introduction of Energy-Saving Devices

Launch of New Energy-Saving Device "MARF" in the Market

In pursuit of realizing the 2030 vision established by the IMO to achieve net-zero greenhouse gas (GHG) emissions by 2050, our company is actively engaged in technology and product development.

Until the stable supply of zero-emission fuels is achieved in the shipping industry, our company will contribute to reducing GHG emissions by expanding and providing Energy Saving Devices (ESDs) for vessels in operation.

Specifically, as a new ESD for vessels in operation, we have developed and launched the "MARF (Mitsubishi Advanced Reaction Fin)" based on the reaction fin technology owned by Mitsubishi Shipbuilding.

MARF is a product which consists of a half-moon shaped duct with fins installed in front of a propeller.

The fins inside the duct generate a counter-rotating water flow, recovering rotational flow that would otherwise be lost and producing forward thrust with the outer duct. This combination of characteristics supports energy-efficient vessel operations.

MARF is particularly effective for low-speed and heavy vessels such as bulk carriers and tankers, with expected fuel savings improvements of approximately 5% to 8%.

Our company remains committed to actively contributing to the decarbonization of the shipping industry.

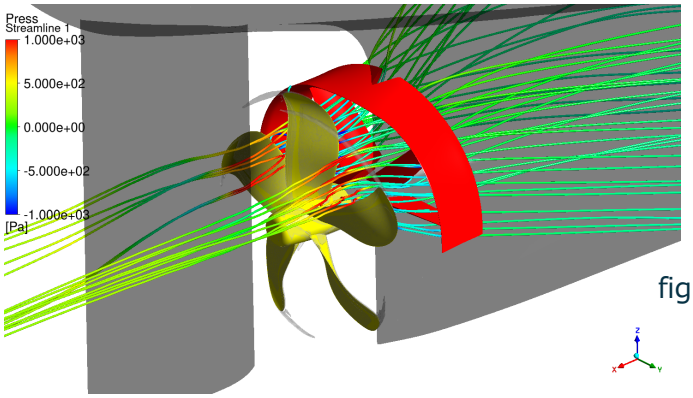


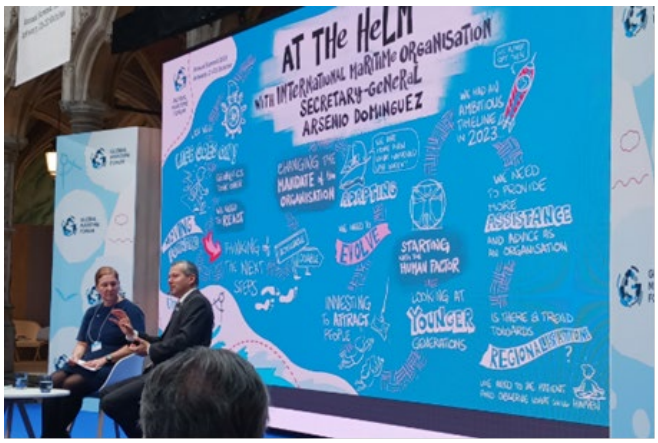
fig1. Flow field estimation by CFD Analysis

Participation in Global Conference

Participation in the GMF(*) Annual Summit

From October 20 to 22, 2025, the GMF Annual Summit was held in Antwerp, Belgium, following the previous summit in Tokyo in 2024. Mr. Arsenio Dominguez, Secretary General of the International Maritime Organization (IMO) and more than 250 leaders across the whole value chain including energy, maritime, port, finance, insurance, participated at the summit and exchanged their views, insights and discussed how to cope with the social challenges such as climate change, through a series following many presentations and panel discussions and workshops.

Just a few days before the summit, the extra-ordinary session of MEPC83 (83rd session of the Marine Environment Protection Committee) was held in London. The adoption of the intermediate measures such as GFI (GHG Fuel Intensity) which was approved in April was postponed the votes for adoption for one year; however, the maritime industry confirmed that it would continue its efforts regarding all measures such as alternative fuel production in scale, improvement of energy efficiency, crew training, etc., to achieve the ambitious target of GHG net zero by 2050. MHI Group, as one of the technology providers in the maritime industry, will continue its contribution for the decarbonization of shipping.



Mr. Arsenio Dominguez, Secretary-General Director of IMO (Right)
Mr. Johannah Christensen, President of CEO of GMF (Left)

The next summit will be held in Shanghai in October 2026.

（※）GMF (Global Maritime Forum)： International non-profit organization headquartered in Copenhagen.

MET Turbocharger FOR HYDROGEN FUEL ENGINE

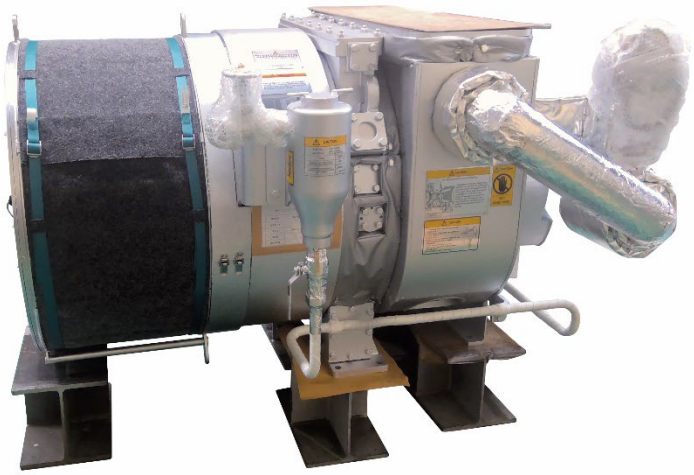
First Delivery of MET Turbocharger for Hydrogen Fuel Engines

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. (MHI-MME) delivered the MET turbocharger (MET33MB) for large low-speed two-stroke hydrogen fuel engines "6UEC35LSGH" developed by Japan Engine Corporation (J-ENG) in September 2025.

The engine is scheduled to be completed by J-ENG in 2027 and will be installed on a hydrogen-fueled vessel built by Onomichi Dockyard Co., Ltd., and its demonstration operation is planned to commence in fiscal year 2028.

In the field of international shipping, the reduction of greenhouse gas (GHG) emissions is becoming an important issue, and the development of hydrogen fuel engines, which enable the reduction of CO_2 emissions to zero, is a major step towards the realization of a Carbon Neutral society.

MHI-MME will continue its efforts as a turbocharger manufacturer to contribute to the realization of a Carbon Neutral society by providing our customers with optimal, environmentally friendly solutions.



MET33MB Turbocharger for Hydrogen Fuel Engine

MET Turbocharger LICENSEE

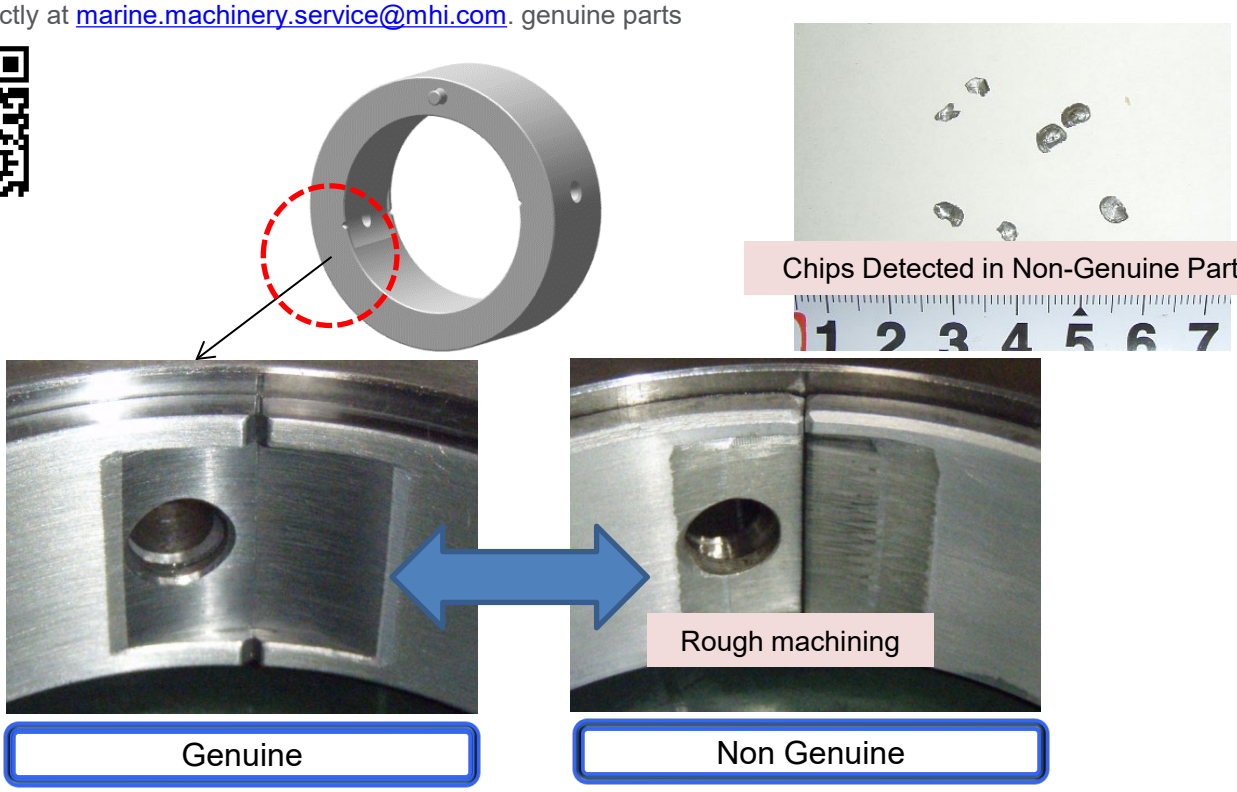
Jiangsu Masada Received First Order MET Turbocharger

Jiangsu Masada Heavy Industry Co., Ltd. (Jiangsu Masada), which signed a license agreement with Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. in 2024 for the manufacture and sale of MET turbochargers, has received its first orders for MET48MB and MET53MB turbochargers under license.

The two turbochargers will be installed in the 6UEC42LSH-Eco-D3 and 6UEC50LSH-Eco-C2 marine engines manufactured by Guangzhou Diesel Engine Factory Co., Ltd., and are currently being produced for delivery in December. Jiangsu Masada plans to expand licensed MET turbocharger production, including other models as well.

Importance of Using Genuine MET Turbocharger Parts for Enhanced Safe Operations

The genuine parts of Mitsubishi Heavy Industries Marine Machinery & Equipment meet strict quality standards and are designed to optimize the performance of MET turbochargers. Comparison between genuine and non-genuine parts reveals a clear differences in manufacturing precision, although they may appear similar at first glance. For example, we find some issues with non-genuine parts, such as chips from machining, which may lead to problems and potential failures.
Using non-genuine parts can decrease the reliability of the turbocharger and may result in unexpected problems.
To maximize reliability and performance, and to ensure safe operation at sea, it is important to remember to use genuine parts.
For parts inquiries, please contact your nearest authorized dealer (https://www.mhi.com/group/mhimme/services) or our company directly at marine.machinery.service@mhi.com. genuine parts



Introduction of Resident Officers in the China Region

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. has dispatched two resident representatives to China to support turbocharger manufacturing and marketing and sales activities with its licensee, Jiangsu Masada Heavy Industries Co., Ltd. This aims to enhance the turbocharger business in the Chinese market.

Mr. Uekawa, Deputy General Manager (Left)
Mr. Kojima, Deputy General Manager (Right)

Additional Service Menu for Steam Vessels

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. has expanded its service offerings with a new menu aimed at extending the lifespan of our equipment installed on LNG vessels. Below are some of the maintenance options we offer. As LNG vessels age, there can be situations where regular maintenance alone is insufficient for the adequate preservation of various equipment. In addition to the services introduced here, we are expanding and providing a range of service options to meet the needs for extending the lifespan of LNG vessels. If you have any requests or inquiries, please contact our service sales office at marine.machinery.service@mhi.com.

Ahead Nozzle Valve Refurbishment

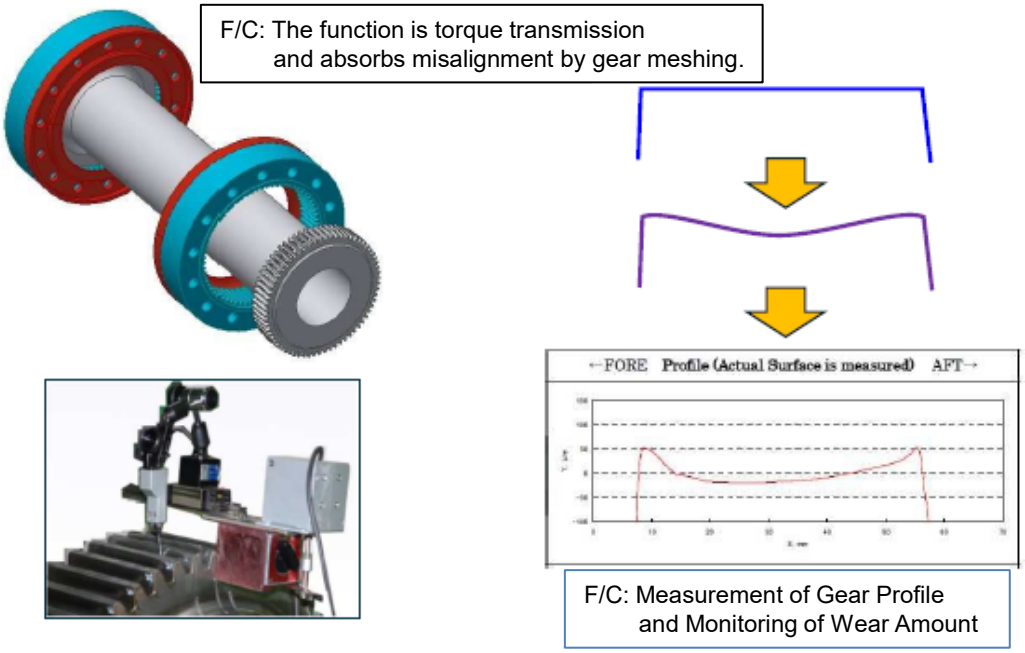
Over years of operation and inspection, the seat surfaces and tightening bolts and nuts of the Ahead Nozzle Valve cover on the main turbine may show signs of deformation. In some cases, this has led to steam leakage on operational vessels. Based on our inspection experience, we recommend refurbishing the seat surfaces, replacing the tightening bolts and nuts, and adding washers around 15 years after ship delivery. We encourage you to consider this for the safe operation of your vessel.

Improvement of Seat Contact Surface

Refurbishment of Bolts and Nuts

Flexible Coupling Wear Diagnosis

The flexible coupling (gear coupling), which transmits torque from the main turbine to the reduction gear, can experience gear tooth surface wear due to over operation. For vessels that are over 10 years old, we use specialized measuring equipment during docking periods to monitor wear levels and assess the overall condition. We encourage you to consider this service for enhanced safe operations



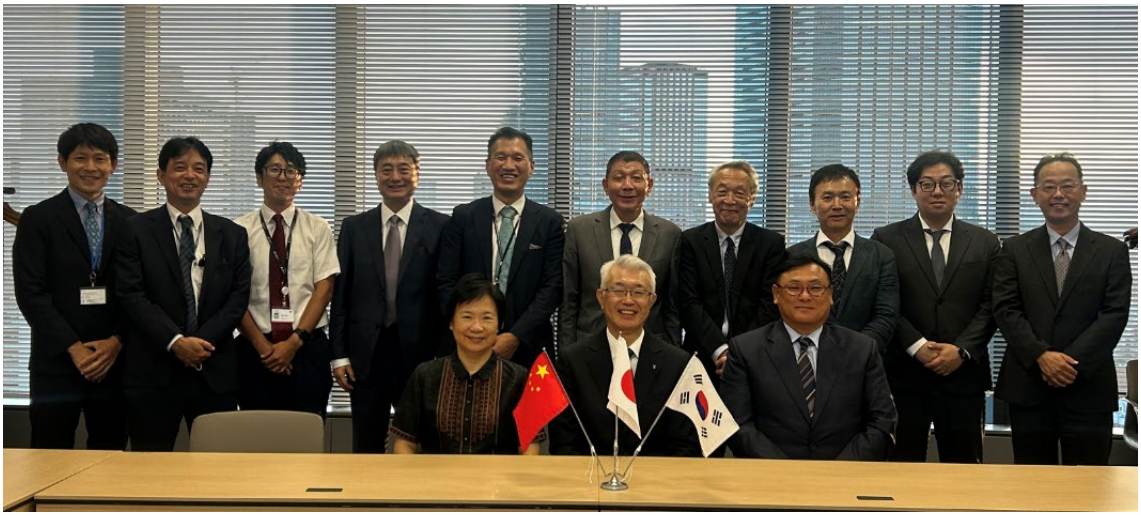
STEERING GEAR LICENSE

Steering Gear Licensing Conference Held in Tokyo

In August 2025, Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. held a licensing conference at the Tamachi Tower in Tokyo with Yoowon Industries Co., Ltd. (South Korea) and Jiangsu Masada Heavy Industry Co., Ltd. (China), both of which hold licenses for our steering gears. This was the first conference in eight years, due to the impact of COVID-19, and it featured active discussions on further improving product quality, sharing technical challenges, and strengthening future cooperation.

Participants from each company shared the latest market trends and customer needs, providing us with valuable insights for future product development and market strategies. This conference served as an important opportunity to deepen the trust with our license partners and to build a foundation for sustainable technical cooperation.

We will continue to collaborate with our partner companies to deliver higher quality products.



Steering Gear Licensing Conference

AUTHORIZED ENGINEER FOR MAIN STEAM TURBINE

Introduction of Certified Technicians for Main Turbine Inspection

In May 2025, Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. approved a technician from a partner company as a “certified technician responsible for main steam turbine inspections”.

This enhancement of the service technicians increases the number of vessels that can be serviced simultaneously, enabling us to better accommodate customer scheduling needs.

We will continue to collaborate with our partner companies for higher quality services.

Certified Technician of a partner company
PMB Co., Ltd. Mr. Tomokazu Higuchi

PROPELLER RETROFIT ORDER INTAKES

Three-Hundred Orders for Propeller Retrofit Projects

- Contributing to Sustainable Operations by Reducing Both Fuel and CO_2 Costs-

Mitsubishi Heavy Industries Marine Machinery & Equipment Co., Ltd. has reached a cumulative total of 300 propeller retrofit orders (*1). Retrofitting propellers optimally designed for vessels operating at low loads can be expected to realize approximately 2-12% improvement in fuel efficiency. This not only reduces fuel costs but also helps mitigate the cost burden associated with CO_2 emissions. Discussions are ongoing within the International Maritime Organization (IMO) regarding actions towards GHG reduction. As CO_2 costs are becoming a concern for business profitability in the future, improving propulsion efficiency will be an effective measure. Our company is committed state-of art new propeller to be delivered in time, by optimizing individual vessels based on operational data and collaboration with our manufacturing operations partner in China.

We have completed the "100th propeller retrofit" project for vessels with MSC, covering a wide range of container ships from 2,000 to 23,000 TEU. This has resulted in the confirmed improvement of fuel efficiency. We expect annual reduction of approximately 487,000 tons of CO_2 (*2). The 100th retrofit marks an important milestone in our long-standing partnership with MSC.

The photo shows a mega container ship owned by MSC, which had its propeller replaced in 2025.

We aim to leverage these achievements and insights to offer proposals to other clients, contributing to the realization of sustainable shipping by reducing fuel costs and CO_2 emissions.

Mega container which had its propeller replaced in 2025.
@MSC Mediterranean Shipping Co.

(*1) Cumulative since 2013

(*2) Equivalent at the time of the 100th retrofit

EXHIBITION/SEMINAR ACTIVITIES

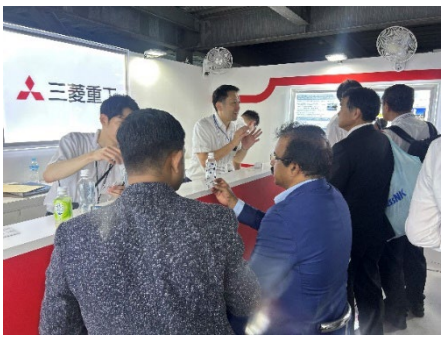
Exhibition and Seminar Participation（in 2025）

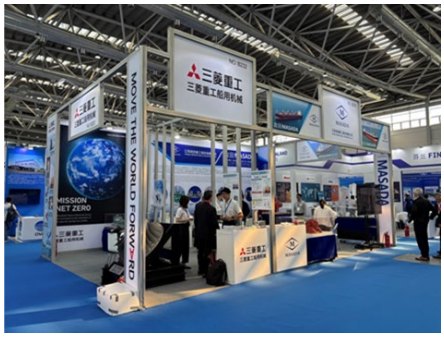
Exhibitions

BARISHIP 2025（IMABARI）	from May. 22 to 24, 2025
NANTONG MARINTEC（NANTONG）	from Sep. 16 to 17, 2025

Seminar

Community of Taiwan Maritime Technician（TAIPEI）	Sep. 19, 2025
Business Matching Forum（ATHENS）	Oct. 17, 2025





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