

Others

Intellectual Property

Governance

— Organization

Strategy and Risk Management

- Obtaining Intellectual Property Rights
- Intellectual Property Evaluation and Reward System

Protection of the intellectual property rights of the NYK Group

Understanding and Respecting the Intellectual Property Rights of Others

Utilization and Contribution of Intellectual Property

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Intellectual Property

Governance

Safety is the foundation of our group's business continuity, and our continued efforts to always stay one step ahead in safe operation is what differentiates us from competitors. Ahead of international environmental regulations, in addition to reducing GHG emissions, we believe that contribution to the industry as a whole will directly link to the materiality of the NYK Group by taking the lead in meeting the "environmental" needs of ships from various perspectives (such as pollution prevention and ecosystem protection) and by taking the lead in new initiatives in areas (related to "safety" and "human resources") such as autonomous ships that are attracting increasing attention from the perspective of improving safety, addressing crew shortages, and ensuring logistics stability.

We are committed to R&D and technological development as the linchpin of value creation through the practice of materiality. At the same time, we are protecting our business activities by properly protecting and utilizing the results of our efforts as intellectual property, accurately understanding and thoroughly respecting the intellectual property rights of other companies, and fulfilling our social mission of "Never Stop Logistics" while simultaneously creating the value.

Organization

We have established an IP Committee as a forum for seeking advice on application review and compensation for inventions made at work. As of May 2024, the Senior Executive Officer and Head of the Technology Division, who chairs the Intellectual Property Committee, is responsible for our group's IP.

Strategy and Risk Management

Obtaining Intellectual Property Rights

We continue to help resolve issues faced at the work-site by leveraging the information and knowledge gained from the daily operation of its ships. With the motto "No SOLUTION without MEASUREMENT," we have been practically collecting and accumulating ship data from actual sea areas, analyzing the data, and developing solutions for many years in cooperation with our group companies such as MTI Co., Ltd., in order to make invisible visible, and protecting the results with intellectual property.

• Examples of Areas of Focus

> (1) Preventing accidents and malfunctions by monitoring ships from land

Based on big data including ship position, speed, engine operating conditions (temperature, pressure, flow rate, etc.), acceleration by motion sensors, wind direction, wind force, wave height, and other meteorological and oceanographic information, the Ship Information Management System (SIMS), a ship performance monitoring system introduced in 2008, enables analysis and diagnosis that leads to early detection of signs of malfunctions and serious accidents such as breakdowns on operating ships.

> (2) Research on Autonomous Ship Technology

We have more than 30 years of extensive data on evasive maneuvering by captains and officers, accumulated using in-house full-mission maneuvering simulators. This data is used in the development of evasive maneuvering algorithms. In 2023, the "Autonomous Vessel" initiative by NYK and three NYK Group companies (MTI Corporation, Nippon Marine Science Inc. and Kinkai Yusen Kaisha, Ltd.) received the "5th Japan Open Innovation Award,

Minister of Land, Infrastructure, Transport and Tourism Award" sponsored by the Cabinet Office.

• Received the "Data Management Grand Prize Award"

Our company was awarded the grand prize at the Data Management 2024 held by the Japan Data Management Consortium (JDMC) in recognition of our efforts to improve and utilize the data lake * in the three areas. i.e. Ship operation management, deepening of the marine transportation business, and group business management. This award is presented to companies and institutions that have made noteworthy efforts and achievements and are recognized as a model for others in the future.

*Data Lake: A data management system for the utilization and analysis of data. Suitable for collecting and storing large amounts of data because the data can be stored in any format or size

Intellectual Property Evaluation and Reward System

We have established regulations for handling employee inventions with the objective of encouraging our employees to make inventions, to guarantee their rights as inventors, and to ensure the rational management and utilization of patent rights acquired through inventions.

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Protection of the intellectual property rights of the NYK Group

We apply for and manage the patents and other industrial property rights with the aim of identifying intellectual property through originality and ingenuity, differentiating itself from other companies with this intellectual property, and contributing to the business. We also protect ideas that can be intellectual property and other assets such as ship data.

Understanding and Respecting the Intellectual Property Rights of Others

Our group clearly states in "NYK Code of Conduct" and "CSR Guidelines for Business Partners" that it will not infringe on the intellectual property rights of others, and implements this policy throughout its value chain. We respect the intellectual property rights of others, as much as our own intellectual capital rights. We work to reduce the risk of infringement of rights held by others by conducting surveys to avoid industrial property infringement, responding to internal consultations regarding intellectual property contractual clauses, and holding regular intellectual property training sessions.

Utilization and Contribution of Intellectual Property

Appropriate use of our group's intellectual property will not only increase our group's corporate value through monetization, but may also contribute to solving industrial and social issues.

Contributing to the Revitalization of the Maritime Industry through the Use of Technology and Patents

In April 2023, we established the "Shipbuilding Business Group" within the Technology Division. We, either independently or in combination, provide solutions to the technical needs of ship owners, ship management companies, etc., through the technologies and know-how accumulated by our Group in its engineering and marine affairs divisions and engineering group companies, strive to solve various problems of the maritime cluster and contribute to the realization of safe and sustainable maritime transportation.

Initiatives

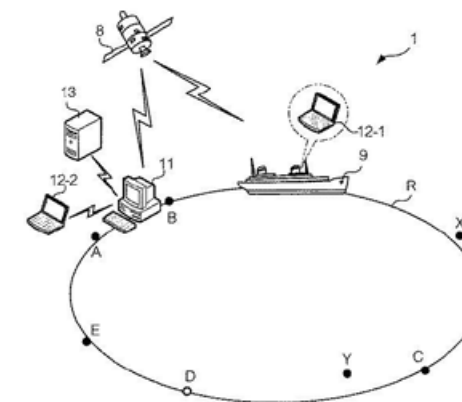
We are developing cutting-edge technologies related to safe navigation and environmental protection, such as IBIS Project, which utilizes big data for optimal economic navigation, and the MT-FAST (hull additive), an energy-saving device that greatly improves fuel efficiency.

Representative Examples of Patents

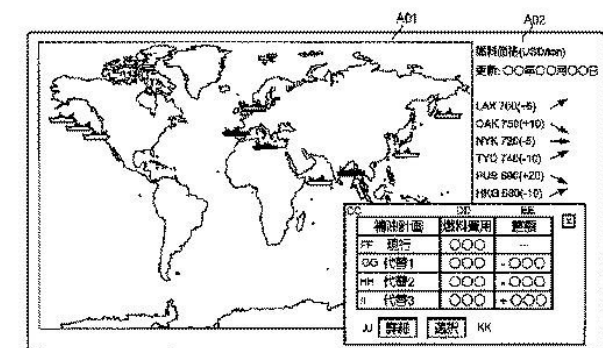
IBIS Project-related Patent (Patent No. 5591429)

This invention provides a mechanism for presenting an oil replenishment plan (oil refueling port and oil refueling amount in the oil refueling port) for reducing fuel cost during ship voyages. For example, if a change in fuel prices at a particular port leads to a refueling plan that will allow a ship in transit to save fuel cost compared to the current refueling plan, the ship's operator and other users will be notified of the same. As a result, users can easily find out the desired refueling plan.

Overall structure of the refueling plan support system



Screen image of the refueling plan support system



- AA Fuel price
- BB Updated: year/month/day
- CC Bunkering plan
- DD Fuel cost
- EE Differential
- FF Current
- GG First alternative
- HH Second alternative
- II Third alternative
- JJ Details
- KK Select

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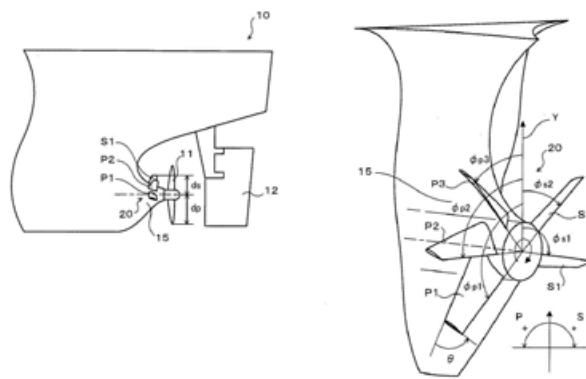
Intellectual Property

● MT-FAST Patent (Patent No. 5002378)

This invention relates to a marine propulsion efficiency improvement device and its installation method.

Ships use engine power to rotate propellers and push seawater backward, converting it into a force that propels the ship in the direction of travel. However, when the rotational force is converted into propulsion force, a vortex called swirling flow is generated, which lowers propulsion efficiency. This invention is a hull appendage "MT-FAST" consisting of several twisted shaped fins. It is attached to the front of the propeller to regulate the water flow flowing into the propeller and to reduce the swirling flow generated behind the propeller. As a result, the propeller propulsion power gets improved, and approximately 4% fuel saving becomes possible.

■ Outline of a ship equipped with a marine propulsion efficiency improvement device

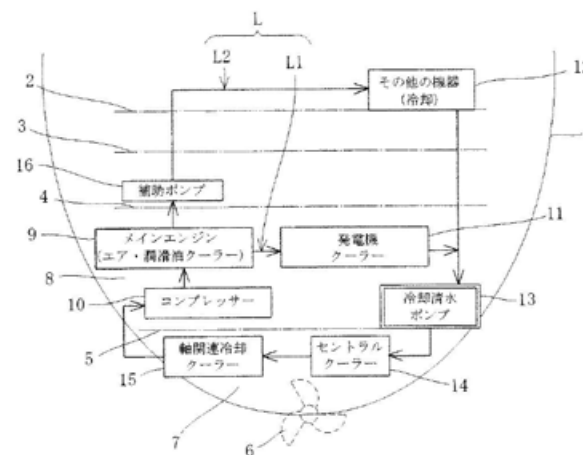


● Reduction of Energy Consumption of Auxiliary Equipment (Patent No. 5474574)

This invention relates to a fresh water cooling system for ships.

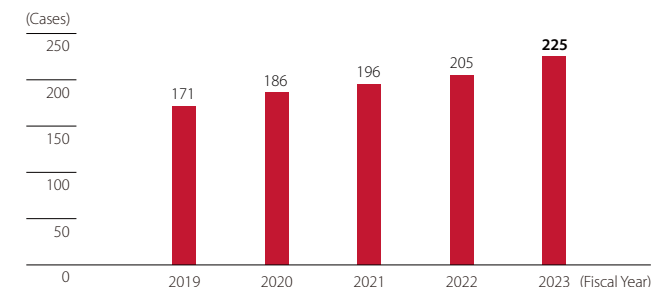
In large ships, the height of the equipment in the upper accommodation area of the ship from the cooling fresh water pump is about 25 m or even higher. As a fresh cooling water pump, a high-capacity, high-lift pump with a large discharge pressure is required, but the challenge is that a large amount of power is consumed to drive the pump. This system divides the cooling system into upper and lower sections. By using an auxiliary pump to supply fresh water to the upper system, the required lift of the cooling fresh water pump can be lowered, and the power consumption for driving the pump can be reduced.

■ Schematic diagram of the fresh water cooling system



Relevant Data

■ Number of Patents



(Note) Numbers of patents indicate the number of cases at the end of each fiscal year