NAKASHIMA
We Go Beyond

NAKASHIMA has an idea

Product lineup

One and only propulsion performance

We create the ultimate propellers that support safe and comfortable voyages from our obsession with "Built-to-Order."

It is an absolute necessity for ships and vessels to exert optimum performance, matching the three elements of hull, engine and propeller. Every propeller that Nakashima manufactures is an "ultimate order-made" propeller, in order to create unique and optimum propellers. The history of Nakashima Propeller is the very history of "Built-to-Order."

The only high-performance propeller in the world created by craftsmenship which can distinguish 1/100 of a millimeter and cutting-edge digital technology.

In order to faithfully reproduce complicated shapes unique to fluidic products held by propellers, craftsmenship and digital technology are integrated in all processes including design, casting, machining, and finish to create high-performance propellers. Digital technology, such as a three-dimensional fluid analysis which indicate complicated flows in numerical values, and CNC blade surface machining equipment for high-precision machining. Skilled craftsmenship,such as hands of expert craftsmen,that can identify differences as small as a hundredth of a millimeter. Nakashima takes pride in its manufacturing using these skills to the fullest extent.

Propulsion Systems for Smooth Voyages

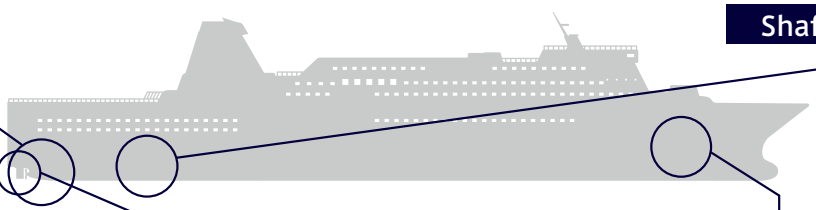
Nakashima Propeller is a comprehensive manufacturer of marine propulsion equipment handling every type of propeller from leisure boat to super-sized tankers at diameters of 12m. We support smooth voyages with a variety of propellers including controllable pitch propellers which can freely operate speed or ahead/astern of ships by controlling the angle of blades, thrusters, and electric propulsion systems.

Main propulsion systems

Fixed pitch propeller

Controllable pitch propeller

Special propulsion system



Shafting system

Rudder

Becker rudder

Energy saving device

ECO-Cap Neighber Duct Ultimate Rudder Bulb

Auxiliary propulsion systems

Controllable pitch propeller Fixed pitch propeller

Transverse thruster

SCHOTTEL Pump-Jet

Global Network

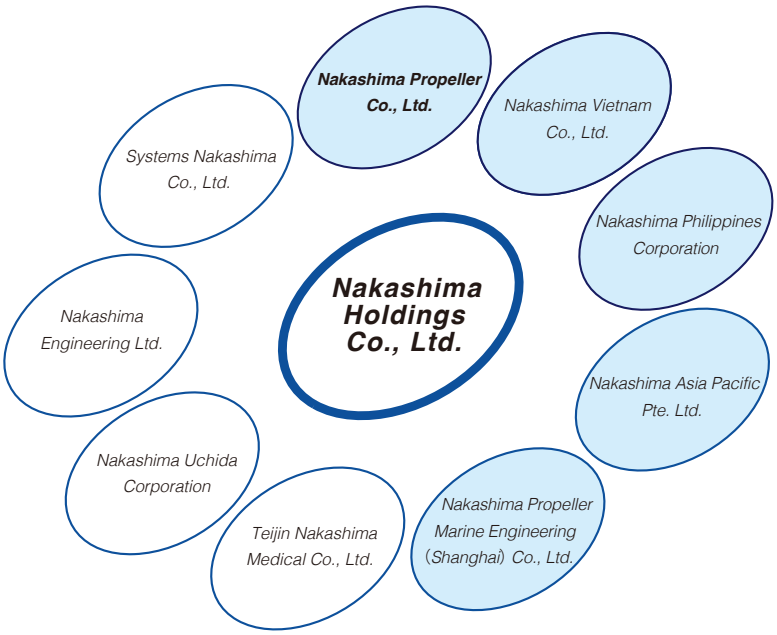
Nakashima's propellers actively work on the seas of the world. We are developing a reliable global network.

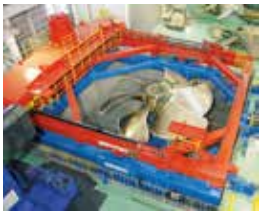
Ships and vessels mounted with propulsion equipment of Nakashima Propeller actively work on the seas of the world. Presently, not only in Japan, but also in various countries around the world, backup systems have been established. The stage has expanded globally through technological cooperation with overseas companies and development of engineers.

NAKASHIMA

We Go Beyond

"We Go Beyond" is an expression which announces the mission of Nakashima Group who consistently pursues the newest and best products and casts limitless possibilities beyond that into shape. We will aspire to make anything that has not been made or cannot be made yet.





History

NAKASHIMA GROUP

1926 Zenichi Nakashima starts Nakashima Foundry casting copper alloy in Shimoishii, Okayama City.

1930 Names "Mitsuwa Propeller" as brand name of small-sized propellers and establishes trade mark with three overlapping circles.

1938 Company organizes as partnership corporation Nakashima Foundry.

1948 Establishes Nakashima Casting Industries Co., Ltd. in response to increases in propeller demand.

1952 In preparation for increasingly larger ships and vessels, decided to develop as a large-sized manufacturer.

1955 Changes trade mark to Eagle mark.

1967 Completes new factory and relocates all departments to Jotokitagata, Joto-gun(currently, Jotokitagata, Higashi-ku, Okayama City).
Changes corporate name to Nakashima Propeller Co., Ltd.
Business establishment certification based on the Ship Safety Law by the Ministry of Transport.

1971 Succeeds in development of keyless propellers.

1972 Technical cooperation of controllable pitch propellers and side thrusters with Stone Manganese Marine Ltd., in England.

1973 Introduces computers (Large-sized host computer FACOM230-15).

1974 Introduces large-sized NC blade surface machining equipment.

1978 Technical cooperation of Becker-rudder with Willi Becker in Germany.

1981 Develops high skewed propeller.
Spins Equipment Design Department off as separate company to establish Nakashima Engineering Ltd.

1983 Newly establishes System Department and starts sales of personal computer CAD "ANDES."

1984 Develops surface propellers.

1985 In order to expand business in the information and communications field, spins System Department off as separate company to establish Systems Nakashima Co., Ltd.
Performs CI and changes trade mark to N mark.

1987 Utilization of structural analysis and electronic control systems and development of "Melody Bell."
As an environmental representation product, Planning and Sales performed by Nakashima Engineering.
Receives a manufacturing license for medical devices from the Ministry of Health and Welfare to develop artificial joints made of titanium alloy.

1991 Introduced stereolithographic equipment "SOUP."
Sales collaboration of thrust equipment including "Pump-jet" and "Rudder-propeller" with Schottel in Germany.

1993 Establishes Nakashima Uchida Corporation, sales company of business equipment through joint capital investment with Uchida Yoko Co., Ltd.

1994 Completes private electric generator by cogeneration system.
Inaugurates Medical Department.

1995 Head works of Nakashima Propeller Co., Ltd. acquires ISO-9001 certification first in the propeller industry field.

1996 Completes racing propeller factory in Head office premise of Nakashima Propeller Co., Ltd.
Completes new head office of Nakashima Propeller Co., Ltd.
Received Nikkei New Office Award.

1997 "NICE 80" developed by Systems Nakashima Co., Ltd. as an in-house intranet receives Minister of International Trade and Industry Award as a superior information systems.

2000 Technical corporation in manufacture of Model TCT thrusters with Korea KT Electric Co., Ltd.

2001 Completes medical building.
In celebration of the 75th anniversary, donates a large-sized propeller to Museum of Maritime Science in Higashiyashio, Tokyo.

2004 Completes R&D center in Haga Research Park, Okayama City.
Medical Business Department acquires ISO-13485 certification.

2005 Completes Tamashima Works for manufacturing large-sized marine propellers.
Employee, Hisayuki Miyata receives Prime Minister's Award "First Monozukuri Japan Grand Prix."
His Imperial Highness visits our factory.

2007 Completes factory of Nakashima Vietnam Co., Ltd. in Haiphong City, Vietnam and starts operation.

2008 Reorganization of the group with Nakashima Holdings at its core.
Split off of the Medical Department to create a separate company called Nakashima Medical Co., Ltd.

2009 Nakashima Vietnam Co., Ltd. constructs its second factory in the Dinh Vu Industrial Zone in Haiphong City and begins operations.
The Mikado Group merges with Nakashima Holdings.

2010 Extends R&D center.

2011 Established Nakashima Asia Pacific Pte. Ltd. in Singapore.

2012 Mikado Japan Co., Ltd. changed its name to Nakashima Mitsuwa Propeller Co., Ltd.
Mikado Philippines Corporation changed its name to Nakashima Philippines Corporation.

2013 Business partnerships with Michigan Wheel Marine in USA.
Established Nakashima Memorial Foundation.

2014 Established Nakashima Medical Technical Center (Thailand) Limited.

2015 Nakashima Medical Co., Ltd. changed its name to Teijin Nakashima Medical Co., Ltd.

2016 Nakashima Propeller merges with Nakashima Mitsuwa Propeller Co., Ltd.
Established Nakashima Propeller Marine Engineering (Shanghai) Co., Ltd.

2017 Acquires marine propulsion equipment business from Mentrade Group in Malaysia.

2018 Teijin Nakashima Medical acquires spine business from Century Medical, Inc.

Nakashima Holdings Co., Ltd.

[Founded] May 1926
[Established] November 1948
[Capital] 100 million yen
[Business content] Business related to management of group companies, management and leasing of real properties
[Location] Jotokitagata 688-1, Higashi-ku, Okayama City 709-0625
Tel:+81-86-279-5111(main)
http://www.nakashima.jp

Nakashima Propeller Co., Ltd.

[Established] August 2009
[Capital] 110 million yen
[Business content] Development, manufacture, and sales of marine equipment
Planning, manufacture, and sales of exterior products
Development, manufacture, and sales of environment improvement equipment
[Location] Jotokitagata 688-1, Higashi-ku, Okayama City 709-0625
Tel:+81-86-279-5111(main)
https://www.nakashima.co.jp

Nakashima Engineering Ltd.

[Established] February 1981
[Capital] 20 million yen
[Business content] Technical consulting and after-sales services of marine propulsion equipment
Planning, construction, and sales of environment representation products
[Location] Jotokitagata 688-1, Higashi-ku, Okayama City 709-0625
Tel:+81-86-279-5111(main)
http://www.nel.nakashima.co.jp

Teijin Nakashima Medical Co., Ltd.

[Established] September 2008
[Capital] 100 million yen
[Business content] Development, manufacture, and sales of medical equipment
[Location] Jotokitagata 688-1, Higashi-ku, Okayama City 709-0625
Tel:+81-86-279-6278(main)
https://www.teijin-nakashima.co.jp

Systems Nakashima Co., Ltd.

[Established] April 1985
[Capital] 10 million yen
[Business content] Development and sales of CAD/CAM systems and business systems
Sales of computer related equipment
[Location] Head office/Jotokitagata 688-1, Higashi-ku, Okayama City 709-0625
Tel:+81-86-279-7700
Administrative Headquarter/2-chome, 3-19, Nakashimada-cho, Kita-ku, Okayama City 700-0982
Tel:+81-86-234-8111(main)
https://www.systems.nakashima.co.jp

Nakashima Uchida Corporation

[Established] December 1993
[Capital] 30 million yen
[Business content] Sales of office business equipment and OA supplies
[Location] Haga 5322, Kita-ku, Okayama City 701-1221
Tel:+81-86-286-9500
http://www.nuc-ok.co.jp

Nakashima Memorial Foundation

Nakashima Vietnam Co., Ltd.

[Established] December 2005
[Capital] USD 6.88 million
[Business content] Manufacture of various marine propellers
[Location] Land Plot CN2.2B, Dinh Vu Industrial Zone
Hai An Dist., Haiphong, Vietnam
Tel:+84-31-3614325
http://www.nakashimavietnam.com

Nakashima Asia Pacific Pte. Ltd.

[Established] December 2011
[Capital] SGD 0.5 million
[Business content] Sales of various marine propellers
[Location] 8 Temasek Boulevard #32-01B,
Suntec Tower Three, Singapore 038988
Tel:+65-6836-5015

Nakashima Philippines Corporation

[Established] February 1989
[Capital] PHP 110 million
[Business content] Manufacture of various propellers
[Location] Cavite Economic Zone, Rosario, Cavite, Philippines 4106
Tel:+63-46-437-2207

Nakashima Propeller Marine Engineering (Shanghai) Co., Ltd.

[Established] October 2016
[Capital] USD 0.5 million
[Business content] Maintenance and repair of propulsion equipment of ships in operation, optimisation of propulsion performance
[Location] Rm 702 Neiwailian Building, 518 Shangcheng Road, Pudong New District, Shanghai 200120, China
Tel:+86-21-5835-8179

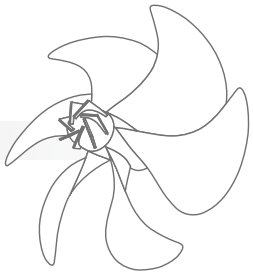
Product lineup

NAKASHIMA PROPELLER

GPX PROPELLER

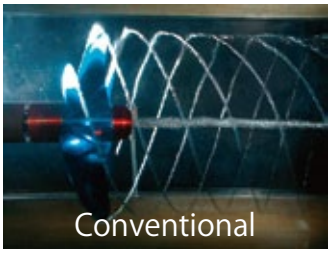
FIXED PITCH PROPELLER

The latest fixed pitch propeller – 4 technologies fuse together



Non Hub Vortex

One of the characteristics of GPX propellers is the lack of a hub vortex. Nakashima has succeeded in reducing hub vortex merely through advancing our propeller design and technology, called NHV technology.

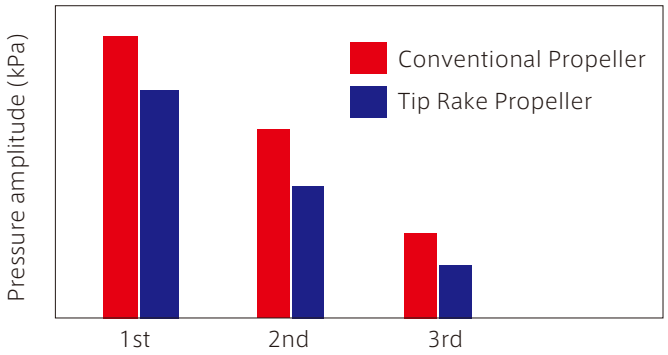


Small Blade Area

In order to increase efficiency, expanded blade area is reduced to a minimum. We have achieved the highest friction reduction efficiency ever. The below photos clearly show the difference between original and narrow, more advanced blades.

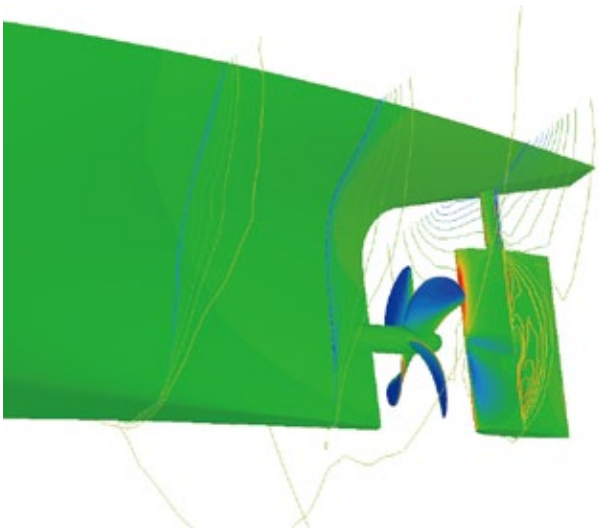
Tip Rake

Tip Rake is a cavitation reduction measure. Designing mildly-curved propeller tips reduces the pressure amplitude at all orders, particularly 2nd and 3rd order.

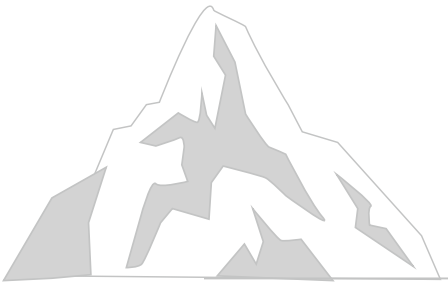


Wake Adapted

Wake distribution differs depending on each vessel type, and Nakashima designs propellers to suit each vessels individual wake distribution. Nakashima aims to improve not only the efficiency of the propeller itself, but also propeller efficiency within its specific wake flow. CFD analysis technology is able to integrate the design of both propeller and hull.



Reduction of CO2

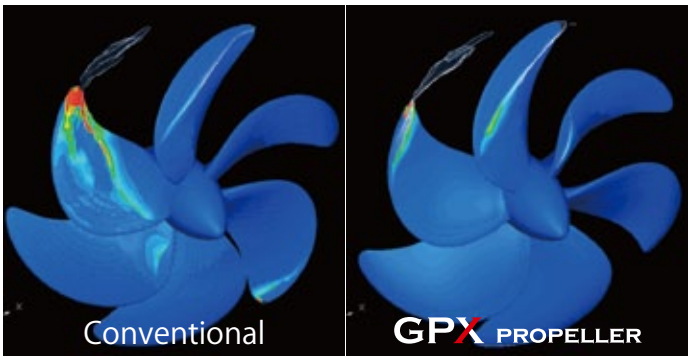


Since the introduction of EEDI in January 2013, further improvements to propulsion efficiency have been in high demand. Not only due to EDDI, but also from the perspective of reducing GHG emissions and cavitation noise, requests regarding propeller performance have been getting both higher and more strict.

Analysis Technology

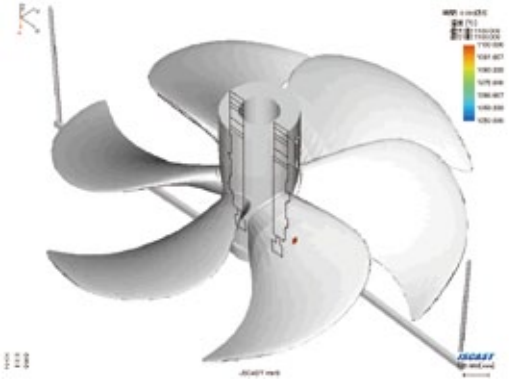
Computational Fluid Dymamics

High accuracy cavitation simulations are used to reduce blade area through the use of CFD design. Nakashima has succeeded in increasing calculation accuracy by comparing high speed camera recordings from model testing with CFD calculation results. Incorporating erosion risk, our estimation accuracy for cavitation simulations is very high and reliable.



Casting Analysis

Casting and machining processes are the most important parts of propeller manufacturing. Nakashima utilizes advanced technology for casting analysis when making molds. Through comparison between casting analysis results and the actual casting, Nakashima has developed reliable casting technology.



Production Technology

High-efficiency propellers cannot be manufactured without reliable and advanced production technology. Nakashima utilizes CNC blade-milling machines and produces propellers that reflect the previously calculated dimensions. Particularly, design details of the two important areas, the leading edge governing cavitation generation, and the trailing edge influencing propeller singing and efficiency, are reflected in our final products. As a result, GPX propellers have been proven to be high efficiency propellers, not only in model testing, but also on actual vessels.

Vessel Type	Efficiency compared to original propeller(%)		
	Propeller open efficiency	Self propulsion test	Actual (Sea trial)
Chemical tanker	+2%	+4%	+4.5%
Cement carrier	—	—	+7%

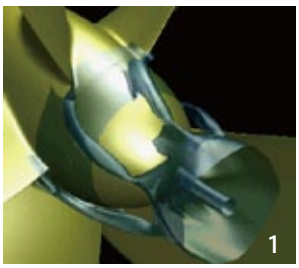
ECO-CAP

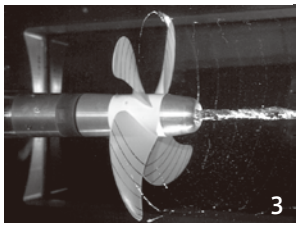
ENERGY SAVING DEVICE

FOC Improvement 1~3 %

ESD ENERGY SAVING DEVICES

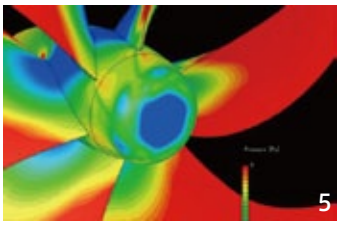
Design — Newly designed propeller cap for propeller hub vortex reduction

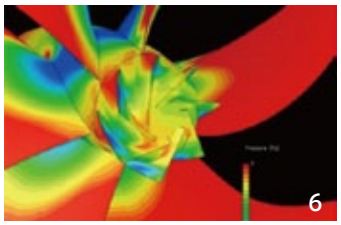




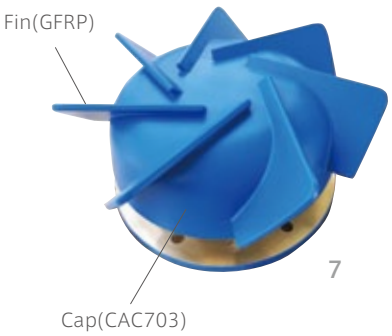
A hub vortex is produced behind the propeller cap due to rotational flow (Figure 1).
Because the hub vortex decreases efficiency, Nakashima Propeller has designed more than 500 different propeller cap profiles, in order to find the optimal profile for reducing hub vortex and increasing efficiency. During the development of our propeller cap, we found that a propeller cap profile with several small fins is the most effective. This profile became the prototype for the ECO-Cap (Figure 2).
Reduction of propeller hub vortex was confirmed through model tests in a cavitation tunnel (Figure 3/4).

CFD Analysis — Mechanism for improvement of efficiency using ECO-Cap





The pressure distribution behind two different propeller caps is shown above. Blue indicates negative pressure areas, while positive pressure areas are colored in yellow & red. For the regular propeller cap, pressure distribution shows a lot of blue, while the pressure distribution with the ECO-Cap shows mostly yellow & red (Figure 5/6).
Using a regular propeller cap, resistance is increased due to negative pressure. On the other hand, using the ECO-Cap produces positive pressure, generating thrust, and increasing overall thrust compared to regular propeller caps.
Although dependent on propeller profile, such as blade number, pitch, and boss diameter, propeller efficiency was increased by approximately 1.0-1.3% ***in model tests.***
The Reynolds number used in model tests is significantly lower than for actual vessels, and models can only generate small hub vortices. Therefore, the resultant energy loss is also small. Hence, it can be predicted that energy loss recovery and efficiency improvement using the ECO-Cap will be greater than in model tests.



Actual Ship — Verification of FOC on actual vessel

For the ECO-Cap equipped to an actual vessel, thin FRP blades were adopted to decrease resistance, and it was then installed to the cap body (Figure 7). Using FRP materials, it was possible to minimize weight, compared to regular propeller caps.
Moreover, as a result of verification on an actual vessel, Fuel Oil Consumption (FOC) greatly improved, with a decrease of 2.8% compared to before equipping the ECO-Cap.

ULTIMATE RUDDER BULB

ENERGY SAVING DEVICE

FOC Improvement 3~6%

ESD ENERGY SAVING DEVICES

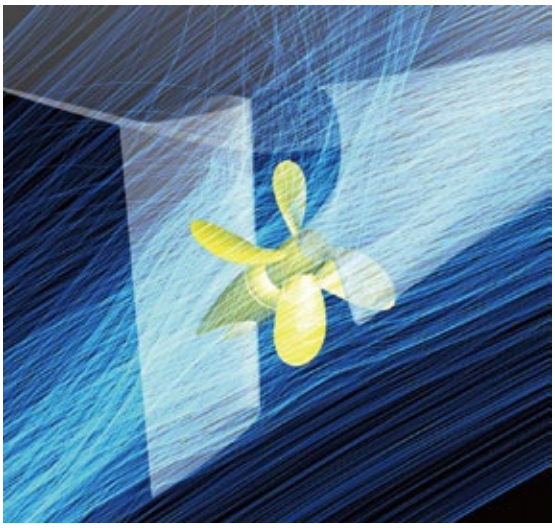
Design

The Rudder bulb closest to the propeller plane

The three factors improving efficiency using rudder bulbs are:

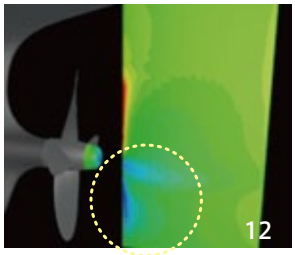
1) Reduced hub vortex
2) Increased wake gain
3) Optimized interference between propeller and rudder

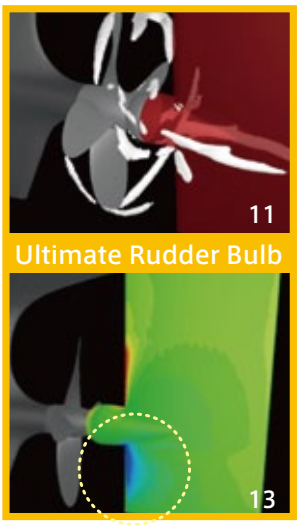
Generally, a rudder positioned closer to the propeller is considered more efficient. By having a rounded propeller cap mounted on the propeller, the bulb is able to be arranged as close as possible to the propeller (Figure 9).



CFD Analysis

Recovering energy loss, 6% efficiency improvement





Using a normal rudder (Figure 8), a strong hub vortex is produced from the propeller cap toward the port side of the rudder, causing energy loss (Figure 10). A strong hub vortex hitting the rudder reduces the negative pressure against the rudder, while also increasing rudder resistance (Figure 12).

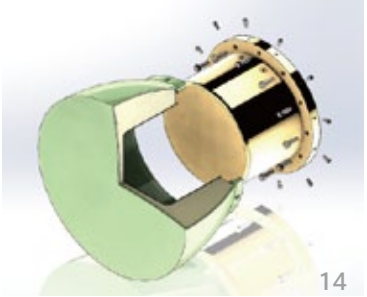
On the other hand, the Ultimate Rudder is able to recover the vortex using the bulb head (Figure 11). This brings an increase in negative pressure at the rudder's leading edge, leading to reduced rudder resistance (Figure 13).

From the above, it was theorized that hull efficiency may be improved through use of the Ultimate Rudder. From a self-propulsion test using a 208BC model vessel, more than 5-6% improvement in efficiency was confirmed. In addition, changing the rudder angle during the model test produced the same lift-drag ratio compared to using a rudder without the bulb, showing no adverse effects.

Maintenance

Easy replacement of new material bulb head

The Ultimate Rudder is designed for an FRP material bulb head to be attached to the copper nut cover. The bulb head can be easily removed & reinstalled onto the nut cover by tightening several bolts, meaning it is also easy to perform maintenance. (Figure 14) The inside of the bulb head is filled with urethane, making grease injection unnecessary.



NEIGHBOR DUCT

ENERGY SAVING DEVICE

4~7 % Improve FOC

ESD ENERGY SAVING DEVICES

Design

Neighbor Duct generates the thrust by utilizing the flow along the hull side (Fig.1), and it decreases hull resistance.
Therefore it is new concept duct whose side part is in the shape of vertically long ellipse, and it can be mounted near stern.
In order to design the Neighbor duct, hull data and model test results (self propulsion test result with barehull, hull resistance, wake distribution, and so on) are necessary.

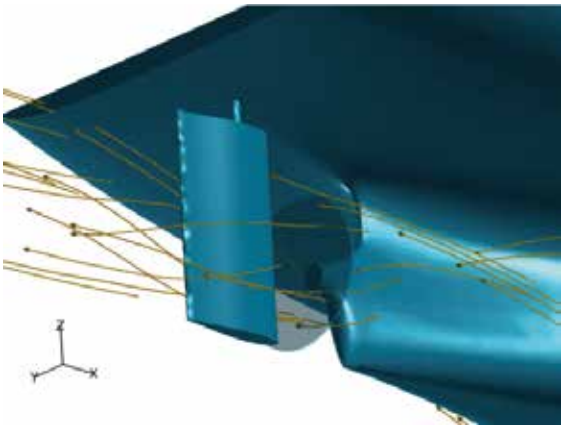


Fig.1 Side flow around the stern

CFD Analysis

The hull data, the streamlines of barehull are calculated by CFD as shown in Fig. 2 (left).
Next, width, attack angle and position etc... of duct are surveyed by CFD and Neighbor Duct is optimised as shown in Fig. 2 (right). Further by self propulsion analysis of CFD, variation of self propulsion factors, bilge vortex, and so on are confirmed by CFD, then the design of Neighbor Duct is finished.

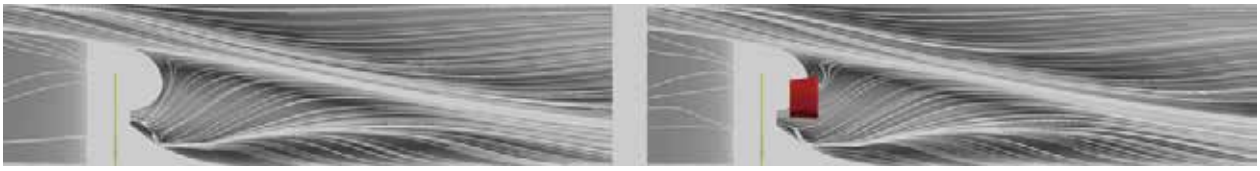


Fig.2 Streamlines by CFD analysis

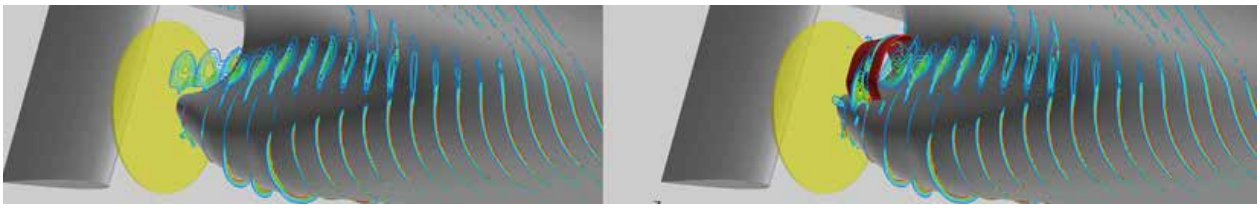


Fig.3 Confirmation of bilge vortex

Model test

4.7% fuel consumption reduction was confirmed at the self propulsion test which was carried out with the hull model for 82BC in NMRI (Fig.4).
Especially, an effect of thrust deduction factor was improved and it verified that Neighbor Duct was effective for increase of thrust. <Patent pending>

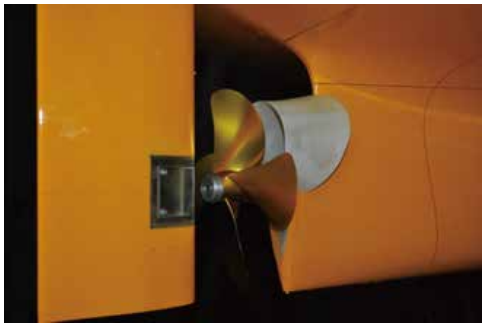


Fig.4 Neighbor Duct for model test

MONSTER PACKAGE

ENERGY SAVING DEVICES

8.7% Improve FOC

Combination

The concept of "Monster Package" is an aim to improve the propulsive efficiency by the combination of ECO-Cap, Ultimate Rudder Bulb, and Neighbor Duct.
Because the ways to cover the energy loss by our energy saving devices are different each other, it is verified that energy saving can be effective even with the combination by CFD analysis (Fig.3).
The fuel consumptiion reduction by each energy saving devices were confirmed at self propulsion test in NMRI, ECO-Cap is 2.9%, Ultimate Rudder Bulb is 3.9%, Neighbor Duct is 4.7%, the combination of ECO-Cap and Neighbor Duct is 6.2%, and the combination of Ultimate Rudder Bulb and Neighbor Duct is 8.7%.

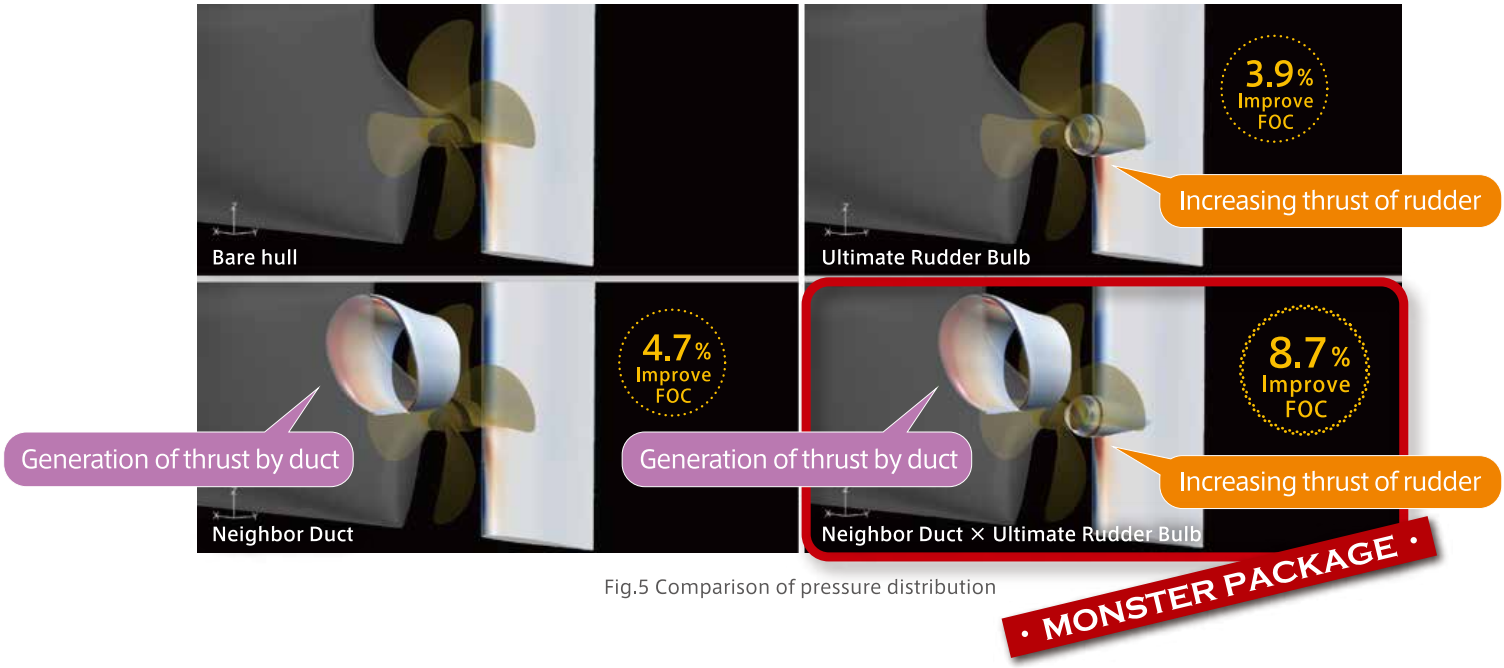


Fig.5 Comparison of pressure distribution

COMPOSITE STATOR

ENERGY SAVING DEVICE

4~5% Improve FOC

Collaboration

Composite stator was developed with FLUID TECHNO Co., Ltd. and it is made of GFRP.
The profile of Composite Stator can be optimmized as the section and attack angle are changed by utilizing characteristic of GFRP material (Fig.6).
The stator can be easily mounted to hull body with the boots made of steel. <Joint patent pending>

Fig.6 Construction and actual equipping of Composite Stator

TRANSVERSE THRUSTER NT

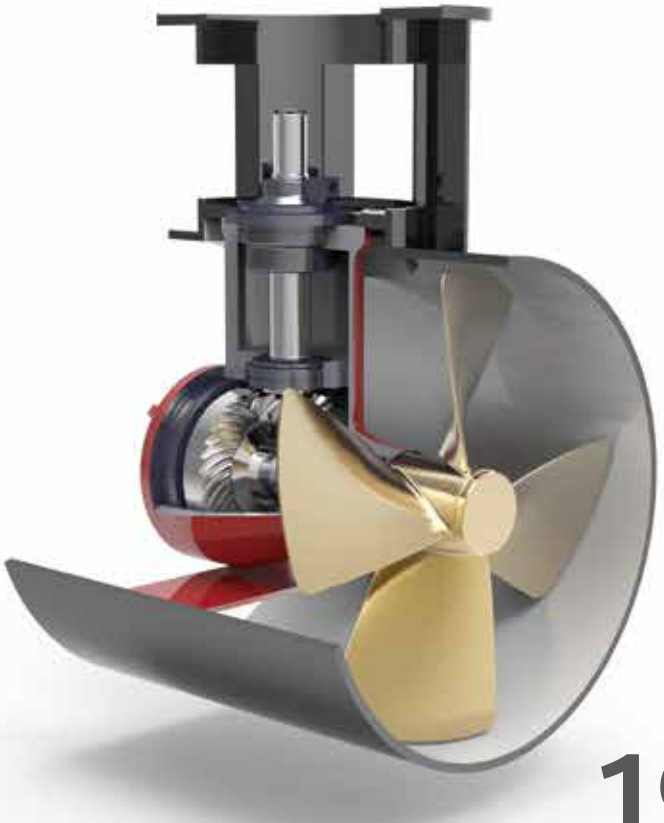
MODEL NT-C

Controllable pitch propeller

Propeller Dia. 700mm ~ 3,150mm
Input Power 60kW ~ 3,800kW

Thruster Model	Input Power (kW)
TC-70N	115
NT-C010	285
NT-C020	385
NT-C030	520
NT-C040	670
NT-C050	830
NT-C060	1,005
NT-C070	1,250
NT-C080	1,500
NT-C090	1,800
NT-C100	2,150
NT-C110	2,500
NT-C120	3,000
NT-C130	3,800

14 sizes



MODEL NT-F

Fixed pitch propeller

Propeller Dia. 295mm ~ 3,150mm
Input Power 10kW ~ 3,800kW

Thruster Model	Input Power (kW)
TFN-15S	27
TFN-25S	45
TFN-50S	57
TFN-75S	83
NT-F005	140
NT-F007	215
NT-F010	285
NT-F020	365
NT-F030	520
NT-F040	670
NT-F050	830
NT-F060	1,005
NT-F070	1,250
NT-F080	1,500
NT-F090	1,800
NT-F100	2,150
NT-F110	2,500
NT-F120	3,000
NT-F130	3,800

19 sizes

This table shows the input power at the case for auxiliary use (limited, intermittent driving). For applications requiring classification, continuous driving, DP system, or other special specifications, please contact us for more information.

※1 NT thruster not available in all sizes. Conventional model available in those cases.
※2 Specifications are subject to change without notice.

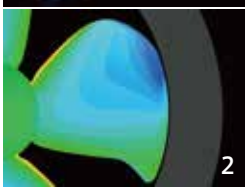
Excellent performance

Nominal Thrust Approx. 20% up

Realizing the full power of a thruster through improved performance

NAKASHIMA has investigated the cavitation performance of transverse thrusters by CFD (Computational Fluid Dynamics). Drawing from our extensive knowledge of propeller design and hydrodynamics, we developed superior blade shapes for both our CPP and fixed pitch thrusters.
As a result of this effort, we have created a compact and powerful thruster with nominal thrust about 20% greater than our previous products.
Thruster compactness has several benefits. It allows a ship designer to place the thruster further forward, increasing turning moment and therefore ship maneuverability. Furthermore, its smaller opening reduces hull resistance.


1


2

Reliability & Robustness

Over 6000 units

Contributing to safe navigation with reliable equipment

NAKASHIMA started manufacturing thrusters in 1976. Since then, we have delivered over 6,000 units. Utilizing the knowledge gained from our delivery record, we have developed highly reliable thrusters.
The owner/operator of our new thrusters can be assured that the thruster system, including controls, provides reliable long term service with proper maintenance.

- Both our fixed and controllable pitch thrusters consist of simple and robust structure. The thruster unit can be removed from hull easily, for on-shore inspection and maintenance.
- The thruster propeller shaft seal utilizes the same shaft sealing device as our main propulsion systems. The sealing ring can be replaced in the afloat condition by bonding. (Fig. 3) (with the exception of our small unit)
- Environmentally acceptable lubricants (EAL) requested by the United States Environmental Protection Agency' s (EPA) Vessel General Permit (VGP) can be used in our thrusters. They use same oil for lubrication and blade pitch control, allowing for easier oil management.
- For the controllable pitch type, the high performance filter and air dryer are installed in the header tank as standard. The combined use oil for lubrication and blade pitch control maintains oil cleanness. (Fig. 4)
- For the controllable pitch type, we use a liquid crystal touch panel for the remote control device, which helps to efficiently manage large amounts of information. The operator can assess the whole thruster system condition from the console in the bridge, contributing to safe navigation. (Fig. 5)
- We have service agencies in Asia, the Middle East, Europe, Africa, North America, and South America. Our worldwide service network can provide all necessary maintenance work.


3


4

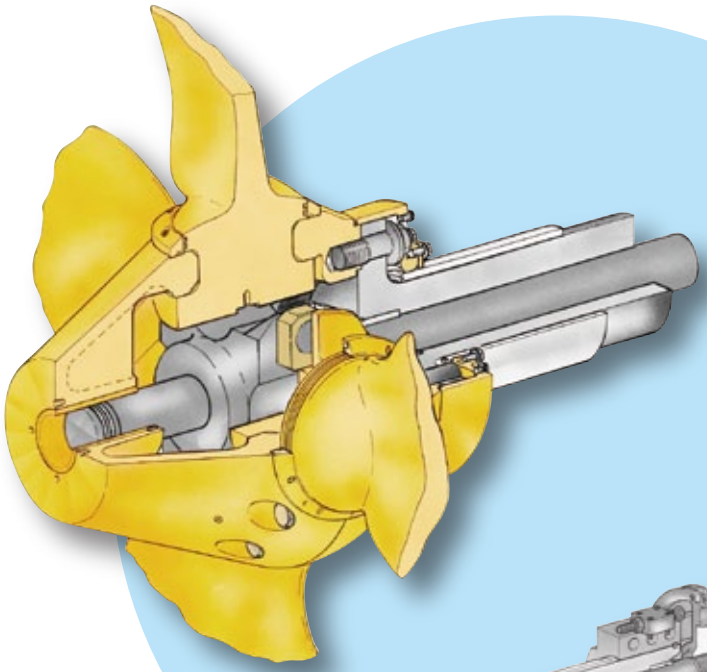

5

Optimal solution

"Optimal" solution for every request

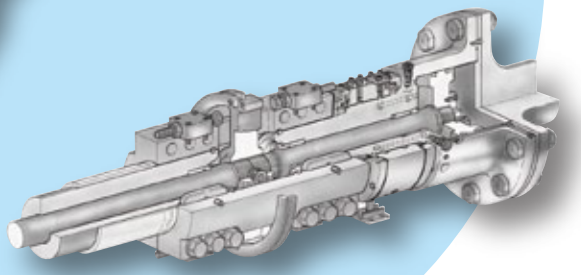
At NAKASHIMA, we take the time to evaluate each individual application. For research ships, minimizing noise and vibration is extremely important and reducing propeller cavitation in the thruster is critical.
For this case, we utilized our hydrodynamics technology and experts to develop a special blade profile designed to reduce underwater noise. (Fig. 6)


6



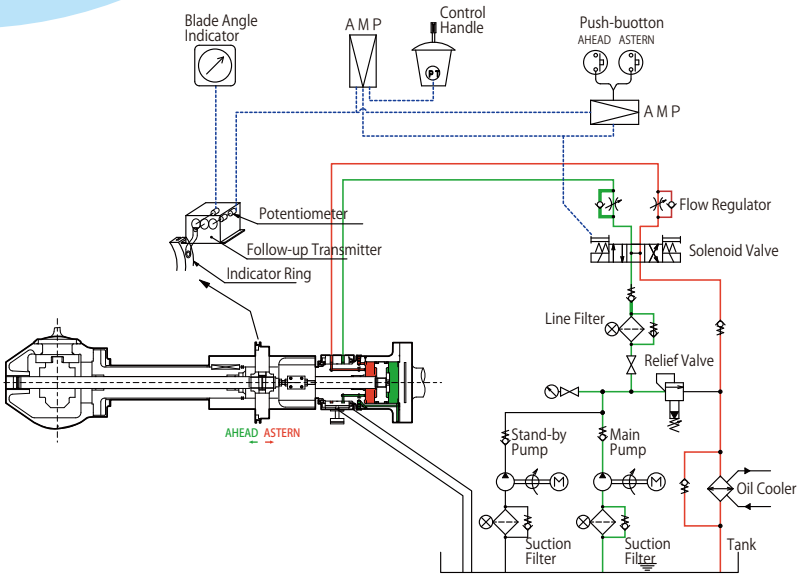
MODEL XS

This model is mainly used in small- to mid-sized vessels. A hydraulic cylinder for controlling the blade angle is installed in the cylinder shaft inside the vessel. The force generated by the hydraulic cylinder is transmitted to the propeller hub via a push/pull rod, in order to adjust the blade angle. This simple structure reduces maintenance costs. The inside of the hub is lubricated with grease to prevent oil leaks, eliminating concerns over environmental pollution.



CPP

HYDRAULIC POWER UNIT

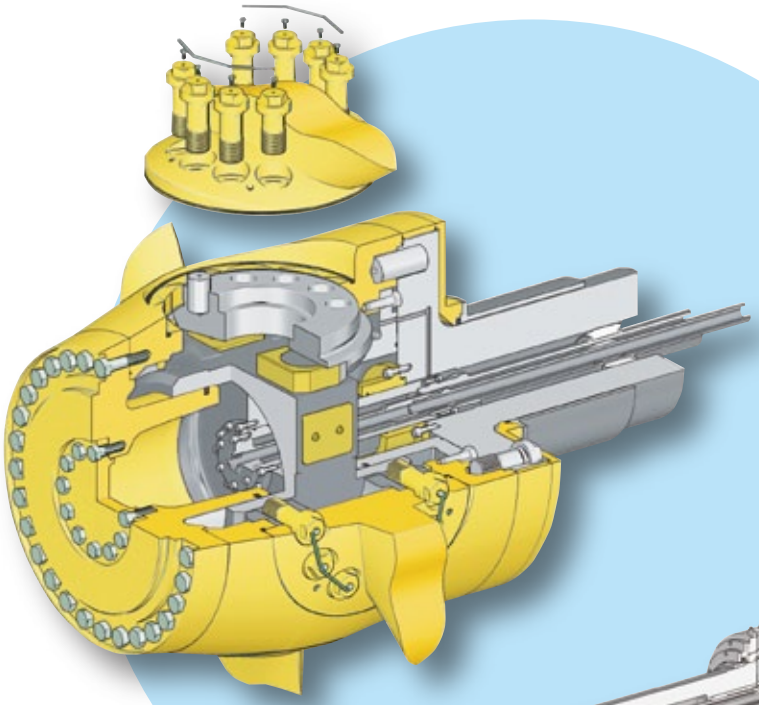


CONTROLLABLE PITCH PROPELLER

The controllable blade angle enables the vessel to move forward or backward and stop more easily. When used in combination with a side thruster, controllable pitch propellers are highly practical when vessel speed needs to be changed frequently, for example when entering or leaving port, leaving shore, or docking. In case of an emergency stop, this type of propeller can immediately respond by going from full forward to full reverse.
Since the blade angle can be adjusted, vessel speed can be freely adjusted, with the engine running at the most efficient load. Use of a controllable pitch propeller can reduce both fuel consumption and NOx emissions.

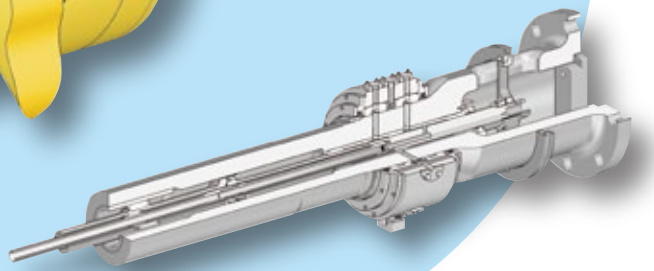
RECORD

Tankers, Ferries, Tugboats, Fishing vessels, Work vessels



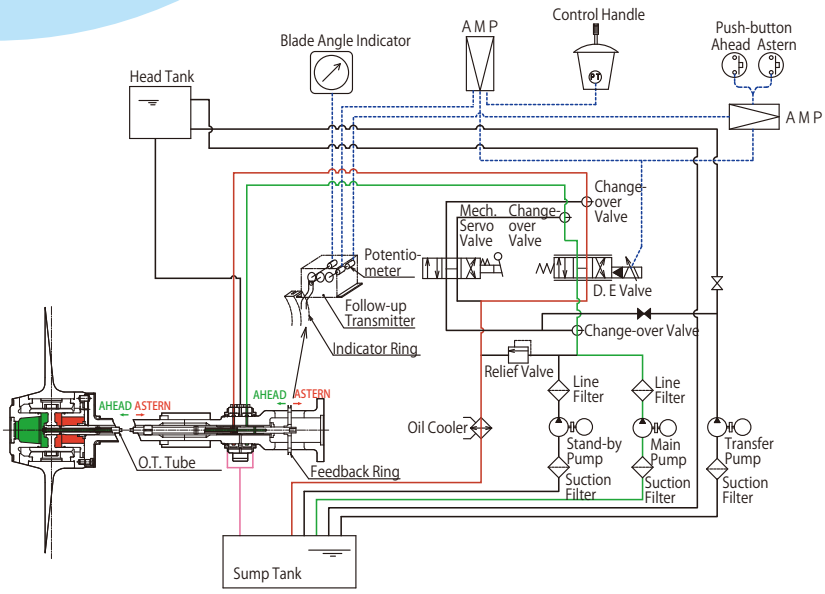
MODEL XL

This model is mainly used in large-sized vessels. A hydraulic cylinder for controlling the blade angle is installed in the propeller hub, outside the vessel. As the blade angle can be adjusted using the hydraulic cylinder installed inside the propeller hub, the blade angle can be accurately controlled. Moreover, since the flow direction control valve functions to control the blade angle, fine and smooth adjustment of the blade angle is possible, eliminating inching movement, even when a slow blade angle movement is specified by a timer program or other means.



CPP

HYDRAULIC POWER UNIT



Model **XS** / Model **XL**

FEATURES

1. Enables efficient utilization of main engine output and reduction of fuel consumption.
2. Efficient operation, high stopping performance, and reduced time spent leaving shore or docking due to continuous movement from full forward to full reverse.
3. Reduced fuel consumption by operating at optimal efficiency, where propulsion efficiency, fuel consumption of the main engine, and other factors are comprehensively considered.
4. Enables required vessel speed or thrust force to be achieved, even on vessels where load conditions vary greatly, such as trawlers and towing vessels.
5. Avoids over-torque of main engine by reducing the propeller pitch angle during operations in rough weather compared to regular operation.

NAKASHIMA PROPELLER

www.nakashima.co.jp/eng/

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