

Matching the requirements Voith propulsion technology for offshore applications





Voith technology for offshore applications

The open sea – a valuable source of energy and, at the same time, an unpredictable force that can only be mastered safely and efficiently with the best technology. This calls for an effective bridge – robust vessels fitted with innovative Voith propulsion systems.

Best Dynamic Positioning (DP) performance – holding station was never easier

With the Voith Schneider Propeller (VSP) and the Voith Inline Thruster (VIT), your vessels can hold station in the required position even in high seas, severe gusts of wind and strong currents.

Reduced fuel consumption – resource friendly

By responding immediately and with pinpoint accuracy to wind, waves and currents, the VSP consumes considerably less power during dynamic positioning. Thanks to their high efficiency, VSP and VIT need significantly less fuel than comparable propulsion systems while under way or when holding position.

Increased comfort

Vessels propelled by VSPs offer more comfort to those aboard, as our Voith Roll Stabilization (VRS) system can reduce the risk of seasickness, and the Voith Inline Thruster keeps noise and vibration to a minimum.

Downtime reduction – more operating days

Where other ships have to stay in port, vessels fitted with VSPs can remain at sea without interrupting their schedules. The VSP's unique power adjustment capability and the Voith Roll Stabilization system simply gives you more operating days per year.

Great productivity in all conditions

VSP-equipped vessels can make connections to offshore constructions faster, that means you can perform more transfers and vessel operations within the allotted time frames.

Effective, innovative offshore solutions

Since 2007, more than 50 Voith propellers have been fitted to vessels now operating successfully in the challenging offshore market – worldwide.

Voith Schneider Propeller (VSP)

An ever-growing number of operators are benefiting from the use of Voith Schneider Propellers on their offshore vessels. Their ability to perform operations in adverse sea conditions has been proven over decades: when other vessels have been unable to approach, or have even had to turn back, the VSP-propelled vessels complete their tasks safely. To keep vessel and crew safe while operating in harsh sea conditions, vessels need to hold their position and provide a stable platform for the crew to work on. The VSP, with its unique Voith Roll Stabilization feature, combined with Dynamic Positioning (DP) control offers unrivalled results. To work safely and efficiently, both captain and crew need the confidence that the vessel is going to behave predictably and reliably regardless the conditions – and the Voith Schneider

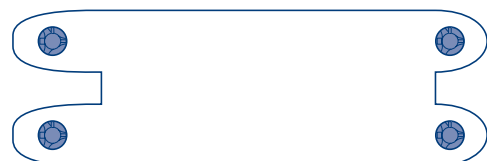
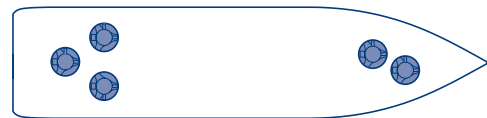
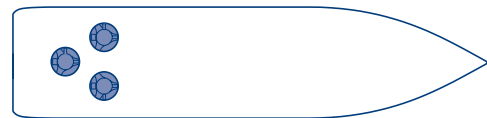
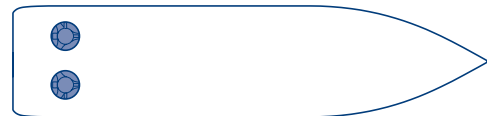
Propeller plays a central role in ensuring this. Voith has developed an effective solution for offshore vessels, and the superior qualities of the VSP have proven their worth for years now on many vessels across the globe. Voith engineers have a wealth of experience and are happy to assist at the design stage of any project, right through to commissioning. As a global company, Voith offers a full support network staffed by employees and trusted partners across the world.

The VSP is available in a range of power options up to 4.0 MW for diesel, electric and hybrid propulsion systems. The units are approved by all major classification societies and are available for use in iced-over conditions.

Possible VSP arrangements

Voith Schneider Propellers can be incorporated easily into any vessel design. Power rating and installation point can be chosen from a wide range of options to provide optimum results.

- 1 The conventional arrangement of two VSPs has been used on platform supply vessels (PSVs), offshore construction vessels (OCVs), service operation vessels (SOVs) and some research craft. This is an excellent solution for power demands of up to 8 MW.
- 2 Triple-VSP configurations have been installed on larger craft, e.g. on wind turbine installation vessels (WTIVs). Each prop can interact as part of the Voith Roll Stabilization system, thus creating a safe, stable working environment aboard.
- 3 For even higher power requirements, multiple VSP installations are possible. VSPs can be arranged at the stern of the vessel as well at the bow. Such vessels offer excellent station keeping performance in compliance with DP3 requirements.
- 4 For the very highest DP performance, a twin-hull design can be fitted with four VSPs (one at each corner). Such catamarans offer a broad working platform and superior station keeping.



Voith Inline Thruster (VIT)

The VIT significantly improves vessel comfort and delivers extra thrust when it is needed. The VIT is an excellent choice for dynamic positioning (DP) or maneuvering in port.

General specifications

The Voith Inline Thruster is driven by an integrated permanent magnetic (PM) synchronous ring motor. The PM motor is cooled by the surrounding seawater, obviating any need for extra cooling equipment.

The motor windings are housed in the stator, and the permanent magnets are housed in the rotor. The rotor is supported by oil-lubricated bearings for radial and axial loads. The bronze propeller blades are directly connected to the inner ring of the rotor, eliminating the need for a central gearbox. The direction and speed of rotation are controlled by frequency converters. The design meets the requirements for continuous dynamic positioning.

Bearing system

The VIT used in offshore applications has a central roller-bearing system featuring a proven design. The bearings are equipped with a non-leak, redundant sealing system.

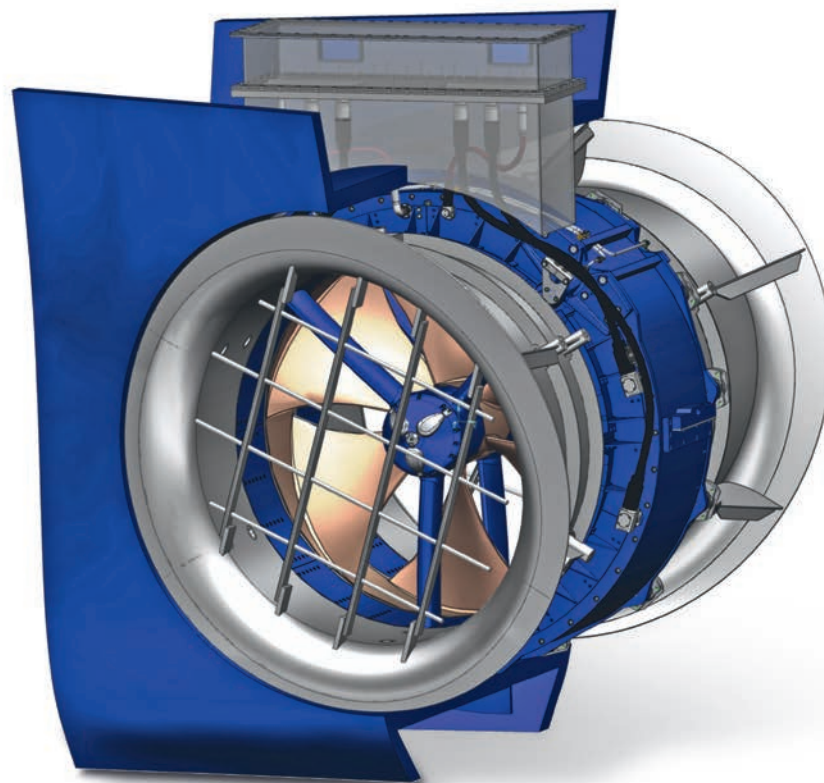
Blades

The propeller's fixed-pitch thrust blades are made of bronze and are highly resistant to cavitation, making them suitable for ice-class vessels.

Green efficiency

VIT systems require no additional cooling. The synchronous PM motor is one of the most efficient electric motors available, making it an excellent choice for high-performance thrusters. The absence of an underwater gearbox further enhances efficiency. The VIT provides high thrust in both directions and the slimline design also occupies less hull space. Being lighter than conventional systems, the VIT design allows slim waterlines, resulting in less fuel consumption. Overall, this is a very environmentally-friendly system to have aboard.

VIT tunnel thruster assembly



Reduced noise and vibration

The unique design of the VIT produces significantly less noise and vibration. With conventional thrusters there are three key reasons for noise:

- 1) Propeller tip clearance, i.e. the distance between the inner tunnel in the hull and the tip of the blades rotating within it
- 2) Shaft-induced cavitation due to the underwater gearbox
- 3) Vertical transmission of cavitation noise and vibrations into the vessel

The VIT design avoids all three of these issues, greatly reducing both noise and vibration. It is even possible to have accommodation areas close to the thrusters without having to worry about insulation.

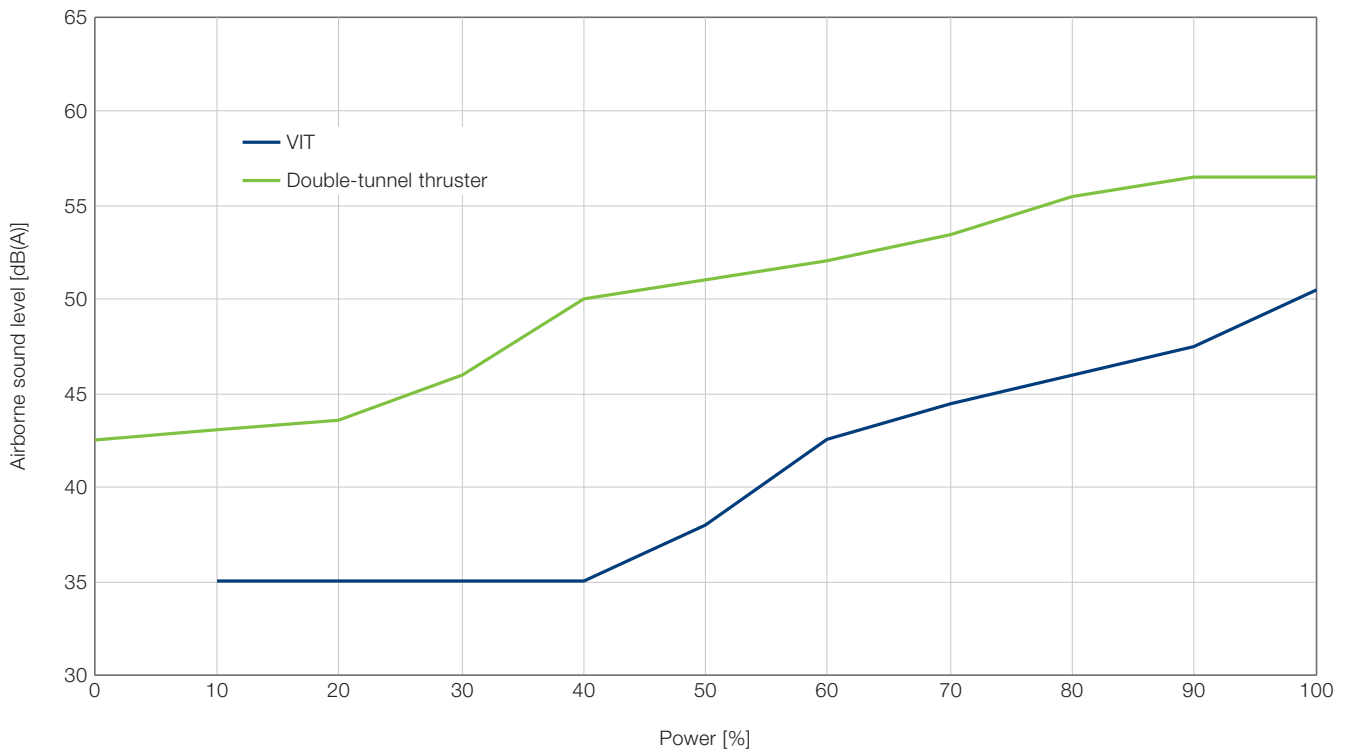
Performance

The fast, powerful performance of our thrusters is legendary. PM engines deliver high torque – even at low revs – and high acceleration combined with instant thrust enhances vessel maneuverability. VIT thrust is the same in both directions. The VIT is a great help in delivering outstanding DP performance.

Turnkey system

Voith supplies the full system including the thruster tunnel, grids, flow parts and electronics for power supply and control. As a one-stop system supplier, we are your single point of contact.

Noise difference: VIT vs mechanical thrusters



Source: Lloyd's Register Report 13.3720: Noise and vibration measurements

The benefits to you

The Voith Schneider Propeller (VSP) creates both propulsion and steering forces, allowing the magnitude and direction of thrust to be adjusted quickly and precisely. Its accuracy and speed of response deliver superb Dynamic Positioning (DP) performance while keeping fuel consumption to a minimum. Under way or while holding station, the VSP also provides active roll stabilization by making rapid thrust variations to

improve seakeeping and ensure the vessel is able to operate safely around offshore installations in conditions which force other craft to stay in port. The VSP's design principles make it outstandingly robust in coping with debris and ice. Only the blades protrude from the hull, with all other parts located safely inside the vessel. Long maintenance intervals and high reliability keep operating costs as low as possible.



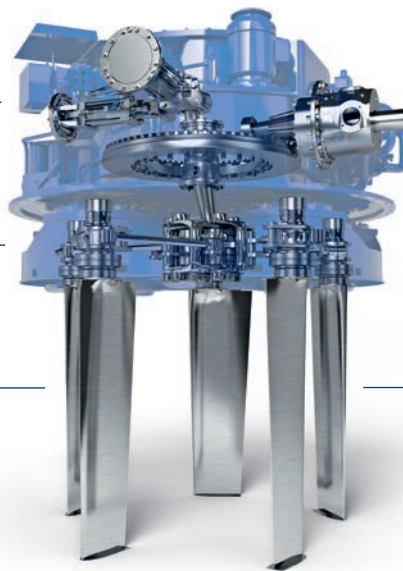
Safe and precise maneuvering



Fast response time



Voith Roll Stabilization (VRS)



High reliability and low maintenance requirements



Low fuel consumption



Maximum safety for the crew, vessel and the environment

The initial idea was to develop a propulsion system with minimum vibration and noise emissions. The result is a rim-driven propeller powered by a permanent-magnetic electric motor without the need for an axle, shaft or gearing. Voith Inline Thrusters (VIT) impress users with their prompt steering capabilities and can be retrofitted as thrusters or even as propulsion systems.

This fascinating technology lends itself to a wide range of applications. Voith Inline Thrusters are most commonly used as bow and/or stern thrusters.



Low noise, low vibration



The unit is seawater-cooled, thus requiring no additional cooling system



Propellers made from hard-wearing bronze



High torque with no transmission losses



Maintenance-free motor



Flexible installation positioning due to modest size

Dynamic Positioning (DP) with Voith Schneider Propellers

For modern offshore vessels, good Dynamic Positioning performance is a standard requirement. This allows operations at offshore structures, such as wind turbines or oil rigs. The DP performance is the result of how fast and accurate the propulsion systems can counteract environmental conditions, including wind, current and/or waves. The most common practice is to validate the vessel performance and to compare different vessels by a static DP plot.

A more realistic picture of a vessel's dynamic positioning performance is the dynamic DP plot, which considers the vessel motions, the dynamic environmental conditions and the reactivity of the propulsion system.

The graph below shows the difference of static and DP behavior of a wind farm service vessel with VSP.

The VSP offers huge advantages when it comes to DP operations. The fast and extremely precise thrust allocation in all directions is the main reason for outstanding performance. When the vessel starts to move away from its position, the VSP can react immediately and brings the vessel back into the requested position.

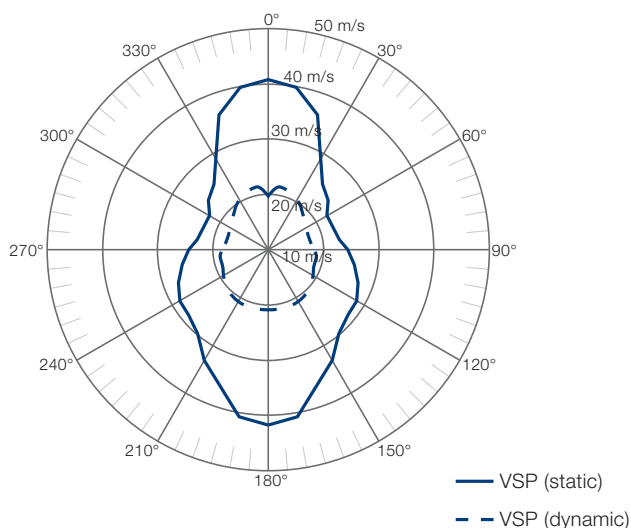
Other propulsion systems can't react as fast as the VSP can. Therefore, vessels without VSP will reach their limits at less demanding conditions.

The picture below shows the difference of a VSP driven vessel versus a vessel with rudder propellers at the same input power conditions.

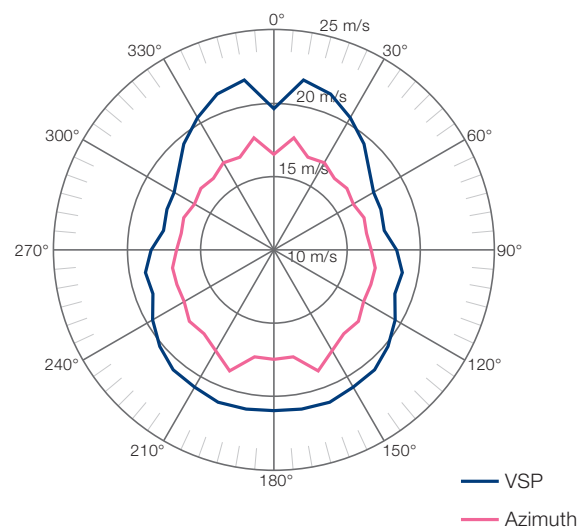
A more accurate positioning is also helpful for personnel transfer and crane or helicopter operations.

When the vessel is able to work at higher seastate or in high wind conditions, it remains in full operation longer, which is a huge benefit for operators.

Comparison of static and dynamic DP plots



Comparison of dynamic DP plots





1 OCV NORTH SEA GIANT turning on the spot

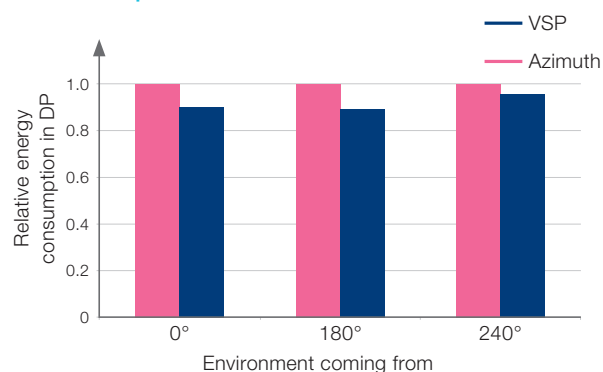
2 ASV EDDA FIDES staying in DP at an oil rig

Fuel consumption @ DP

The ability of the VSP to react faster than azimuth systems leads to lower fuel consumption. When using the VSP there is no need to counteract with the propellers when no or only low amount of thrust is requested.

This all leads to cost savings and has a positive effect on the environmental footprint of the vessel.

Fuel consumption



Sleep mode @ DP

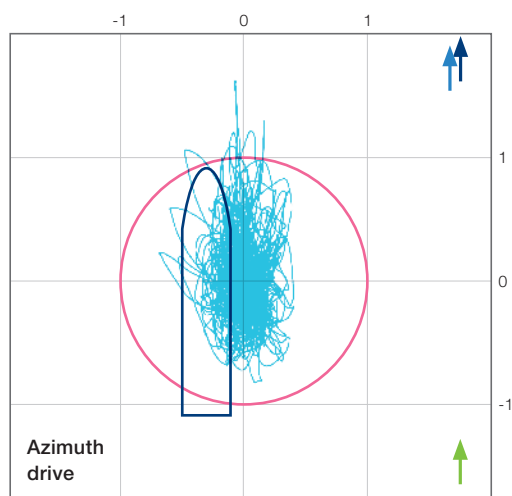
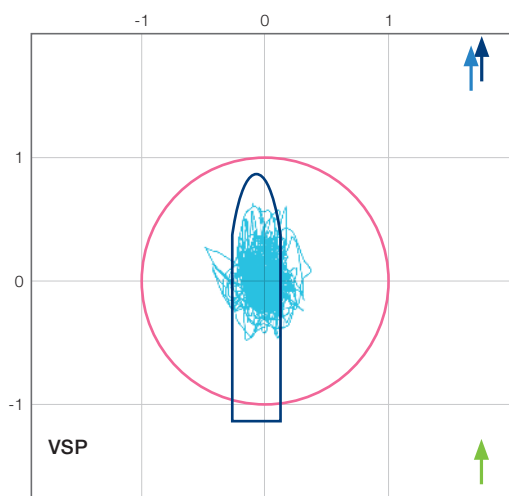
The sleep mode is a unique feature of the VSP. When operating at smooth environmental conditions or when higher position deviations are allowed, it is possible to select the sleep mode.

The VSP is able to generate thrust in all directions from zero to maximum strength. Due to the fast and omnidirectional thrust generation of the VSP it is possible to operate at DP with only one active propeller.

The “sleeping” unit is in stand-by conditions and, if necessary it is immediately available. The active propeller with higher load operates at a higher efficiency level compared to two propellers at low load. This effect leads to lower fuel consumption.

Additionally, the sleep mode saves operational hours of the drive lines and, with that, it has a positive effect on the maintenance and operational costs.

Results from a simulator study for a wind farm service vessel with different propulsion arrangements for identical wind, weather and wave conditions clearly shows the difference in DP accuracy.





Fingertip control – even the largest offshore vessels can be controlled by touch screens and joysticks.

Control systems

Voith supplies an electronic control system perfectly matched to the propulsion system. For Voith Schneider Propellers and Voith Inline Thrusters, we offer an electronic control system with a modular hardware and software architecture allowing us to mix-and-match numerous helpful control features. Fast response and precise control (using controls designed by real-life professionals), and remote diagnostics via Internet are just some of the great benefits this control system offers.

Control position on Edda Fram



Voith Roll Stabilization (VRS)

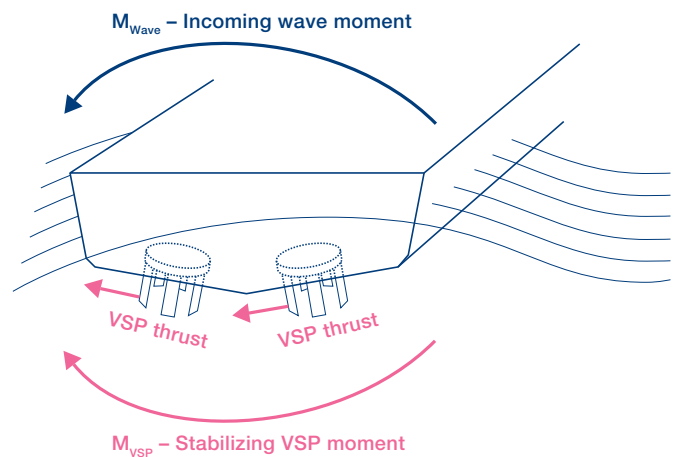
The Voith Schneider Propeller generates both propulsion and steering forces. The thrust can quickly be adjusted in terms of magnitude and direction. This rapid thrust variation and generation of high moments facilitates the use of the VSP for effective reduction of the ship's rolling motion.

When the vessel encounters an incoming wave, sensors measure the angular acceleration and the system immediately calculates, then applies the restoring force to counteract the rolling motion of the vessel. Bridge personnel can preselect the power range to be applied to roll stabilization.

This unique way of stabilization works at zero speed, being under Dynamic Positioning or while sailing. As the feature of roll stabilization is incorporated into the propeller, it requires no additional equipment. Roll stabilizing tanks are no longer required and thus no reduction of payload has to be encountered.

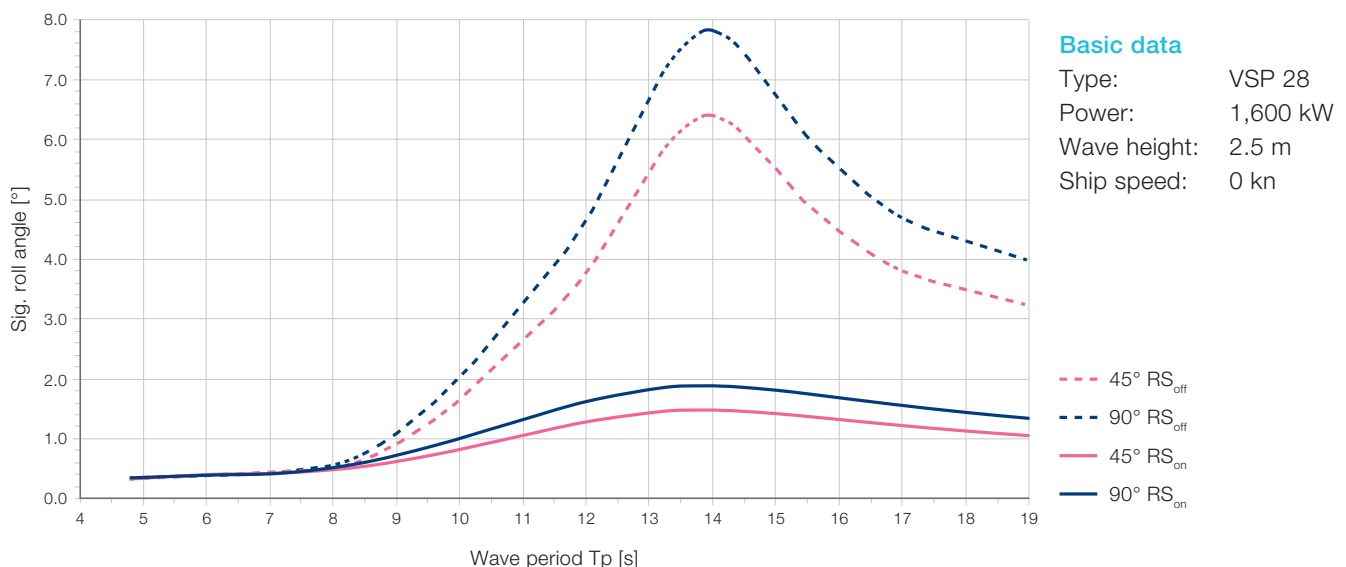
While aboard numerous offshore vessels during harsh weather conditions, the VRS has shown its superior operational capability. Depending on the vessel dimensions, a high level of reduction of roll angles has been achieved, all in accordance to the predictions in early design stage.

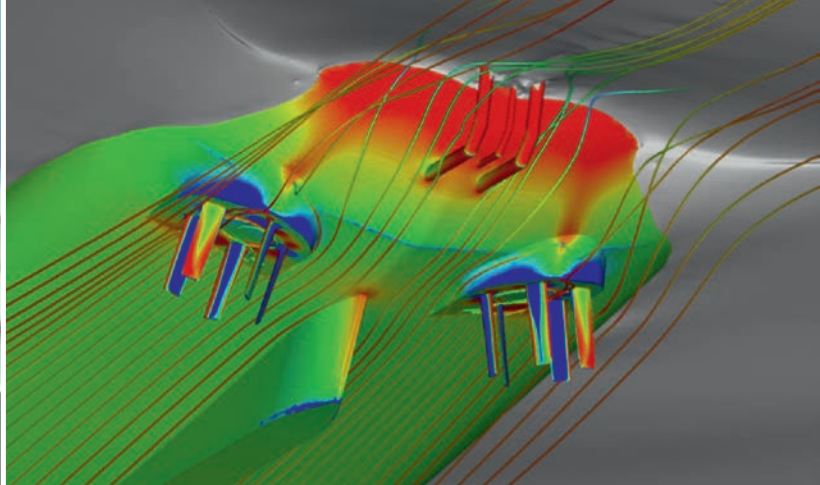
Moments and forces during ship's rolling



Extending the operational window with VRS generates additional income for the ship owner by making it available on more working days as VRS facilitates safe offshore support operations in severe weather conditions. It also increases the comfort of the crew as their demanding jobs require health and well-being. Additionally, the safety of cargo, ship and crew is enhanced.

Typical result of achievable roll reduction for a wind park service vessel in the North Sea





Voith project support

As well as building propulsion systems, we also provide comprehensive support when it comes to developing new vessel designs and solving complex technical issues. Using a wide range of computational fluid dynamic (CFD) calculations, simulator studies and finite element analysis, we can forecast vessel behavior reliably and give you peace of mind when committing to a major investment. We also conduct model evaluations in our own test tank and at well-known international research institutes, and regularly perform large-scale measurements to exacting levels of quality.

What makes Voith customer support unique is our comprehensive mix of great tools, skilled engineers, a can-do attitude, and powerful hardware and software coupled with decades of experience. We don't just focus on props, we have the entire vessel in mind and are experts in performing all the calculations, simulations and measurements required.

- Simulator studies and simulator training
- Nautical training
- Technical training
- Model tests in own test tank
- Assistance with model tests
- CFD studies
- Basic layouts of vessel designs, as generated arrangements, line plans, installation proposals
- Bollard pull and speed forecasting
- Escort force calculations
- Dynamic Positioning calculations

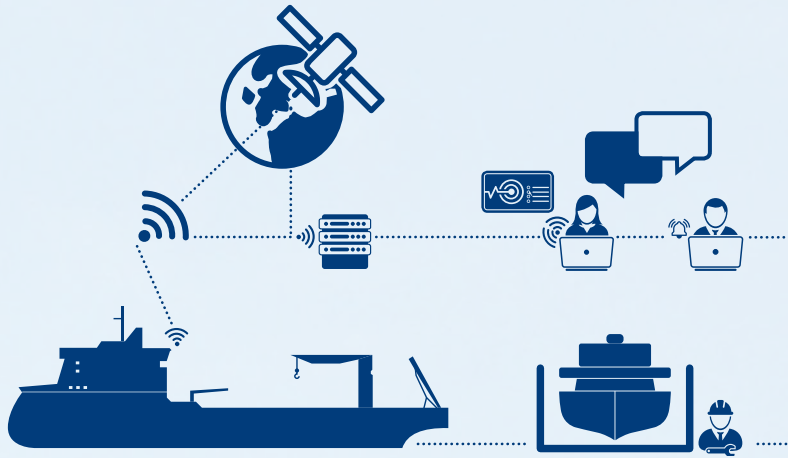
- 1 SOV Windermere
- 2 OCV Polar King
- 3 OCV Edda Flora
- 4 ISV Siem Moxie
- 5 WTIV Sea Installer

Reference installations all over the world



Remote access

Years of excellence: Voith propulsion systems are in service all over the world, and in a wide range of vessels. For each electronically controlled propulsion system, we have a perfectly matched remote access capability – meaning we can inspect and examine, irrespective of location, without the need to dispatch a service technician right away.





Our Service –
Part of
Your Business.

A lifetime partnership

We offer customized service packages covering the entire product lifecycle. With over 90 years of marine experience, Voith customers are in good hands – both before and after the purchase.

As well as innovative service solutions and product support, Voith offers personalized training courses to ensure your operating personnel receive the best training imaginable.

Our focus, throughout, is customer satisfaction, efficient operation of the Voith product, and short repair and maintenance times. Vessels equipped with Voith technology are in service all over the world. To ensure optimum service and minimize response time, we have established a global service network with experienced technicians providing support during installation, commissioning and during maintenance and upgrade work. Naturally, we ensure long-term availability of spare parts for all products.

Technical support

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