



**AZIMUTH
PROPULSION
FOR ARCTIC AND
ICE-GOING VESSELS**



Steerprop
The Azimuth Propulsion Company

THE AZIMUTH PROPULSION COMPANY

Steerprop Ltd. is the center of azimuth propulsion technology. The Steerprop team is composed of personnel whose experience stretches back to the 1970's and the earliest experiences with ice-going azimuth propulsion. Ice-going and arctic propulsors have always been important market segments and areas of expertise to the company's personnel.

Based on extensive expertise and experience, Steerprop Ltd. designs and produces azimuth propulsors of superior quality and efficiency. Steerprop Azimuth Propulsors are built using only proven technologies, enhanced by the latest innovative solutions and optimized using advanced design methods. This combination of proven reliability and modern efficiency enables Steerprop Ltd. to produce the reliability and efficiency that its clients deserve.

Reliability, efficiency and environmental friendliness are the very core philosophies of product development and Steerprop Ltd.'s business. In product development, these philosophies are demonstrated by the robust, mechanically simple design of Steerprop Azimuth Propulsor. This design is continually further enhanced with new innovative solutions and design methods to create the most efficient and reliable propulsors available. In line with this philosophy of constant improvement, Steerprop Ltd. is focused on constantly developing its operative processes to reflect these principles of reliability, efficiency and environmental friendliness even more.

Partially as a result of this focus on constant development and improvement, Steerprop Ltd.'s management processes have been certified according to the ISO 9001, ISO 14001 and OHSAS 18001 standards by Det Norske Veritas classification society.



AZIMUTH PROPULSION IN THE ARCTIC



The Arctic Icebreakers Varandey and Toboy by the Varandey Terminal in the Barents' Sea. Both icebreakers are equipped with Steerprop Azimuth Propulsors.

Azimuth propulsion is a solution second to none for arctic and ice-going vessels. The azimuth propulsors' ability to project thrust in any of the full 360 degrees provides vessels with azimuth propulsors with unrivalled maneuverability. This ability makes azimuth propulsors most potent tools for ice-management. Operators can utilize this vectored thrust to open and widen channels, blow ice ridges and free offshore installations from ice pressure.

This unrivalled maneuverability enables vessels with azimuth propulsors to maneuver freely in any direction even in icy conditions. This has created entirely new vessel concepts such as arctic oil and LNG carriers that utilize stern-first icebreaking in icy conditions and oblique vessels that are able to create wider channels in ice by breaking the ice with their lateral sides.

Azimuth propulsion is also provide additional layers of safety and convenience in ice-going conditions in such occurrences as ice-loads blocking ducted propellers. With conventional shaft lines clearing the ice load can be problematic and complicated, but azimuth propulsors can be used to clear each other with their slipstreams simply by rotating the propulsors. Certain types of propulsors, such as propulsors with open propellers or Push-Pull Contra-Rotating Propellers are even immune to ice-blocking.



The Azimuth Propulsion Company

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STEERPROP ARCTIC AZIMUTH PROPULSORS

Steerprop Arctic Azimuth Propulsors are built using proven technologies that are specifically chosen for their proven track-record of durability and reliability. These technologies are then enhanced with the latest innovative solutions and optimized with the latest calculation methods. Example of these solutions include pressure lubrication and cooling systems to eliminate the efficiency losses caused by oil whipping. Other examples are seal systems that utilize pressurized air to completely eliminate even the smallest oil leaks.

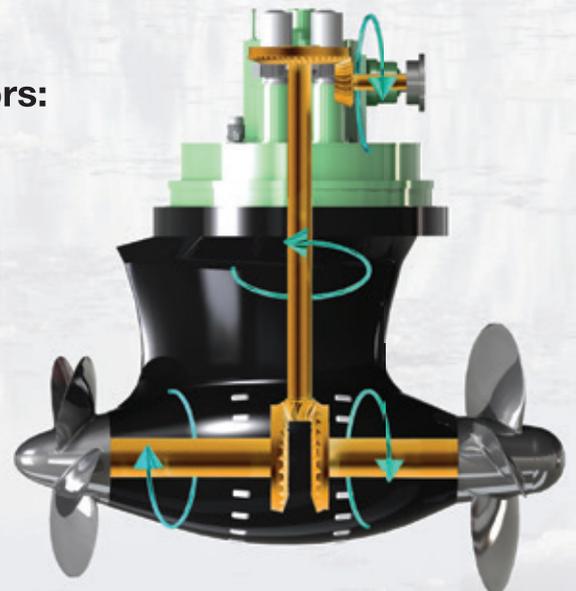
All Steerprop Azimuth Propulsors utilize rugged mechanical power transmission due to the many advantages of mechanical construction. With this technology, propulsive power from the vessel's prime mover motors is transmitted to the propeller shaft with robust right-angle mechanical gears. This configuration enables the prime mover motor to be specifically optimized to the needs of the individual vessel. The use of mechanical transmission also means that the propulsor has an even thermal gradient, which means that it can be built with more accurate tolerances for greater reliability. This also means that the azimuth propulsors require no external cooling systems other than their own lubrication systems.

Accurate electrical steering and modern advanced control systems have long been hallmarks of Steerprop Azimuth Propulsion systems. Electrical steering is extremely accurate and energy efficient as it uses power only when actively steering, unlike hydraulic steering systems that continually require power from the vessel - even when only keeping a steady course. Due to its accurate and quick steering, electrical steering systems are particularly suited to vessels that require pin-point accurate steering such as DP- or ice-management vessels.

The Steerprop Control System utilizes modern automation components and programming that enables the system to seamlessly interface with any known system - dynamic positioning, satellite control or similar. The newest revision of the control system also includes remote service systems that enables Steerprop Service to provide greater remote support to the vessel's crew.

Advantages of Steerprop Arctic Azimuth Propulsors:

- Sturdy, reliable construction
- Available in any ice-class
- Accurate electrical steering
- Advanced control system
- Zero emissions propeller shaft seals
- Compact propulsors and auxiliary equipment
- No external cooling systems required



FEATURES OF ARCTIC AZIMUTH PROPULSOR CONFIGURATIONS



SP CRP ECO ARC

- Contra-Rotating Propellers
- Available up to 25 MW
- Superior free running efficiency
- Improved ice-milling capabilities
- Superior ice-management



SP PULL ARC

- Pulling propeller
- Available up to 16 MW
- Free running efficiency
- Ice-milling capabilities



SP D ARC

- Ducted propeller
- Available up to 16 MW
- Enhanced bollard pull
- Improved ice-management



SP O ARC

- Pushing propeller
- Available up to 16 MW
- Traditional, proven solution
- Ice-management capabilities

STEERPROP ARCTIC REFERENCES



Varandey

Multi-Purpose Arctic Icebreaker

Classification:

Russian Maritime Register of Shipping
KMLL7[2]A1 Icebreaker Tug

Flag:

Russian Federation

Owner:

Lukoil Kaliningrad

Principal Dimensions:

LOA	100.0 m
Breath molded	21.7 m
Depth molded	13.3 m
Draft maximum	10.5 m
Deadweight	4 463 tons
GRT	7 338 tons

Performance:

15 knots in open water, 3 knots in 1.7 m ice
with 20 cm snow cover

Main Propulsion System:

Diesel-Electric	
Main generators	4 x 5 760 kW
Propulsion motors	2 x 8 400 kW

Built by:

Keppel Singmarine of Singapore

Azimuth Propulsors:

2 x SP O 4,5 ARC

Max power input 8 400 kW
Input speed range 0 .. 880 rpm

Propeller:

4,5 m diameter, 4-bladed detachable, stainless steel

Azimuth System:

4 x 45 kW frequency converter controlled electrical
motors with overload clutches

Azimuth Speed:

1.5 rpm

All information presented regarding the
SP O 4,5 ARC are specific to the Varandey only
and should be used only as reference.

The two 8,400 kW SP O 4,5 ARC azimuth propulsors installed on the
Varandey are the most powerful mechanical azimuth propulsors in the
world.



Credit: Arctech Helsinki Shipyard

Baltika

Oblique icebreaking oil recovery vessel

Classification:

Russian Maritime Register of Shipping
KM Icebreaker 6, Oil recovery ship

Flag:

Russian Federation

Owner:

The Directorate of State Customer for
Programs of Development of Sea Transport

Principal Dimensions:

LOA	76.4 m
Breath molded	20.5 m
Draught	6.3 m
Deadweight	1 150 tons
GRT	3 800 tons

Performance:

14 knots in open water,
3 knots in 1.0 m ice

Main Propulsion System:

Diesel-Electric	
Main generators	3 x 3 000 kW
Propulsion motors	3 x 2 500 kW

Built by:

Arctech Helsinki Shipyard Oy of Finland
Shipyard Yantar JSC of Russia

Azimuth Propulsors:

3 x SP 60 PULL

Max power input	2 500 kW
Input speed range	0 .. 950 rpm

Propeller:

3,0 m diameter, 4-bladed stainless steel

Azimuth System:

4 x 37 kW frequency converter controlled electrical
motors with overload clutches

Azimuth Speed:

1.5 rpm

All information presented regarding the
SP 60 PULL are specific to the Baltika only and
should be used only as reference.

The Baltika is the world's first oblique icebreaker. Steerprop Ltd. is proud to
be a part of the team that built and services the Baltika.