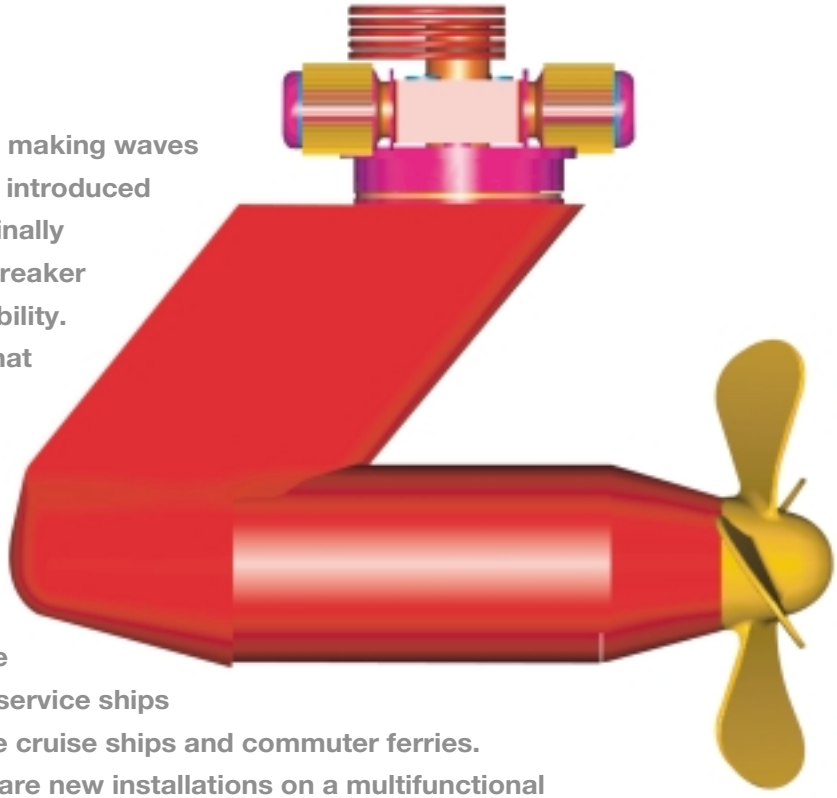
Compact Azipod®

Quality power and thrust for rigs and small ships

Perttu Tuomaala, Matti Turtiainen



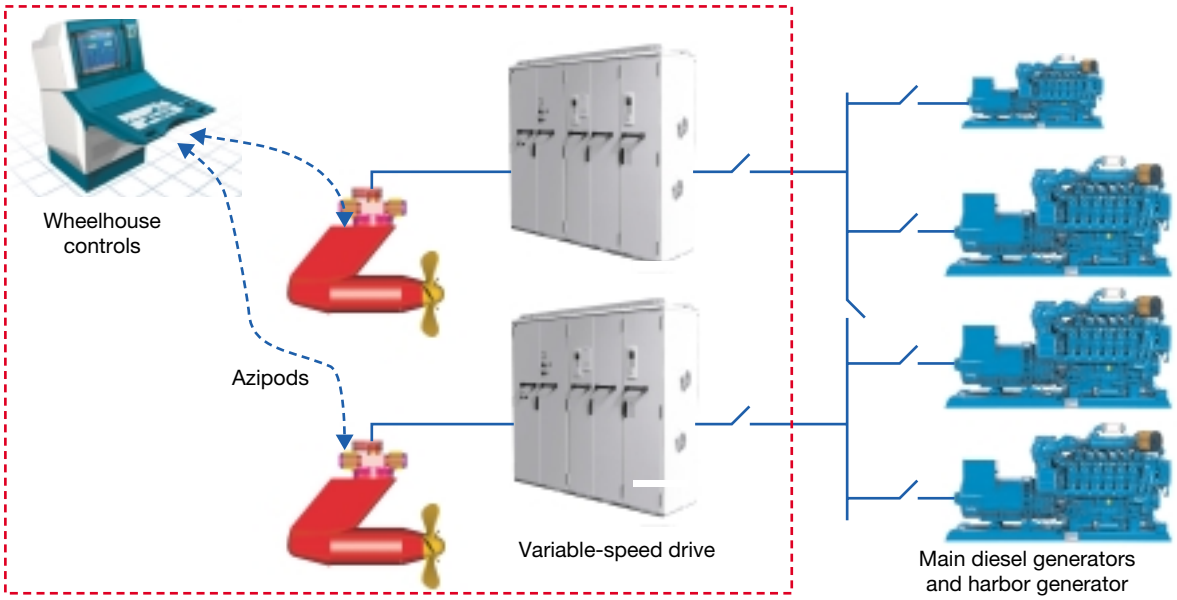
Podded electric propulsion has been making waves in the marine world ever since it was introduced in 1990. Dubbed Azipod®, it was originally conceived in Finland to improve icebreaker operations by increasing maneuverability. Providing this capability is a motor that sits inside a submerged pod which is freely steerable through 360°.

The latest addition to the family is Compact Azipod®, a version developed especially for rigs and small vessels. Azipod now covers the entire marine market, from offshore service ships through tankers and trawlers to large cruise ships and commuter ferries. Underscoring its growing popularity are new installations on a multifunctional supply vessel and naval survey vessels.

A ship's propulsion system is typically a massive arrangement consisting of prime mover (the diesel engine, gas turbine, etc), power transmission equipment (the shaftline with gearbox), steering and control systems, and, finally, the propeller. Most of the world's fleets use one or the other form of this so-called diesel-mechanical propulsion. With this arrangement, mechanical power is transmitted directly or via a gearbox from the shaft of the prime mover to the propeller. Normally, a long – and heavy – propeller shaft is needed.

An option often preferred by shipowners is electric propulsion. In this case, the power is transmitted from the prime mover to the propeller electrically, and neither gearboxes nor long shaftlines are needed. One of the benefits of electric propulsion is that prime movers may be run at the optimal speed of rotation all the time. This saves shipowners a lot of fuel and makes the propulsion system easier to control. In addition, noise and vibrations are reduced. Since there are no gearboxes and no long shaftlines, maintenance is significantly reduced.

1 Diesel-electric propulsion system with Compact Azipod® units



Azipod® (for Azimuthing Podded Drive) was developed to take advantage of all these characteristics and provide the kind of dynamic performance and maneuverability that today's marine market demands. The ultimate electric propulsion configuration, with Azipod units and variable-speed drives, is shown in 1.

What the market wants

Choosing the 'right' propulsion system for a ship is no easy matter. Ships' operators want a system that consumes as little fuel as possible and can be maintained easily, quickly and cheaply. At the same time, extremely good maneuverability is expected. And the various parts of the system should not take up too much room.

The shipyard has other priorities: Ideally, the propulsion system should allow flexible positioning of the diesel engines or other prime movers inside the ship's hull. A constraint for the propulsion system supplier, however, is the delivery time – often as little as three to four months for vessels in the lower power range.

Small in size, big in performance

ABB has developed a podded electric propulsion system precisely for this market. Called Compact Azipod®, it is small, modular and offers improved performance and steering capability. And ABB can deliver it to shipyards in just a few months. Power and thrust comes from a permanent magnet motor driven by ABB's proven water-cooled ACS 600 W converter. Also featured is ABB direct torque control (DTC) technology, which allows accurate control of both motor speed and torque without pulse encoder feedback from the motor shaft.

Compact Azipod units designed for a power range of 400 kW to 5 MW will meet constantly growing market demand for better maneuverability and operating economy. This new series combines the latest marine propulsion technology with standardized designs, making it attractive for a wide range of merchant and offshore vessels. Shipbuilders benefit from Compact Azipod's inherent modular flexibility, which provides new options for standardizing vessels' steel structures. The power transmission and steering module can be installed in the ship's hull at a convenient time during the ship's construction. Pre-assembled strut and motor modules allow delivery, installation and connection to the power and steering module at any time up until launching of the ship.



The reliability, availability and maintainability of Compact Azipod also has a positive effect on maintenance scheduling. The small number of different components, for example, reduces the size of operators' spare parts inventories and makes servicing easier.

First installations of Compact Azipod®

By July 2001, ABB had won contracts for the delivery of more than 20 Compact Azipods. Excellent performance and low system life-cycle costs have shown Compact Azipod to be the best alternative even for ships making extra-special demands on their propulsion systems. The following two examples of deliveries – one to the offshore world and one to the naval sector – illustrate this.

Multifunctional supply vessel

The very first units to be installed were two pods delivered to Søviknes Verft AS, a Norwegian company contracted to build a multifunctional platform and remotely operated vehicle (ROV) vessel 2 for Island Offshore in Ulsteinvik.

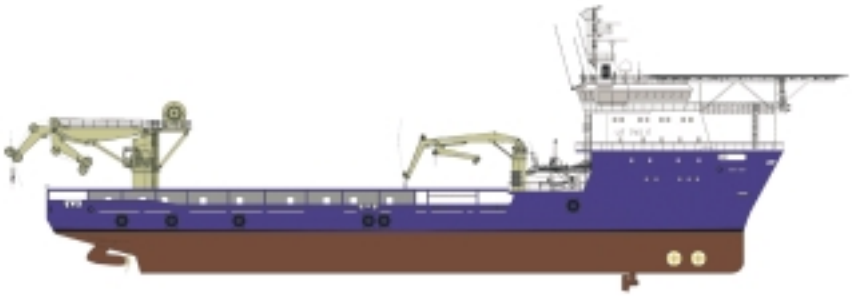
Søviknes Verft AS is a member of the Aker Brattvaag Group, which is wholly owned by Aker Yards.

According to Aker Brattvaag, the ship "is a refinement of the well-known UT 745, and has an overall length of 92.4 meters. It will be fitted out for 62 persons, and have an advanced dynamic positioning system as well as diesel-electric propulsion based on ABB's Azipod solution. Furthermore, the ship will be made ready for a number of options, such as a moon pool, ROV, helicopter landing pad and large offshore crane. In designing the fittings, great emphasis has been placed on the crew's health, safety and environment. Very low-noise machinery and bow thrusters will be used.

"In addition to providing normal supply services, the ship will be capable of ROV services and other tasks related to the underwater market. The ship will also be suitable for cable-laying and maintenance tasks.

"The hull is to be built at Aker Tulcea in Romania, and the completed ship will be delivered in November 2001."

2 Multifunctional supply vessel (UT 745 E), built by Søviknes Verft AS and fitted with Compact Azipod units



Royal Navy survey vessels

An example of how Compact Azipod satisfies the expectations of even the most demanding customers is the contract that has also been signed with Appledore Shipbuilders in the United Kingdom to supply electric power plants and Compact Azipod propulsion systems for two survey vessels for the Royal Navy. The vessels will be supplied under a contract with Vosper Thornycroft (UK) Ltd, acting as prime contractor for the UK Ministry of Defence. Delivery is scheduled for 2002 and 2003 3.

According to 'Navy News', the Royal Navy's on-line website, the two ships, which are named *HMS Echo* and *HMS Enterprise*, will be equipped with "the latest survey systems, including multi-beam echo sounders and modern side sonars, as well as advanced navigation and communication systems. Each of the ships will be available for operations for over 330 days each year – a 50-percent improvement on older, existing vessels. Their considerably improved stability at sea means they will be able to carry out survey work for 90 percent of the year in seas much rougher than before.

"*HMS Echo* and *HMS Enterprise* will work with the Fleet in world-wide front-line operational roles, including supporting mine warfare and amphibious operations, as well as undertaking specialist surveying tasks necessary to the long-term effectiveness of the Royal Navy."

ABB's deliveries for the two survey vessels, which have a top cruising speed of 15 knots, include generators

3 *HMS Echo*, one of two new survey ships ordered for the Royal Navy by the UK Ministry of Defence. For these ships, which will have a top cruising speed of 15 knots, ABB is delivering generators for the main power plant and two PWM DTC-controlled Compact Azipod units rated at 1,700 kW each.

for the main power plant and two pulse width modulation DTC-controlled Compact Azipod units rated at 1,700 kW each. Key issues in winning this contract were the units' excellent propulsion performance and low life-cycle costs. The latter are the result of high diesel-electric propulsion efficiency and low-cost maintenance. The ships are the first Royal Navy vessels to have integrated electric and Azipod propulsion systems.

A fast-growing market

Compact Azipod is further testimony to the success of the original Azipod concept. Designed for the lower-power range, it takes Azipod into new areas, expanding the application range to cover the entire marine propulsion market. Every kind of marine vessel, from offshore service ships and drilling vessels through tankers and trawlers to large cruise ships and commuter ferries – all can benefit from Azipod [1]. In the meantime it has become the standard for large cruise vessels.

Since the first Azipod system was installed in 1990 over 300,000 operating hours have been accumulated. With Compact Azipod extending the Azipod area of application across the entire propulsion market, ABB is confident that this figure will continue to rise rapidly.

Author

Perttu Tuomaala
Matti Turtiainen
ABB Industry Oy
PO Box 185
FI-00381 Helsinki
Finland
perttu.tuomaala@fi.abb.com
matti.turtiainen@fi.abb.com
Telefax: +358 10 22 22350

Reference

[1] **R. Pakaste et al**: Experience with Azipod® propulsion systems on board marine vessels. ABB Review 2/1999, 12–18.