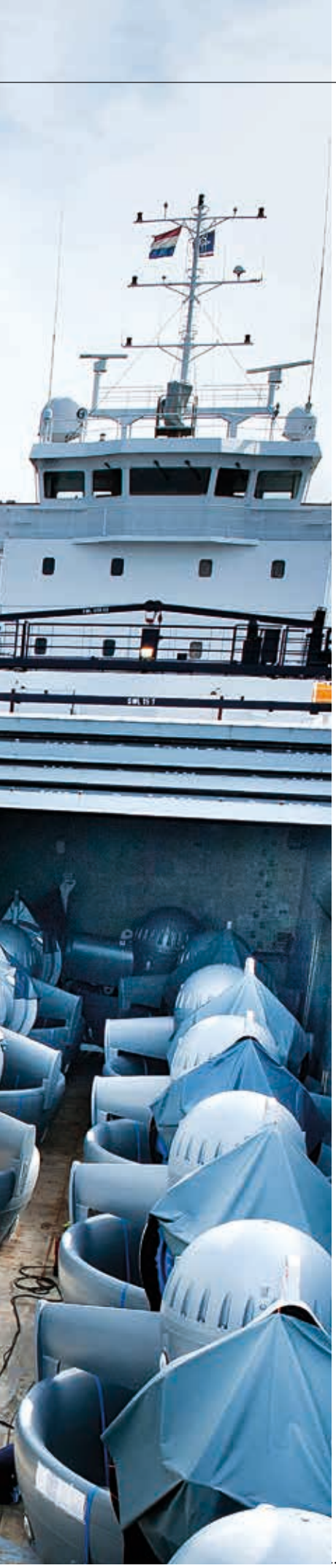

CELEBRATING 50 YEARS OF AZIMUTH THRUSTERS

In the half century since the first Aquamaster® azimuth thruster was delivered, the technological advances and differences of today's designs make it virtually unrecognisable

The first azimuth thruster was largely made up from tractor and vehicle components, and started life as a diversification for the Hollming shipyard in Rauma, Finland.

The yard had been established to build vessels as war reparations to the Soviet Union, and was looking for something to even out market fluctuations. Their first product was a steerable propeller with a deck-mounted diesel engine, which was installed on a hopper barge called *Palko*, also devised by the yard.

That was half a century ago, and the beginning of product development that has grown in size and scope to become a key part of today's Rolls-Royce propulsion portfolio.

At that time the principle of the azimuth thruster was well known. John Ericsson, the innovator of many technologies in the 19th century, had patented a deck-mounted outboard engine. Other patents were issued in the US and UK in the 1870s and demonstrated as through hull units on a large scale. During the Second World War, barges were equipped with over-the-stern thrusters with deck-mounted engines. But there was not yet a convincing commercial demand. This emerged in the 1970s and has widened ever since.

For the first few years, production volumes were small, between two and ten units per year in sizes from 50-200hp.

The market was there, but the main difficulty was sourcing components. The first exported units went to Germany, then Sweden specified azimuth units for propelling road link ferries.

In the UK, Yorkshire Dry Dock built many small coastal cargo vessels, each with two 400hp units. As the export market grew, a suitable name was needed for the product, and it evolved over time to be known as the 'Aquamaster® azimuth thruster'. Aquamaster® remains a valued registered trademark of Rolls-Royce.

By 1975 thrusters were offered in four sizes, from 100 to 800hp. The market outside Europe had grown as well, expanding to include the US, Canada and Japan, while sales volumes were growing rapidly and marketing companies and agencies were being set up around the world.

ABOVE: The Contaz thruster range brought with it new levels of efficiency, with low levels of noise and vibration.

LEFT: The largest order for UUC underwater mountable thrusters to date was for the innovative Allseas heavy lift vessel *Pioneering Spirit*. The picture shows the 13 thrusters being loaded for the voyage to the buildyard in Korea.

THE PRODUCT HAS GROWN IN SIZE AND SCOPE TO BECOME A KEY PART OF TODAY'S ROLLS-ROYCE PROPULSION PORTFOLIO

Research and development

It was clear that the market was interested in bigger azimuth thrusters. The problem was finding durable large bevel gears and the other components needed to handle the high powers. Special gears could be prohibitively expensive to buy, and other design constraints might pose a long-term maintenance cost.

A significant advance came at the beginning of the 1980s with the design of the first unit to be rated at over 1,000hp. This was the Aquamaster® 1600. The Finnish oil company Neste ordered three tugs equipped with these thrusters and these vessels became a good reference in the years that followed, not only for reliability but also for their manoeuvrability.

The quest for greater efficiencies led to the Aquamaster® CRP, an azimuth thruster with two contra-rotating propellers close together so the aft propeller recovered swirl energy from the leading one. It was given the name Contaz.

The result was an improvement in thrust and vessel speed, with a corresponding decrease in fuel consumption.

The first CRP thrusters were delivered to a road ferry operating in Turku, southern Finland. It operates in ice during the winter.

ABOVE: The quest for greater efficiencies led to the successful Aquamaster CRP, an azimuth thruster with two contra-rotating propellers, which was named Contaz.

THE FIRST AQUAMASTER AZIMUTH THRUSTERS WITH POWERS IN EXCESS OF 10,000HP WERE DEVELOPED IN THE EARLY 1990S, THE INITIAL APPLICATION WAS ICE-STRENGTHENED ARC 1 UNITS

Powerful

At the other end of the size spectrum the first Aquamaster® azimuth thrusters with a power rating in excess of 10,000hp were developed in the early 1990s, the initial application being a very demanding one, ice-strengthened ARC 1 units. Two thrusters per ship were supplied to the multipurpose icebreakers *Fennica* and *Nordica*, providing both main propulsion and excellent manoeuvring in open water or thick ice. The two vessels are still operating in the same way today, providing icebreaking services in the Baltic during winter and acting as offshore support vessels in summer.

The Aquamaster® business was restructured and enlarged several times in the years following its

Steerable azimuth thruster no1

Steerable azimuth thruster no 1 went into service in May 1965, propelling the mud hopper barge *Palko* with 60kW of power.

Ice-strengthened models

Ice-strengthened models rated at 7,500kW with DNV Polar 10 ice class were fitted to the ice-breakers *Fennica* and *Nordica* in 1993.

Underwater mountable units

Large underwater mountable thrusters, with over 5,000kW of power, were developed for drills ships and semi-submersible rigs.

UUC Allseas

The largest order for UUC underwater mountable thrusters to date was for the innovative Allseas heavy lift vessel *Pioneering Spirit*. Over 1,000 UUC thrusters have been delivered to date.

LEFT: The ice breakers *Fennica* and *Nordica* were fitted with thrusters rated at 7,500kW with DNV Polar 10 ice-class.

BELOW: UUC underwater mountable thrusters are removed and exchanged during a drill rigs normal docking period.

birth in the Hollming yard, most significantly when it was merged with the Rauma Repola deck machinery business. The enlarged Aquamaster® business was acquired by Vickers plc in 1995 and was combined with Kamewa propulsion products manufactured in Sweden.

This combination of experience led to the development of the UUC range of underwater mountable thrusters, with the first being delivered for drill rig applications in 1998. These robust thrusters, designed primarily to operate in dynamic positioning (DP) mode, can be removed and installed without drydocking, an important feature as most rigs operate in remote locations. Today they are fitted to over 70 per cent of the world's semi-submersible drilling rigs and drillships.

New developments

From 2000 the thruster and deck machinery product lines manufactured in Finland and Sweden were integrated with other Rolls-Royce products manufactured in Norway. The range of azimuth thrusters became the broadest in the business and development continued.

In 2002 the first Azipull units, a 'pulling' azimuth thruster, were retrofitted on the offshore vessel *Havila Tampen*.

Designed for maximum propulsive efficiency, with a hydrodynamically efficient shape, Azipull units are suitable for higher speed applications and for continuous service speeds of up to 24 knots. Sea trials showed a 20 per cent efficiency gain with better course keeping characteristics.

The conventional azimuth thruster range (US) with L or Z drive has also grown in power, with nine basic frame sizes now covering the power spectrum from 500-5,000kW. Modular construction means customers can select three installation options with ducted or open propellers, controllable, fixed pitch and contra-rotating.

A retractable range is suitable for auxiliary propulsion for DP vessels and take home propulsion, and PM thusters will soon be added.

Over the past five decades more than 8,000 azimuth thrusters have been delivered. RW

Contaz thruster range

The introduction of the Contaz thruster range brought with it new levels of efficiency with low levels of noise and vibration.

Azimuth Thrusters and Tugs

Azimuth thrusters and tugs were an ideal match conferring new levels of precision manoeuvrability.

Azipull Pulling Thruster

The introduction of the Azipull pulling thruster has improved propulsive efficiency for vessels with a high top speed, and has been selected for a number of commercial vessels where precise manoeuvring is also important.