

Smooth operator

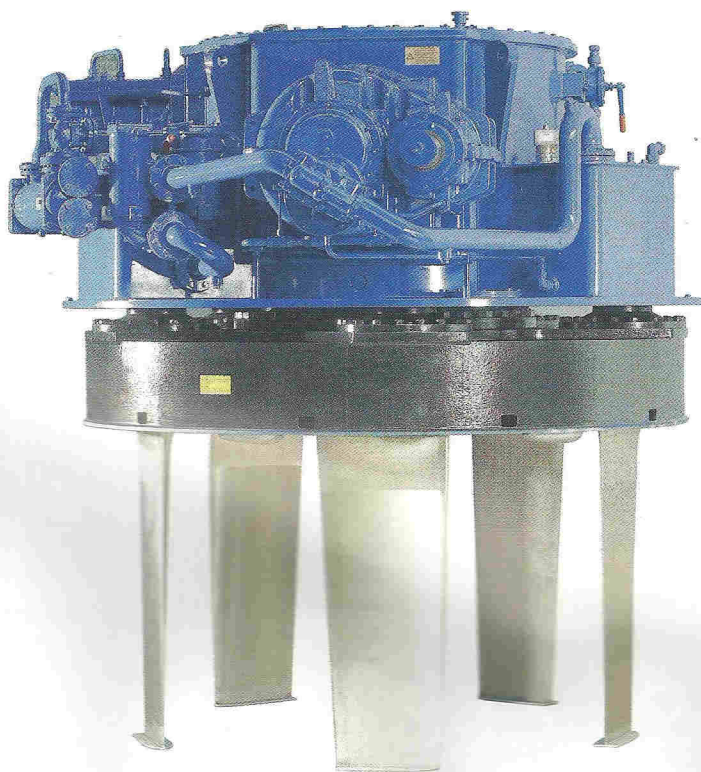
GERMAN ENGINEERING FIRM VOITH'S PROPELLERS HAVE BEEN A MERCANTILE STAPLE FOR YEARS. NEWLY DEVELOPED FOR USE AS STABILISERS, THE SUPERYACHT INDUSTRY IS INTRIGUED

BOB GREENWOOD REPORTS

Although the German heavy engineering group Voith Turbo started to develop the Schneider vertical, variable-pitch propeller for marine applications more than 80 years ago, for many outside the naval and commercial shipping markets it still appears radical. Yet the invention of Austrian engineer Ernst Schneider propels 70 per cent of the world's naval mine hunters, being favoured particularly by the US, Spanish, Finnish and British navies. They also move a fair number of commercial ferries, tugs and supply vessels. But only now are derivatives of the Voith Schneider Propeller (VSP) starting to awaken interest in the superyacht market.

Usually, the VSP comprises four, five or six vertical, or near-vertical, blades mounted on a rotating ring. In a movement that emulates that of a dolphin, but in the vertical and not the horizontal plane, each of the blades oscillates within a limited arc on its own axis to generate thrust forwards, backwards and sideways as the body of the propeller rotates.

One prime advantage of the VSP is the exceptional



Development of the Schneider propeller began 80 years ago

manoeuvrability that it gives displacement vessels, allowing horizontal thrust in any direction. Typically, going from helm to opposite helm is claimed to take around four seconds.

Being designed for diesel-electric propulsion, it can be

mounted practically anywhere along the length of the hull (within reason) because there's no need to align it with large prop shafts and transmissions.

What also makes the VSP attractive is that, compared with traditional shaft drive, it is energy efficient and very quiet.

It's this low noise that explains why it is the number one choice for mine-hunter duty. But with noise attenuation being of interest in the yachting market, this quality should also weigh in favour of the Schneider prop for large-yacht applications.

In most vessels, superyachts included, hull speeds of up to 18kt can be achieved with VSP propulsion, says André Koerner, head of Voith Turbo's project and sales department. But what has aroused interest in the VSP principle in the superyacht market is not its main-propulsion application. Instead the interest has come from the fact that — because it doesn't just provide thrust in a linear direction but is equally effective through full 360° — it can also be used to steer. This is what has given rise to the Voith Cycloidal Rudder (VCR), a derivative of the Schneider propeller.

Instead of four to six blades, the VCR has just two to provide port-to-starboard steering moment and replaces conventional rudders in open water, but at low speeds it gives extra manoeuvrability when docking.

There is a further application, however, that makes the Voith Schneider Propeller, and particularly in its VCR rudder guise, especially interesting for large yachts. That is as a part of a stabiliser system that has certain advantages over more conventional fin stabilisers. With the addition of a Voith Motion Control (VMC) module and software, the Schneider propeller principle can be harnessed as a highly efficient stabiliser that's claimed to be capable of suppressing up to 90 per cent of the rolling motion of a ship.

Tried and tested

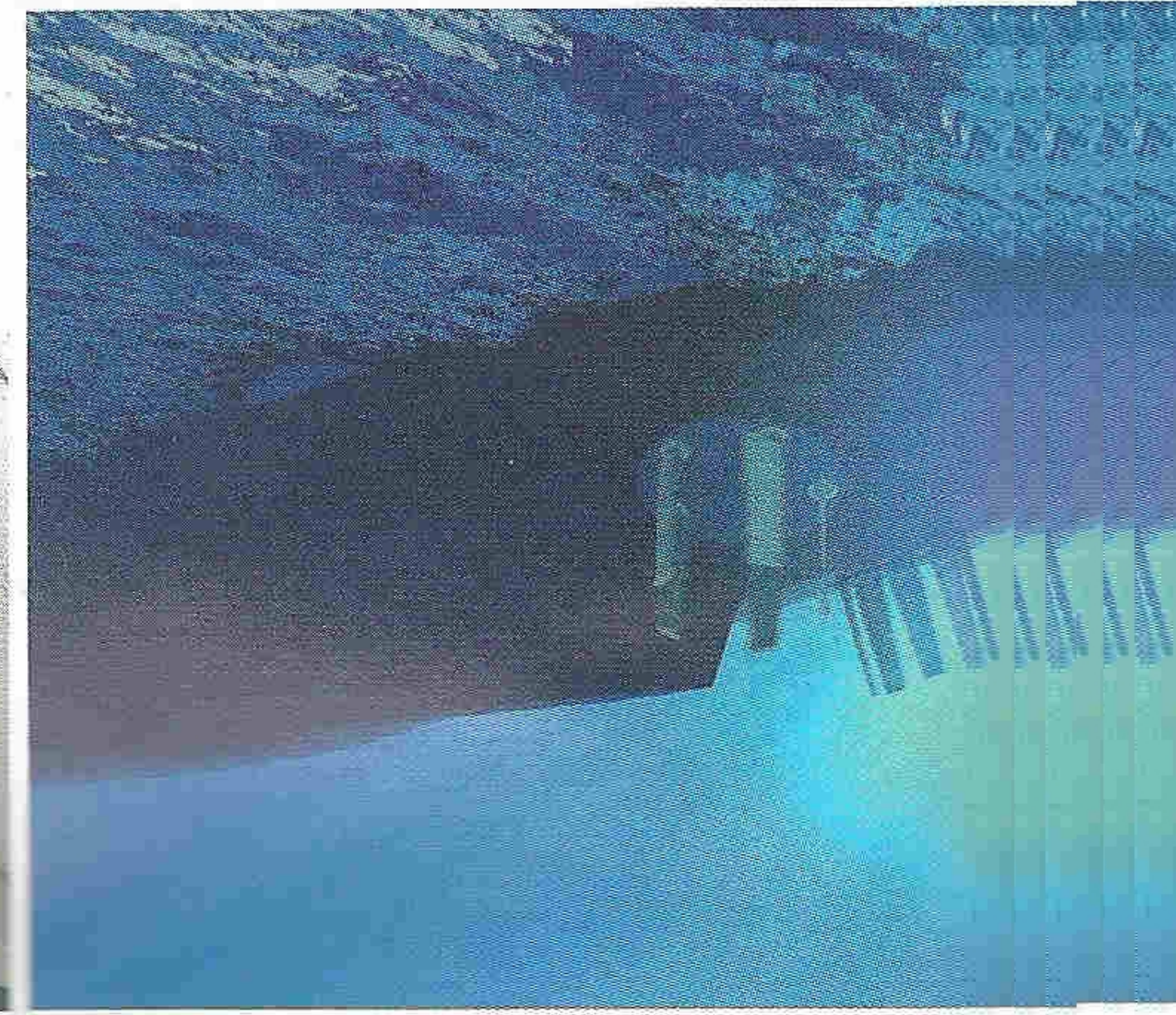
"Roll is caused when waves act on the turning moment of a vessel," André Koerner points out. "By using VSP power we can produce a counter action than dampens this effect. In waves of up to 3m (10ft) we can reduce roll by 65 per cent. With waves of 1.5m (5ft), that can rise to 78 per cent."

In terms of deviation from the vertical, Voith Roll Stabilisation (VRS) can limit what would be a movement of 8° without any stabilisation to an angle of just 2°.

Independent tank testing and full-scale tests using a buoy-laying vessel, both by the Maritime Research Institute Netherlands at Wageningen and the Schiffbau-Versuchsanstalt in Potsdam, Germany, add credence to these claims. In irregular seas, these revealed a 65-93 per cent roll reduction.

While roll suppression of this magnitude will be welcomed by any mariner in the interests of the comfort of those aboard, there's one application where it is especially important. For vessels that supply offshore oil rigs, the operational safety benefit of having a stable platform from which to unload in heaving seas is obvious. Over the past few years — since Voith Turbo started to develop its roll stabilisation system — operators of offshore

Below left: Twin bladed Voith Cycloidal Rudders mounted amidships deliver thrust to counteract wave force when a vessel turns



supply vessels have shown considerable interest in it.

The precise and rapid management of the 'x and y' co-ordinates of the Schneider propeller and the anti-roll stabiliser prop, together with dynamic positioning controls, enable these vessels to remain stable and on station while unloading at sea as well as keeping them level at speed.

The ability of the Schneider principle to be used to stabilise vessels has also attracted the attention of the superyacht industry.

"We are talking with major designers and builders of large yachts about the Voith

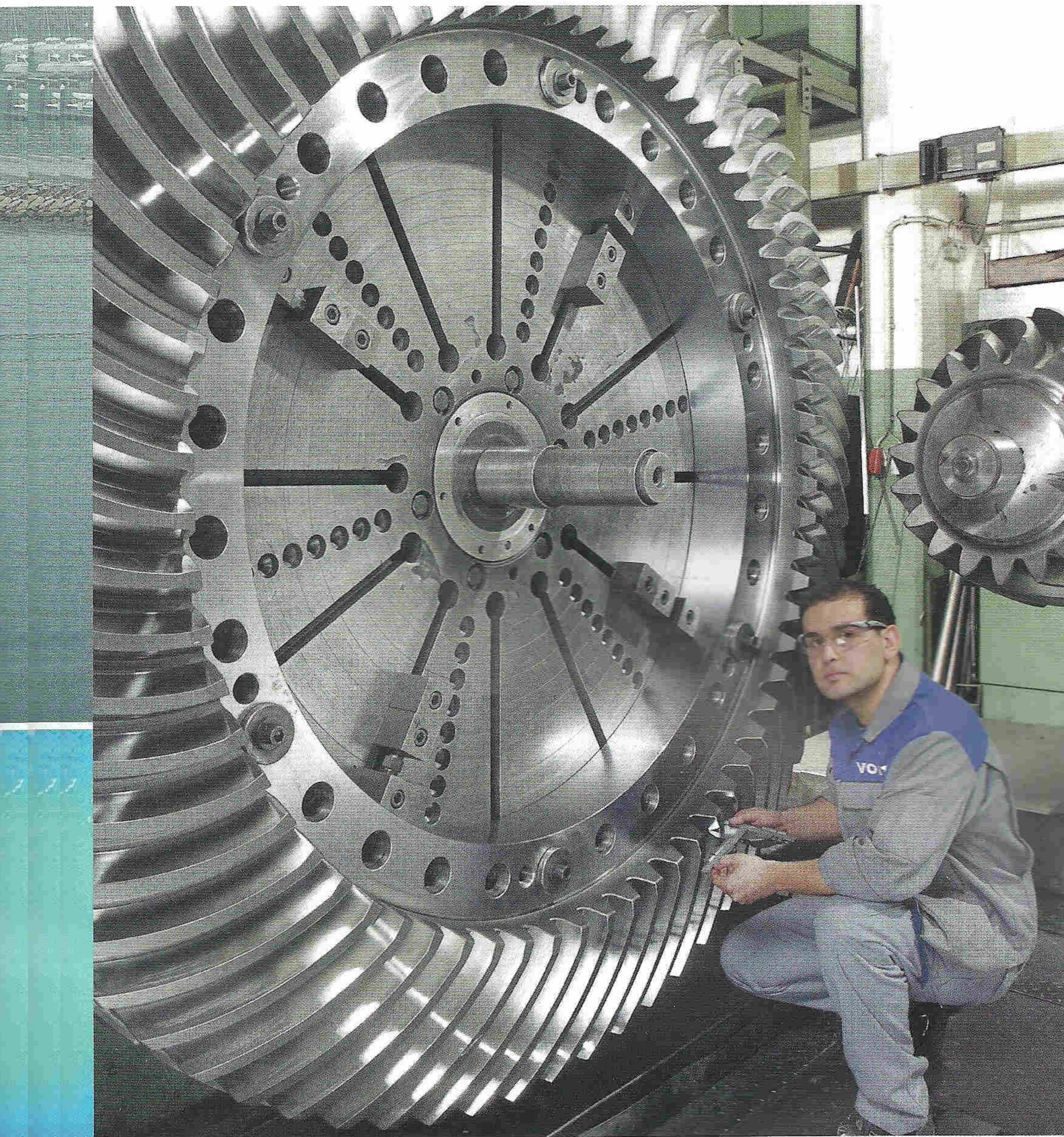
Independent tank testing and full-scale tests revealed a 65-93 per cent roll reduction in irregular seas

Roll Stabilisation system," says André Koerner. "It's an attractive option for yachts above 40m-45m (131ft-148ft). Below that size the systems are really too large and heavy," he adds.

Like the active fin stabilisers that they are designed to replace, the twin-vane Voith Cycloidal Rudders are positioned amidships for VRS applications. Though relatively large, these stabiliser props are

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André Koerner, head of project and sales, Voith Turbo



are unique in that they're fully submerged — unlike others which are surface-piercing.

"The big advantage," says Koerner, "is that the jets are almost cavitation-free up to 40kt, whereas with conventional props above 20kt in displacement hulls cavitation would be a problem.

"These jets give much higher efficiency compared with the conventional type, giving higher speeds for the same power," he adds. "They're much quieter, produce less vibration and are easier to integrate into the vessel. Not only that, there's more room for toys aft, too."

Left: A pair of giant bevel gears will transmit 10,000hp each to twin Voith Schneider Propellers



still appreciably smaller in blade area than the fins that would be needed to provide an equivalent roll dampening effect and produce less drag at speed.

At lower speeds — up to around 7kt — they can also propel otherwise conventionally-powered yachts in diesel-electric mode for near-silent running under generators, or for manoeuvring in small and congested harbours.

Dutch interest

One superyacht builder that has already decided to use the VRS system is the Dutch yard Heesen Yachts. Voith Turbo and Heesen have entered into

an agreement to develop the system for superyachts.

"We have now brought this to the active marketing stage," Koerner reveals, "and we're marketing it to their clients."

For its part, Heesen confirms that it has work in hand involving the VRS, but declines to give details. A spokesperson for the yard said: "We have the intention to apply this system in one of our yachts, but this is a future plan that will be discussed in due course."

Meanwhile, Voith Turbo has been working with Feadship's DeVoogt design studio on propulsion proposals for the

Dutch builder's X-stream and F-stream 55m (180ft) concept superyachts, aired respectively at the 2006 and 2007 Monaco yacht shows. Propulsion proposals for these futuristic axe-bowed-piercer designs centre around hybrid diesel-electric power for lower speeds but direct-drive diesel for speeds of 20kt-25kt. Azipods or Voith Cycloidal Rudders are intended to provide low-speed propulsion and manoeuvring, while at high speeds the proposed transmission is a pair of linear Voith Water Jets (VWJ).

The jets, which are being developed with the help of Potsdam's tank-testing facility,

As a major southern German engineering company operating in the papermaking and marine engineering markets — with an annual turnover of about €4bn, 37,000 employees and yet still privately owned since it was started by Johann Matthaeus Voith in 1825 — Voith is well positioned to take its commercial and military naval engineering expertise further into the superyacht market.

"Our intention is to give our customers full scientific support," concludes Koerner. "We're not just a competent supplier — rather, we see ourselves as a partner to the whole design." ●