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SuperYacht industry

Oceanco Y726

ONE OF THE LARGEST YACHTS BY VOLUME BUILT BY OCEANCO

Azimut|Benetti keeps pole position

FOCUS ON ITALY

Harnessing the power of green technology

MARINE PROPULSION & POWER GENERATION

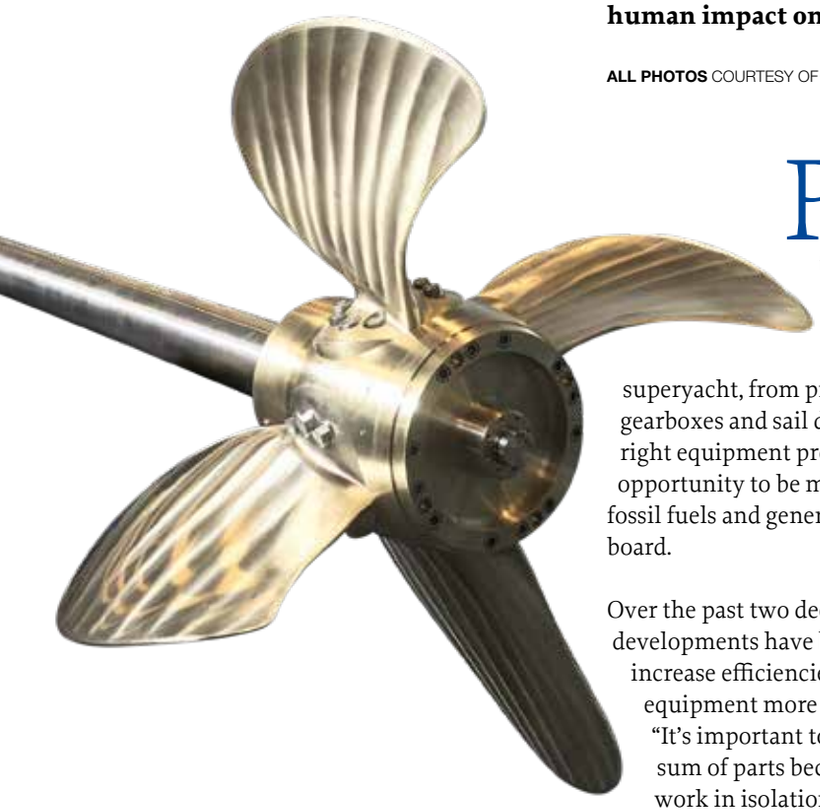
Hundested Propeller – VP 5 and propeller shaft on Southern Wind SW108 Gelliceaux.

Harnessing the power of green technology

Photo courtesy of Southern Wind Shipyard.

Hundested Propeller looks at how the right propulsion equipment can reduce human impact on the environment

ALL PHOTOS COURTESY OF HUNDESTED PROPELLER UNLESS MENTIONED OTHERWISE.



Propulsion equipment could be considered one of the most polluting and highest fuel consuming elements of a superyacht, from propellers and shafts to gearboxes and sail drive units. Yet the right equipment provides the opportunity to be more efficient, use less fossil fuels and generate power to use on board.

Over the past two decades, significant developments have been made to help increase efficiencies and make equipment more flexible and greener. "It's important to look at a project as a sum of parts because things rarely work in isolation," says Rune Graesdal Zilcken, sales manager at Hundested Propeller.

Since 1921 Hundested Propeller has evolved from marine engines, to propellers, gear boxes and sail drive units. "The superyacht sector is a driving force for new technology," adds Graesdal Zilcken. "Over the past 10 years Hundested Propeller's focus has been on hybrid propulsion and regeneration, and we are starting to see this being used in commercial sail cargo boats like TOWT."

The Equipment for Regeneration

"It is often believed that a higher propeller speed will generate more output," says Graesdal Zilcken. "If you follow this logic, then you would run with a smaller pitch >>

than the design pitch – and that is not true. A higher shaft speed generates more heat in the gear due to the gears spinning faster. A higher propeller speed generates more noise due to propeller cavitation."

The following is an example of power regeneration on a superyacht. When there was load on the propeller under 12 knots the propeller often stalled and there was heavy vibration in the stern of the boat when regenerating, enough to make the rails on the deck rattle. The gearboxes overheated when running fast and the regeneration output was low. The outcome was far from satisfactory.

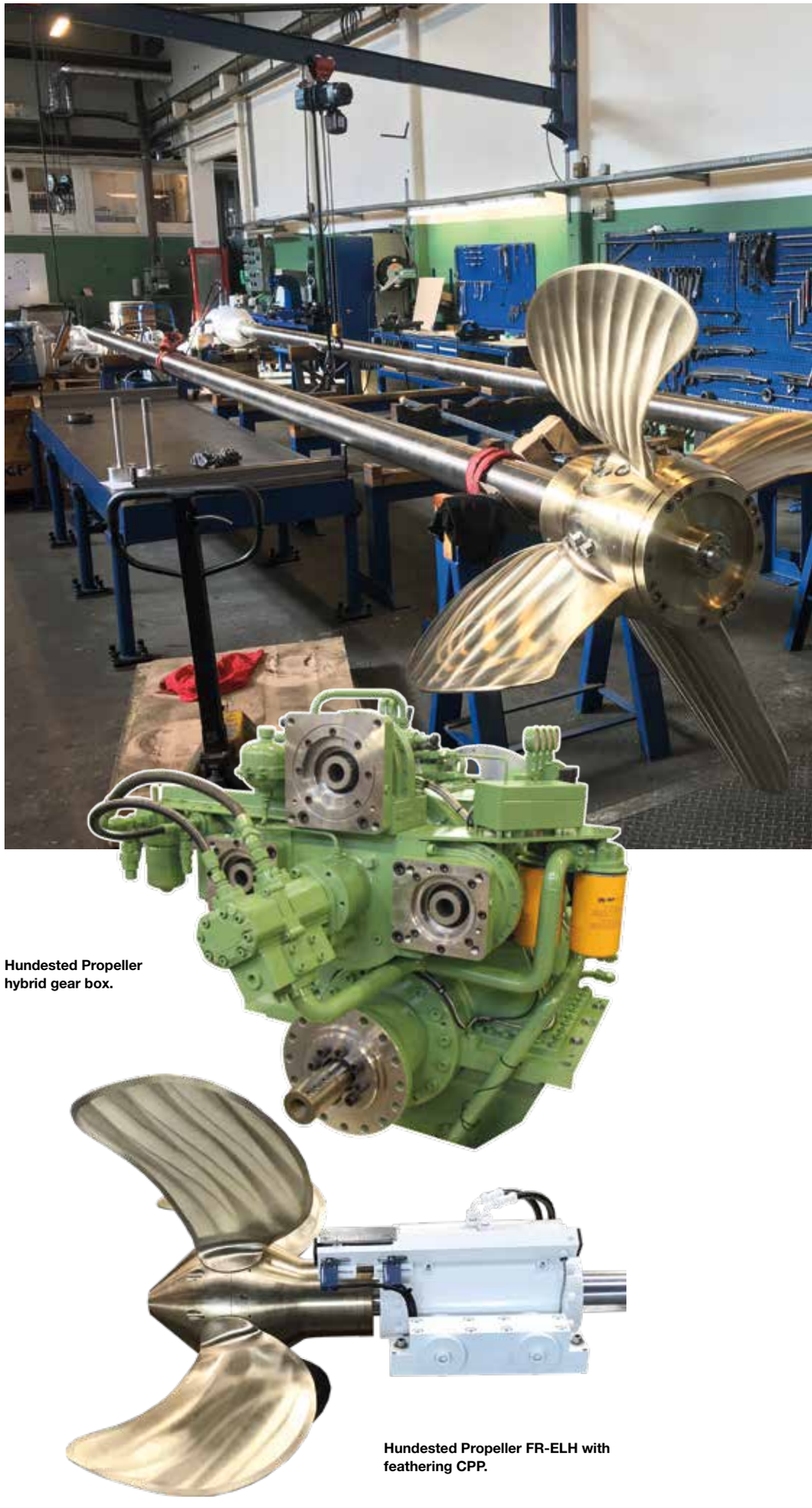
By introducing controllable pitch propellers and a pitch control unit, the engineers could adjust the pitch to 20% less than the feathering position. By changing the pitch, the outcome was completely different. The overheating disappeared due to lower shaft RPM. The propeller could regenerate starting from 8 knots, and the noise disappeared. In this instance, the Hundested Propeller equipment managed to regenerate 240kW at 14 knots.

Controllable Pitch Propellers

This isn't new technology. Controllable Pitch Propellers (CPP) have been used in the marine industry since the early 1930s. They enable a captain to fully use the engine power irrespective of the current boat operation. CPP offer several advantages: They give maximum power and RPM at both low and high vessel speed by adjusting to the optimum pitch without overloading the engine; they offer unmatched manoeuvring capabilities as thrust can be changed between astern and ahead in seconds just by adjusting the pitch, while keeping the engine at full RPM; and they minimise noise from engine and propeller with an optimum combination of pitch setting and RPM.

Other technologies

Pitch Control Unit's (PCU) are a vital part of the power generation and hybrid propulsion puzzle and give full control of the angle of the propeller blade. It's advisable to look for different versions, for example electro-hydraulic models offer low energy consumption with the removal of constantly running hydraulic pumps and motors.



Hundested Propeller hybrid gear box.

Hundested Propeller FR-ELH with feathering CPP.


Hundested Propellers being manufactured at Hundested Propeller.


Bravo Eugenia


SW96 Nyumba GT under sail. Photo courtesy of Southern Wind Shipyard.

A flexible gear box is the brain of the operation and helps optimise fuel consumption. "If you imagine a superyacht that for most of its trips transits from A to B at a certain speed, that for example requires 1,500 horsepower, and for a limited time needs to go at higher speed that require 2,000 horsepower, then there may be fuel savings if you choose a hybrid solution," says Graesdal Zilcken. "Supplement the main engine of 1500 horsepower with an electric motor that can supply the last 500 horsepower only when needed, and this avoids carrying oversized equipment when it is possible to adapt the equipment to what the current operating situation is.

How to harness green technology

First, get the pitch right for power regeneration. Sea trials will determine the correct pitch position for your vessel. Second, understand the shaft speed and control system for the pitch. The control system needs a built-in maximum RPM limit for the shaft in regeneration mode. When this maximum RPM is achieved, the pitch should increase and hereby lower the shaft RPM. And third, know the electrical power system on board. The most efficient system will be a shaft driven generator that via a converter produces DC to the batteries, and from there delivered to the grid.

"In practice, when the CPP is placed in regeneration position, the shaft will naturally rotate as the boat moves through the water. This movement, when connected to a Hundested Gear Box, is where regeneration happens," says Graesdal Zilcken. "When a generator or an electric motor is connected to the gear box it serves multiple uses; it can replace a normal diesel/auxiliary generator and at the same time function as a motor if 'silent mode' is required – your hybrid propulsion. This is a viable option.

"Several superyachts have successfully minimised the size of the main engine and when maximum power is needed the electrical motor provides a boost," he adds. "Together with Hundested's hybrid clutch for the input shaft of the gear box, full flexibility in hybrid propulsion is achieved – running fully electrical, diesel or both.

i. hundestedpropeller.com