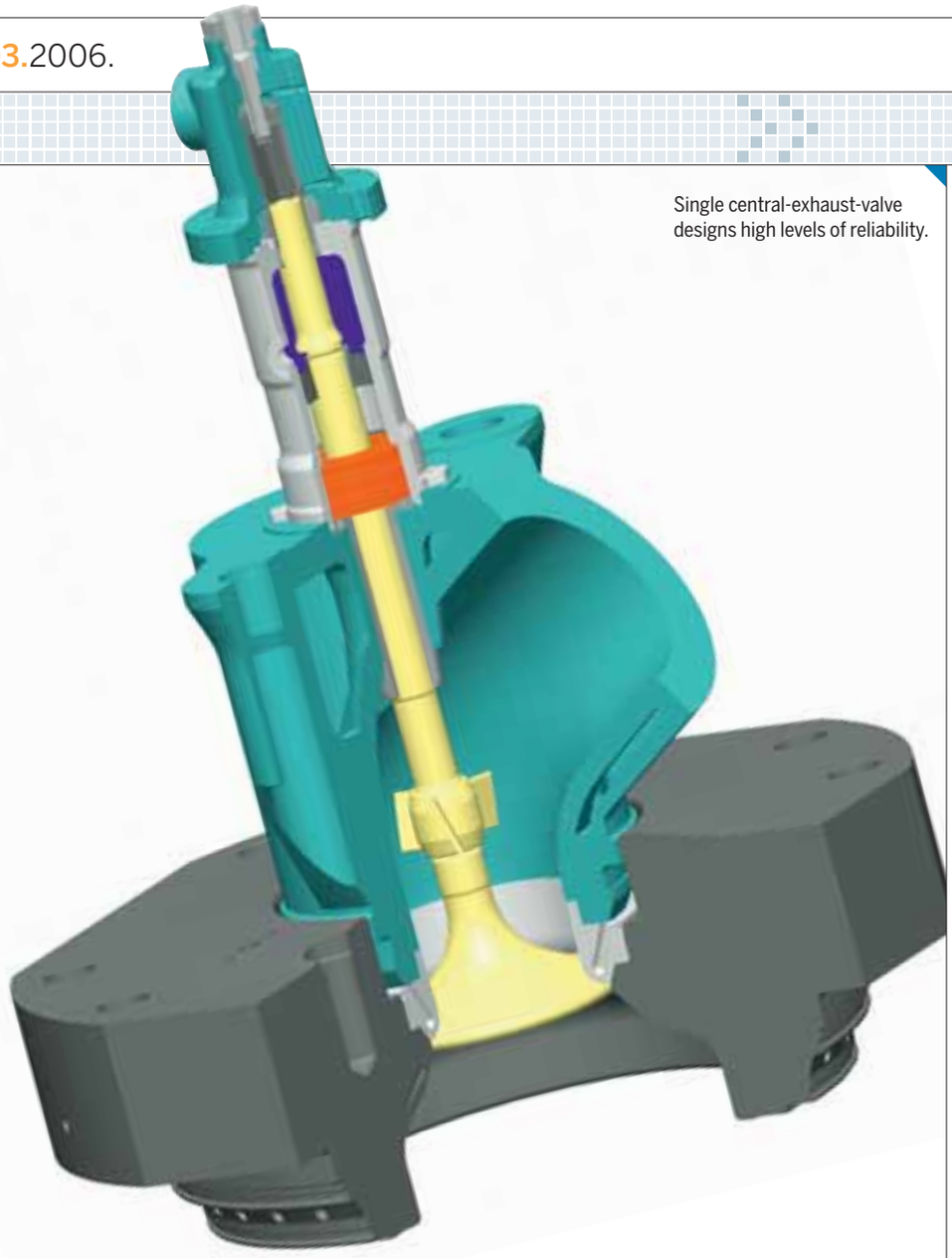


Single central-exhaust-valve designs high levels of reliability.

MULTIPLE ENGINES ON A SINGLE PLATFORM OFFER MANY BENEFITS

▶TEXT: KASPAR AEBERLI | PHOTOS: WÄRTSILÄ

FOUR NEW LOW-SPEED ENGINE TYPES are currently being developed by Wärtsilä in Winterthur, Switzerland, under the platform concept. This is common practice in the car industry where cars of completely different brands are designed and built using a common platform with as many identical parts as possible – even engines and body panels – being shared to reduce costs by increasing manufacturing volume.

THE same idea is being employed in the new Wärtsilä RT-flex82T, RTA82T, RT-flex82C and RTA82C engines being developed for the propulsion of two different groups of ships: large tankers such as VLCCs (very large crude carrier) and ULCCs (ultra large crude carrier), and panamax container ships. Parameters are being standardised as far as possible so that many components can be identical in both engine types, yielding the benefits of rationalisation in design and manufacturing, greater volumes, lower manufacturing costs, and also simplifying the stocking of spare parts.

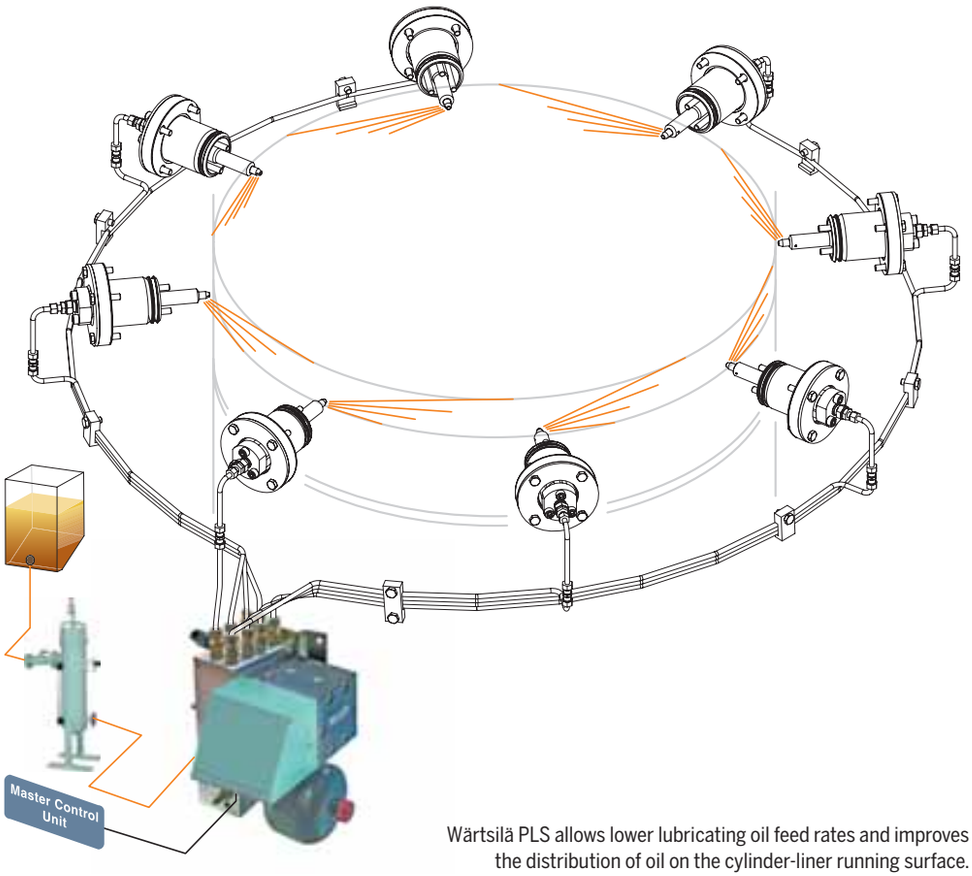
The new engines all have a cylinder bore of 820 mm but there are two different piston strokes appropriate for the ship applications envisaged. The 'T' types for tankers will have a stroke of 3375 mm to suit the shaft speeds required for the propulsion of the next generation of large tankers: VLCCs and ULCCs of 200,000 tdw to more than 350,000 tdw. These engines will be built with between six and nine cylinders to cover a power range of 21,720 kW to 40,680 kW at 68 to 80 rpm.

'C' type engines are intended to be ideal prime movers for containerships of panamax size with capacities up to 4500 TEU and typical service speeds of about 24 knots. They will have a stroke of 2646 mm and will be available with six to twelve cylinders to cover a power range of 21,720 kW to 54,240 kW at 87 to 102 rpm. The RT-flex versions will have the very-latest electronically controlled common-rail systems while the RTA versions will have traditional, mechanical camshaft systems. In all other respects, the RT-flex and RTA versions have the same principal characteristics and design features.

Superior operating economy

To help provide superior operating performance, the layout fields for these engines, as defined by the power/speed ratings R1, R2, R3 and R4, are extended to include the ratings R1+ and R2+. These provide the same power levels as R1 and R2 but with increased shaft speeds. The extended fields offer wider flexibility to select the most efficient propeller speed for lowest daily fuel consumption, and the most-economic propulsion equipment, namely the propeller, shafting, etc.

The new RT-flex engines will also have the option of Delta Tuning for lower fuel consumption at part loads compared with conventional camshaft type engines. Delta Tuning takes advantage of the complete flexibility in fuel injection and valve →



Wärtsilä PLS allows lower lubricating oil feed rates and improves the distribution of oil on the cylinder-liner running surface.

operation allowed by the common-rail system.

Another contribution to the superior operational economy of the new engines is the improved cylinder lubrication provided by the Wärtsilä Pulse Lubrication System (PLS). This allows much lower lubricating oil feed rates than with previous systems while improving the distribution of cylinder lubricating oil on the running surface of the cylinder liner.

PLS features precise, electronic control of feed rate and timing with full flexibility in settings. Jets of cylinder lubricating oil are sprayed onto the liner surface from a single row of quills arranged around the liner, each quill having a number of nozzle holes. The oil jets are individually directed to separate, evenly-distributed points on the liner surface. There is no atomisation and no loss of lubricating oil to the scavenge air.

Three year periods between overhauls

To achieve the target of three years between overhauls, the new engines incorporate proven design features that provide excellent piston-running behaviour and long periods between overhauls. Cylinder liners are given a good physical running surface by careful machining and plateau honing. Piston rings have a chromium-ceramic coating and the piston ring grooves are chromium plated. An anti-polishing ring is fitted to prevent the build up of carbon deposits. Surface temperatures of the cylinder liners are optimised to ensure that the engines are insensitive to fuel sulphur levels.

Scavenge air is delivered by a constant-pressure turbocharging system that employs high-efficiency exhaust gas turbochargers. The scavenge air receiver is of simplified design with a horizontally-arranged cooler and auxiliary blowers. Special attention has been given to removing water condensate before air enters the cylinders. The high-efficiency water separator is provided with ample drainage.

High levels of reliability

Various design features focusing on high reliability are incorporated. The bore-cooled cylinder cover is secured by eight elastic studs. It has a single, central exhaust valve housed in a bolted-on valve cage. There are three fuel injection valves, each separately supplied and controlled from the common-rail system.

The piston comprises a forged steel crown with a very short skirt. It has combined jet-shaker oil cooling and is equipped with four piston rings of the same thickness.

The engine structure used in the new 820 mm-bore engines consists of a double-walled bedplate, a fabricated monobloc column and a cast-iron monobloc cylinder block, all secured by pre-tensioned vertical tie rods. The whole structure is very sturdy with low stresses and high stiffness.

The bedplate incorporates the tilting-pad thrust bearing in a very compact and therefore stiff housing. The main, bottom-end and crosshead bearings are all of white metal on steel shells. The crosshead has a full-width lower half bearing. The crosshead pin is of uniform diameter, and the two guide shoes are individual steel castings with white-metal-lined running surfaces.

The piston rod gland is of a proven design with a highly-effective dirt-scraping action in the top part and the ability to scrape system oil in the lower part. System oil losses are minimised as complete internal recirculation of scraped-off oil to the crankcase is provided for.

Additional benefits for shipowners

Wärtsilä RT-flex common-rail engines are proving very popular with shipowners, and this is also expected to be the case with the new 820 mm-bore engines. The RT-flex versions have additional benefits for shipowners and operators, including smokeless operation at all engine speeds, lower stable running speeds, lower fuel consumption, and consistent engine settings for reduced maintenance. The mechanical RTA versions are for shipowners who prefer the traditional concept.

As with all new marine engines nowadays, the new engines will be fully compliant with the NO_x emission regulations in Annex VI of the MARPOL 1973/78 convention.

Since even large marine engines must be simple to install, careful attention has been given to installation of the new engines in ships. The seating involves a modest number of hold-down bolts and side stoppers, and there are no end stoppers, thrust brackets or fitted bolts. Thrust transmission is by thrust sleeves positioned on a number of hold-down bolts. All ancillaries and their arrangement are optimised to reduce installation time and operating costs, with minimum electrical power requirements.

The first engines of the new types are expected to be completed towards the end of 2007. Production is being carried out in cooperation with Hyundai Heavy Industries Co Ltd, who are providing support with engine production design and testing by utilising their existing facilities and manpower.

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