

# Wärtsilä Piston upgrade with internal lubrication and APR



The Wärtsilä Piston upgrade with internal lubrication and APR is suitable for marine and power plant installations equipped with an external piston lubrication system. The upgrade replaces the external lubrication system with a new internal system combined with an anti-polishing ring (APR) to reduce lube-oil consumption by up to 50% as well as maintenance complexity and cost.

## PROVEN, RELIABLE LUBRICATION

Setting the optimal lube-oil flow for Wärtsilä ZA40S engines equipped with an external lubrication system can be a challenging and time-consuming process that requires specialist knowledge. Incorrect lube-oil flow can lead to a risk of engine failure resulting from inadequate piston lubrication and lead to exhaust-pipe fouling in cases of too-high oil flow.

The internal lubrication system has been installed as standard in all Wärtsilä ZA40S engines manufactured from 1996 onwards. The system consists of a bore-cooled steel crown with combined oil spray and shaker cooling. There are three piston ring grooves and one oil scraper ring on the piston crown.

The oil used to lubricate the piston and liner is directly supplied from the oil sump instead of from a dedicated tank. The oil is directly injected between the moving sliding parts, passing through the internal orifices in the connecting rod, piston crown and piston skirt.

## KEY BENEFITS

- Improved piston surface lubrication
- Reduced wear on piston ring, piston and cylinder liner
- Reduced consumption of lubrication oil by up to 50%
- Simplified maintenance and monitoring
- Reduced exhaust-pipe fouling, PM emissions, visible smoke, carbon deposits and after-treatment device clogging



The APR is a separate ring installed in the upper part of the cylinder liner. Because its diameter is slightly smaller than the liner diameter, it prevents the build-up of heavy carbon deposits on the top of the piston. Installing an APR increases clearance between the piston top and liner wall and considerably reduces contact between carbon deposits and the liner wall during piston tilting.

As well as improving lubrication of the piston surface during engine start and operation, the upgrade results in a simpler lubrication circuit, reducing labour and spare-part costs compared to an external system. Furthermore, it also reduces both lubrication costs and exhaust-pipe fouling in cases where too-high oil flow leads to lube-oil spillage. Unburnt lube oil directly contributes to particle mass (PM) emissions, while some ash components from combusted lube oil can shorten the lifetime of after-treatment devices.

#### **TIMING AND SCOPE OF UPGRADE**

In most cases the new pistons and liners are interchangeable with existing components to ensure a smooth, trouble-free upgrade. In exceptional cases a partial upgrade can be performed in line with your individual maintenance schedule.

It is strongly recommended to upgrade all engine units simultaneously. The optimal time to perform the upgrade is during a major engine overhaul, for example at 48,000 hours.

The upgrade comprises the following:

- APR-ready piston assembly with internal lubrication system
- APR-ready cylinder liner
- Anti-polishing ring

The upgrade process involves dismantling and reassembling the piston assembly and the cylinder liners and dismantling the external lube-oil circuit.

**Important:** The upgrade is a part of the IMO TIER 1 conversion package – i.e. engines equipped with externally lubricated pistons cannot be upgraded to IMO TIER 1; an IMO TIER 1 conversion requires internally lubricated pistons.