



## New standard in spindles

# MAN B&W Diesel introduces DuraSpindle™ and sets the benchmark in exhaust valve spindles

**Copenhagen, 20 May 2005.** Since the introduction of the Nimonic exhaust valve spindles on the larger bore MC engines the Time Between Overhaul has become very long indeed with more than 20,000 hours easily obtainable.

Now MAN B&W Diesel has developed a new exhaust valve spindle that will increase by more than 50% the Time Between Overhaul (TBO) of all the other two-stroke engines without nimonic spindles in its range.

Taking ten years research and development, the new engine component, DuraSpindle, is based on a durable alloy hard facing that is toughened through a patented welding, rolling and heating process to prevent critical indentation marks causing 'blow-by' and occasional cracking on valve spindle seats as a result of the combustion process.

Numerous tests found that welding a high temperature resilient Ni-Cr alloy onto a stainless steel spindle would dramatically improve the hardness and ductility of the valve seat as well as its resistance to cracks compared to current Co- and Ni-base hard facings including Nimonic 80A.

In the first stage of the process, the stainless steel DuraSpindle goes through a new robotic welding procedure where Inconel, an alloy traditionally used in gas turbines, is welded in to the welding groove of an exhaust spindle valve seat.

MAN B&W Diesel A/S

Teglholmsgade 41  
2450 Copenhagen SV  
Denmark

Tel.: +45 33 85 11 00

Fax.: +45 33 85 10 30

[www.manbw.com](http://www.manbw.com)

For further information,  
please contact:

Peter Dan Petersen  
Senior Manager  
PR & Documentation

Tel.: +45 33 85 1470

[pdp@manbw.dk](mailto:pdp@manbw.dk)

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Once the alloy has been welded in place, the DuraSpindle is then machined after which more than ten tonnes of force is used during the special rolling process to work harden the Inconel weld to 500 HV. Whilst the spindle is being rolled and rotated three or four concentric grooves, depending on the spindle size, are etched into the seat at a depth of several millimetres. This actually further hardens what was, only moments earlier, a relatively ductile material.

The special rolling process provides compressive stresses, as opposed to tensile stresses to the component, which may cause cracking in the seat area. Compressive stressing significantly reduces the probability of cracking even in the advent of welding defects.

The hard facing on the spindle seat is further hardened by heating the material up to 600-700°C. The metallurgical reaction, called precipitation hardening, creates a fine network of precipitate which further hardens it to 600 HV. Compared with an Alloy 50-type hard facing material DuraSpindle is 20% harder and 50% harder if compared to a spindle with Stellite hard facing or Nimonic 80A.

Harro Hoeg, the mechanical engineer within MAN B&W Diesel's materials research laboratory who developed the new hard-facing: "The new process results in an overall improvement in seat conditions and this improved service performance is maintained for a dramatically increased period of time."

MAN B&W Diesel, which, apart from the Nimonic spindles, intends to stop manufacturing non-DuraSpindle exhaust valves by the end of the 2005, has tested the new spindles over several years in 50MC and, particularly, 60MC engines installed in Wallenius Lines' vessels.

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## Press release

Tests began on the *Don Juan* in 1998 where a number of prototype spindles were fitted to the car carrier's 8S60MC engine. It ran for 20,000 hours without being changed. After MAN B&W Diesel inspected the valve seat no appreciable indentation was found.

More recently, tests have been carried out onboard Wallenius ships *Boheme* and *Electra*. In the latter, MAN B&W Diesel installed two complete valves and will be removed for inspection for the first time in December after more than 28,000 running hours.

"Usually for this type of engine, we recommend the exhaust valve to be overhauled after 12,000 -16,000 hours. But on the *Boheme* we installed a spindle with MAN B&W Diesel's new W-Seat design, which together with the DuraSpindle hard facing, resulted in a substantial increase in the Time Between Overhaul. These had been in operation for 30,000 hours at a recent inspection where they had no indentation whatsoever and were refitted for continuous operation. The limiting factor will now never be the seat of the spindle as it has often been the case," said Mr Hoeg.

With increased durability, reliability, extended TBOs, together with the decreased number of seat grindings and, therefore, maintenance costs, the DuraSpindle means it is now possible to include planned overhauls in the normal docking procedure.

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