

WÄRTSILÄ

Engine Services

RECONDITIONING SERVICES



ENERGY
ENVIRONMENT
ECONOMY

WÄRTSILÄ RECONDITIONING SERVICES

Reconditioning is an ideal way to enable your installation to continue operating profitably while meeting regulations and performance requirements. With Wärtsilä's cost-effective reconditioning methods you will be able to achieve maximum service life of components with minimized maintenance costs and without compromising reliability.

Our Reconditioning services cover:

- Components and parts reconditioning
- Complete engine reconditioning
- Exchange pool services with parts exchange service and sale of reconditioned parts and engines direct from our global stocks.

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TWO-STROKE VALVE SPINDLE AND SEATS

All current large bore 2-stroke marine diesel engines now use the 'uniflow' scavenging system, which incorporates an exhaust valve in the cylinder cover. Expensive materials are required to endure the high temperatures and pressures in the combustion chamber. The cost of these materials is a significant portion of the price of an exhaust valve. The reconditioning of worn valves is therefore a highly cost effective way of prolonging the lifetime of these components. Meeting or even exceeding the OEM standards requires a reconditioning process that is clearly defined and carried out under controlled conditions.

The initial cost savings obtained by reconditioning can very rapidly be lost by premature failures resulting from applying uncontrolled and sub-standard reconditioning procedures. Inadequate welding technology, machinery and materials may result in disintegration of the valve, causing major damage to the cylinder unit.

EXHAUST VALVE SPINDLE AND SEAT

In order to withstand the high combustion temperatures generated in high performance 2-stroke diesel engines, exhaust valves have been made of sophisticated alloys. Surface temperatures to which the combustion face of the

valve spindle is exposed can reach 900°C. Even the most modern and sophisticated alloys erode when temperatures reach these high levels.

The traditional material used for manufacturing 2-stroke exhaust valves is stainless steel with a stellite layer inserted in the seating surface. Later generation uniflow Sulzer and MAN/B&W engines are fitted with exhaust valves made from solid nimonic alloys. Since these alloys are quite expensive, the reconditioning of worn exhaust valves made from solid nimonic alloys is a very attractive cost-saving alternative, provided that the reconditioning process is carried out in a controlled way.

Stainless steel exhaust valves manufactured by different OEM licensees around the world may have variations in the metallurgical specification and composition of the material. Failing to identify the exact material composition and/or applying the improper welding procedure will result in disastrous component failures. Wärtsilä welding procedures include careful identification of the material composition before starting the reconditioning, ensuring that the final product has a lifetime expectancy equal to a new valve.





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Wärtsilä procedures include building up and re-profiling the exhaust valve to the original manufacturer templates. The combustion face and the upper face of the valve disc are remanufactured using advanced robotic welding equipment. The re-stelliting of the seating surface is carried out with Plasma Transfer Arc process, which ensures a high quality weld with minimum dilution of the base material. The valve stem is carefully measured and if it is worn, it is reconditioned using the HVOF spraying process. Wear incurred by chromium plated stems can be rectified by removing the existing chromium layer and replacing it with an HVOF cermet coating.

Special and controlled Wärtsilä procedures are also applied when reconditioning exhaust valve seats for all types of engines. The existing stellite layer is removed, the substrate is then built up, and this is followed by re-stelliting, machining and grinding the valve seat back to original dimensions.

TWO-STROKE CYLINDER COVER

Wärtsilä total reconditioning procedures are designed to bring cylinder covers back to original dimensions and tolerances to regain fully functionality. Wärtsilä's exchange pool makes it possible to supply several types of full reconditioned covers direct from our global stocks.

BORE COOLED CYLINDER COVERS

Bore cooled cylinder covers for B&W, Sulzer and Mitsubishi engines are manufactured

from forged steel with cooling bores. Failure in service can be caused by a range of problems including erosion and corrosion in air start and safety valve bores, erosion in the area adjacent to the injectors, leakage from sealing rings, cracking from the cooling bores, and fretting of the sealing faces and o-ring grooves.

Standard Wärtsilä repair procedures on B&W cylinder covers include replacing the cooling rings.

Reconditioning of Sulzer cylinder covers includes a number of modifications which are approved by the OEM.





TWO-STROKE PISTON RODS

Worn piston rods cause high lubricating oil consumption and contamination of the lubrication oil system of two-stroke engines. Wärtsilä has engineered a new type of reconditioning of piston rods. The engineering process involves making the surface of the piston rod wear resistant and ensures extreme load capacity and a long lifetime.

Reconditioning means applying special welding, surfacing and other techniques including skilful machining in our workshop to bring the parts back to original drawing-board specifications and full functionality. All reconditioned parts are of a uniform high standard, offering full OEM quality and guaranteed performance according to the latest specifications and modifications.

For two-stroke piston rods, Wärtsilä specializes in their reconditioning with special material steel welding-up and remachining / grinding to the original size, i.e. without any undersize and the consequent need to fit undersized stuffing box rings. Each reconditioned piston rod is carefully checked by dye penetrant- ultrasonic and dimensional tests, reports and register certificates are issued, everything in accordance with the ISO-9002 certified quality system.

TWO-STROKE PISTON

Wärtsilä two-stroke piston reconditioning is designed to give ship operators ready access to low cost reconditioned pistons which in all respects, dimensionally and metallurgically, are the equal of new. Long term operation can only be guaranteed if a thorough metallurgical examination is carried out before, during and after reconditioning.

TOTAL RECONDITIONING PROCEDURES

Different piston designs have different weakness and failure patterns. The Wärtsilä total reconditioning procedure is designed to address all critical areas of the piston at the pre-inspection stage before reconditioning starts. Typical examples are the Sulzer (RND and RNDM, RTA), MAN/B&W (GF, GB and MC) and Mitsubishi UEC piston crowns.

FAILURE CHARACTERISTICS

- Internal cracks. These cracks must be identified, removed and re-welded to avoid premature failure.

- Topside cracks. Pistons that fail in this manner can be rebuilt by using Wärtsilä's processes.
- Corroded cooling water pockets. These pockets can be rebuilt to original dimensions.
- Ring groove wear and cracking. The ring grooves and the outer diameter will be rebuilt completely. The ring grooves will be hard chromium plated to a thickness as specified by the OEM.
- Crown burning. All damage and cracks must be removed, the crown will be rebuilt to its original height, and if required special protection layers can be applied.
- Severe crown burning and cracking. 10 mm deep burning and cracks are not uncommon. All cracks must be identified and removed and the crown will be rebuilt to its original height and profile. Crown burning on more modern types can be so severe that the crown must be replaced by a complete new section, using the appropriate welding preparations and procedures.

MECHANICAL AND PHYSICAL PROPERTIES

- Wear resistant surface
- High micro hardness
- Low coefficient of friction
- High resistance to abrasive and adhesive wear

CUSTOMER BENEFITS

- Excellent price performance
- Reduced downtime
- Improved service lifetime
- Short lead-time

FOUR-STROKE CONNECTING RODS

Wärtsilä leads the way in the development of cost-effective reconditioning methods for all generations of diesel engine components, in close cooperation with engine designers and operators. Wärtsilä connecting rod reconditioning has been developed to give ship operators ready access to low cost reconditioning of worn connecting rods. Reconditioning extends the lifecycle of engine components, and quality is guaranteed by our controlled and approved welding technologies and machining processes, and thorough metallurgical examinations before, during and after reconditioning.



RECONDITIONING OF CONNECTING RODS FOR FOUR-STROKE MEDIUM-SPEED ENGINES

A frequently found wear pattern on connecting rods is excessive ovality of the big-end bore. In the long run, oval shaped big-end bores may cause crankpin bearing failures, resulting in crankshaft damage.

INSPECTION PROCEDURE

After cleaning the connecting rod, all serrations and bolts are inspected visually, after which crack detection is carried out. If cracks are found inside the threaded holes of the connecting rod, the rod is beyond repair and must be rejected. If cracks appear in other locations, reconditioning could still be possible. After crack detection the rod and cap are assembled, bolts are tightened

according to the engine maker's instructions, and the big-end bore is measured at different locations.

The following data will be recorded and reported:

- Geometry of the bores
- Pitch of the serrations
- Position of the serrations
- Top angle of the serrations
- Position of the locating pin holes
- Straightness of the rod
- Distance between the centre line of the big and small end bores
- Total weight of the rod

REPAIR PROCEDURE

Two class-approved repair procedures are available for reconditioning:

METHOD A

If no cracks are found during inspection, the following repair procedure is applied. Serrations on the rod and cap side are skimmed on a CNC milling machine, which will reduce the diameter in the vertical direction at the split. The separate parts are fitted together again and the mating faces are checked with blue paste, bolts are tightened in accordance with the engine maker's instructions, and the big-end bore is machined to its original dimensions. The results of final crack detection and connecting rod geometry are then recorded. The connecting rod is protected against corrosion and made ready for shipment.

METHOD B

If cracks are found in the serration area, the connecting rod will be reconditioned completely, as per Wärtsilä procedures. The cracked serration is machined off completely, until the cracks have disappeared. The machined connecting rod is preheated in the oven. Having reached the required temperature, the machined area is rebuilt with certified Wärtsilä high quality alloys, following a controlled and strict welding procedure.

After welding, the rod will be stress relieved immediately. In the final step, all serrations and bores will be machined to the original dimensions. The connecting rod geometry is recorded and the connecting rod is protected against corrosion and made ready.

Wärtsilä is a global leader in complete lifecycle power solutions for the marine and energy markets. By emphasising technological innovation and total efficiency, Wärtsilä maximises the environmental and economic performance of the vessels and power plants of its customers. In 2009, Wärtsilä's net sales totalled EUR 5.3 billion with more than 18,000 employees. The company has operations in 160 locations in 70 countries around the world. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.

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