WÄRTSILÄ

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 without compromising reliability. Our Reconditioning services cover:

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

FROM SERVICE TO SERVICES

Key customers have recognized Wärtsilä as their preferred service supplier - ensuring the availability and cost-efficient operation of their installations. They benefit from having the entire power system and a full range of services provided by one supplier. Wärtsilä is committed to providing full service throughout the product lifecycle for both marine and power plant customers, and is therefore constantly developing its network and services worldwide. Our lifecycle efficiency solutions are divided into the following service categories:

- Ship services
- Power & Industrial services
- Engine services
- Propulsion services
- Automation services
- Reconditioning services
- Training services
- Operations & Management

These service categories cover everything from basic support with parts, field service and technical support to service agreements and condition-based maintenance; from performance optimization including upgrades and conversions, to environmental solutions, technical information and online support.

You can choose from parts and maintenance services up to a variety of comprehensive, tailored long-term service agreements, including performance and operations & management agreements.

Our organization currently has over 8200 dedicated service professionals in more than 70 countries.

Wärtsilä adds value to its customers' businesses at every stage in the lifecycle of their installations. With Wärtsilä as your service partner, you receive many measurable benefits: availability and performance, productivity gains and cost benefits. Above all, peace of mind in the knowledge that your installation is being serviced by the most experienced partner you could have - Wärtsilä.

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. 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 which is clearly defined and carried out under controlled conditions.

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 in way of the combustion face of the valve spindle 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. Considering the fact these alloys are quite expensive, 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 over the world may have variations to 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, hence ensuring that the final product has the life time expectancy equal to new.

Wärtsilä procedures include building up and re-profiling the exhaust valve to original manufacturers' templates. The combustion face and the upper face of the valve disc are remanufactured by advanced robottic welding equipment. The re-stelliting of the seating face surface is carried out by the 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 any wear exists it is reconditioned using the HVOF spraying process. Wear in way of chromium plated stems can be rectified by removing the existing chromium layer and replacing it by 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, where after the sub-strata is built up, followed by re-stelliting and machining and grinding the valve seat back to original dimensions.

Mechanical and physical properties

- Wear resistant surface
- High micro hardness (DPH100>600)
- Low coefficient of friction
- High resistance against abrasive and adhesive wear

Customer benefits

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

TWO-STROKE PISTON ROD

Wärtsilä two-stroke piston reconditioning is designed to give ship operators ready access to low cost reconditioned pistons which in all respect, dimensionally and metallurgically, are the equal of new. Long term operation can only be guaranteed if through 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 preinspection 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 rewelded to avoid premature failure.
- Topside cracks. Pistons that fail in this manner can be rebuilt by special welding 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 bij OEM.
- Crown burning. All damage and the cracks must be removed, the crown will be rebuilt to original height and if required special protection layers can be applied.
- Severe crown burning and cracking. 10 mm deep burnings 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 the more modern types can be so severe that the crown must be replaced by a complete new section using appropriate welding preparations and procedures.

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 coating to minimise this wear. The engineering process involves making the surface ofthe piston rod wear resistant and ensures extreme load capacity and a long lifetime.

Atmospheric Plasma Spraying

Plasma spraying involves melting a material in powder form in a gas that has been intensely heated and ionized bij an electric arc. The high heat content and conductivity of this "plasma flame" and the extremely high velocity of the melted particles provide optimum conditions with respect to strength, adhesion, homogeneity and purity of the sprayed coating.

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 provides possibility to supply several types of full reconditioned covers directly 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, leak-age from sealing rings, cracking from the cooling bores and fretting of sealing faces and o-ring grooves.

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

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

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 is 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, machining processes and through 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 damages.

Inspection procedure

After cleaning the connecting rod, all serrations and bolts are being inspected visually, after which crack detection is carried out. If for instance cracks are found inside the threaded holes of the connecting rod, the rod is beyond repairs and is to be rejected for further use. If cracks may appear in other locations, reconditioning would still be possible. After crack detection the rod and cap are being assembled, bolts are tightened according to engine makers' 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 serrations
- Position of serrations
- Top angle of serrations
- Position of locating pin holes
- Straightness of rod
- Distance between the centre line of the big and small end bores
- Total weight of rod

Repair procedure

Two possible, Class approved, repair procedures, are available for reconditioning:

Method A

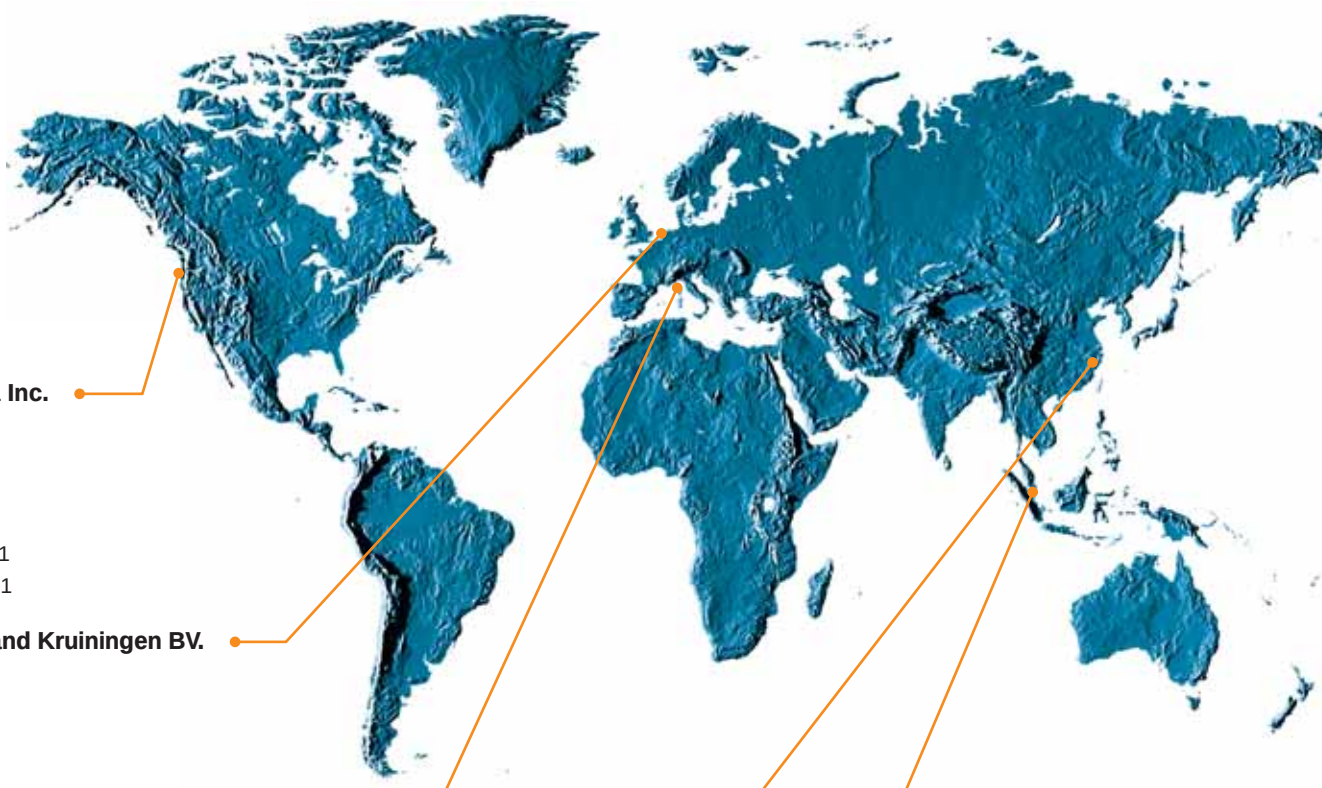
If no cracks are found during inspection, the following repair procedure is applicable. Serrations at the rod and cap side are skimmed on a CNC milling machine, which will reduce the diameter in vertical direction at the split. The separate parts are fitted again and mating faces be checked with blue paste, bolts are tightened in accordance with engine makers' instructions and the big-end bore is machined to original dimensions. Results of final crack detection and connecting rod geometry are being 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 cracks have disappeared. The machined connecting rod is preheated in the oven. Having reached the required temperature, the machined area is rebuild with certified Wärtsilä high quality alloys, following a controlled and strict welding procedure.

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

THE WÄRTSILÄ NETWORK OF RECONDITIONING SERVICES



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WÄRTSILÄ

Wärtsilä enhances the business of its customers by providing them with complete lifecycle power solutions. When creating better and environmentally compatible technologies, Wärtsilä focuses on the marine and energy markets with products and solutions as well as services.

Through innovative products and services, Wärtsilä sets out to be the most valued business partner of all its customers. This is achieved by the dedication of more than 13,000 professionals manning 130 Wärtsilä locations in close to 70 countries around the world.

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