



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 2013, Wärtsilä's net sales totalled EUR 4.7 billion with approximately 18,700 employees. The company has operations in nearly 200 locations in 70 countries around the world. Wärtsilä is listed on the NASDAQ OMX Helsinki, Finland.

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ENERGY
ENVIRONMENT
ECONOMY

WARTSILA.COM

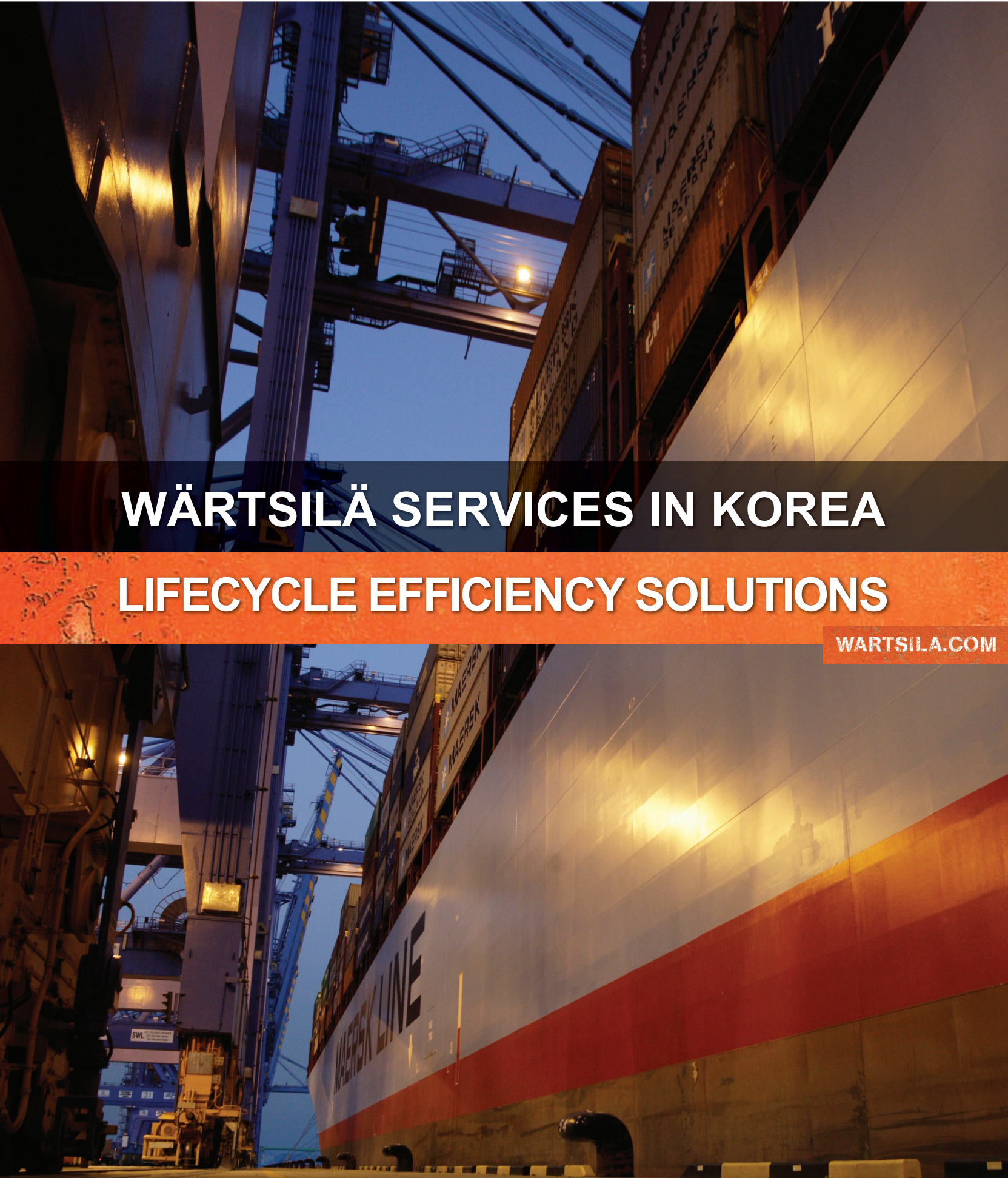
● WÄRTSILÄ NETWORK



WÄRTSILÄ SERVICES IN KOREA

LIFECYCLE EFFICIENCY SOLUTIONS

WARTSILA.COM



WÄRTSILÄ SERVICES IN KOREA

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WÄRTSILÄ SERVICES HAS THE WIDEST OFFERING ON THE MARKET AND SUPPORTS YOU THROUGH ITS GLOBAL NETWORK.

Our Service offering covers your installation from spare parts, maintenance and technical support to upgrade & retrofit and full service agreement. It means optimising persformance, ensuring eco-efficiency, and preventing problems before they happen. And it covers your requirements on land, in port, and at sea.

See how to improve the lifecycle efficiency of your installation at [wartsila.com/services](https://www.wartsila.com/services)



ON LAND



IN PORT



AT SEA





Wärtsilä Korea Main Office & Workshop



Wärtsilä Korea Land & Sea Academy

WÄRTSILÄ CORPORATION

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SHIP POWER

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Wärtsilä enhances the business of its marine and oil & gas industry customers by providing innovative products and integrated solutions that are safe, environmentally sustainable, efficient, flexible, and economically sound. Our solutions are developed based on our customers' needs and include products, systems and services. Being a technology leader, and through the experience, know-how and dedication of our personnel, we are able to customize optimized solutions for the benefit of our clients around the world.



POWER PLANTS

POWER PLANTS

Wärtsilä is a leading supplier of modern, environmentally advanced, highly efficient, and dynamic power plants that allow the maximum integration of intermittent renewable power generation. We offer multi-fuel power plants, including base load generation, peaking and load following operation, as well as dynamic system balancing and ultra-fast grid reserve. We serve both the current and future capacity markets. In addition to the technical advantages, our fast track deliveries of complete power plants, together with long-term operation and maintenance agreements, provide our customers with complete solutions - in urban areas as well as in the most demanding remote environments.



SERVICES

SERVICES

Wärtsilä supports its customers throughout the lifecycle of their installations by optimising efficiency and performance. We provide the most comprehensive portfolio of services and the broadest service network in the industry, for both the energy and marine markets. We are committed to providing high quality, expert support and the availability of services in the most environmentally sound way possible, wherever our customers are located.

WÄRTSILÄ SERVICES IN KOREA

Wärtsilä has operations in Korea, since mid 1970's. Wärtsilä Korea Ltd. is a fully-owned subsidiary of Wärtsilä Corporation, a Finnish engineering company focussing on the marine and energy markets with extensive ranges of products, solutions and services.

Wärtsilä Land & Sea Academy in Korea, which is part of Wärtsilä Services, was established in 2007 and it has steadily increased its reputation. It records 700 participants trained in Korea on average every year. It provides various types of training courses for land & sea based installations, covering Wärtsilä products.

We are continuously broadening our range of services and adding valuable products and specialist services to our portfolio. Our lifecycle efficiency solutions are provided within the following services solutions:

- Engine Services
- Propulsion services
- Seals & Bearings Services
- Electrical & Automation Services
- Service Agreements
- Training Services
- Environmental Services
- Expert Services
- Boiler Services

These service solutions cover everything from basic support with parts, field service and technical support to service agreements and condition based maintenance; from installation and commissioning, performance optimization,

Performance optimization

Our customers are looking for strategies to improve efficiency and reduce expenses

Preventing unexpected

Guaranteed performance and risk management are key needs for our customers



Environmental efficiency

Environmental legislation and energy efficiency are key drivers for our customers

LIFECYCLE EFFICIENCY

including upgrades and conversion, to environmental solutions, technical information and online support.

Our service network is the broadest in the industry, consisting of approximately 11,000 service professionals in more than 200 locations in nearly 70 countries. We offer expertise, local availability, responsiveness, and the most environmentally sound solutions for all customers, regardless of the manufacturer of their equipment.

Wärtsilä Services in Korea provides the excellent services with competent employees for all our customers 24/7.

wartsila.com (global)

wartsila.co.kr (local)



SERVICES MISSION

We create lifecycle services with our customers, enhancing their business - whenever, wherever.

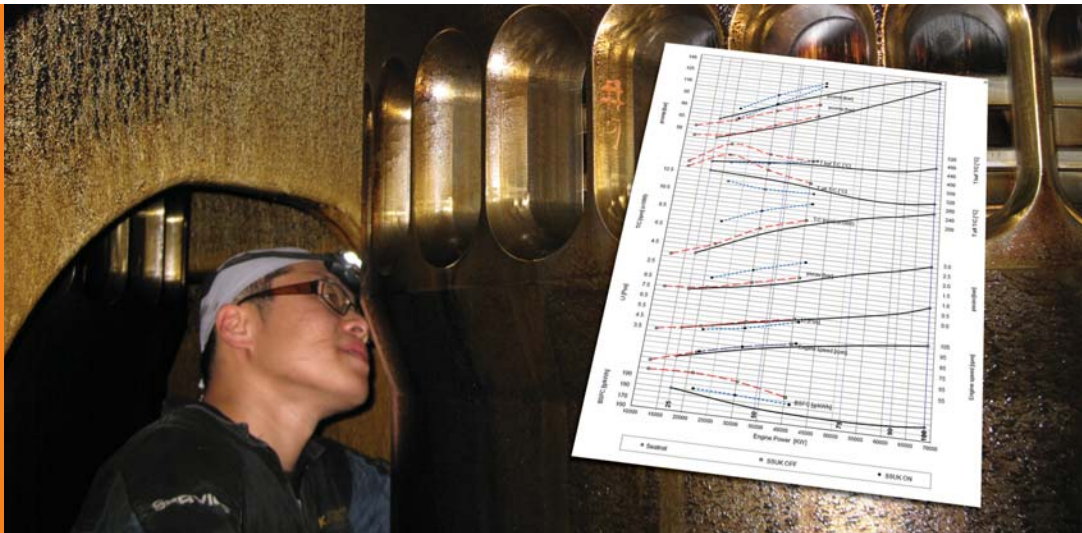
STRATEGIC GOAL

Our customers recognize Wärtsilä as their services partner: competitive, trusted and easy to deal with.

- Engine Services
- Propulsion Services
- Seals & Bearings Services
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OUR SERVICES

- Cylinder liner overhaul and inspection
- Cylinder cover overhaul
- Fuel pump overhaul and injection timing
- Piston / Gland Box overhaul
- Engine control system maintenance
- Engine performance check and evaluation
- Bearing overhaul and inspection
- Exhaust valve overhaul
- Cooler cleaning and overhaul
- Camshaft overhaul
- Gear train maintenance
- And more in accordance with maintenance manual requirements; please contact us for further information.

Our service can cover

Wärtsilä product engines;

- All RD, RN, RL, RT type
- All RT-Flex and W-X type
- All ZA type, WICHMANN type
- All GMT type

All other makes

2-STROKE ENGINE OVERHAUL



YOUR BENEFITS

- Improve vessel operation efficiency through planned maintenance
- Ensure operation sustainability and engine risk reduction through pre-inspection
- Immediate response for parts and man power arrangement
- Technical support from respective engine maker experts
- Reduce fuel and lubricating oil consumption by improving the running conditon
- Technical guidance after performance checks and evaluation

OUR CAPABILITIES

We provide full package services for Wärtsilä 2-stroke engines and other makes. We ensure the reliable performance of our customers installations, from regular running hour based maintenance to accidental repair.

We are confident in achieving the highest levels of satisfaction as an engine maker by providing the utmost level of quality and service to our clients.

OUR SERVICES

RT-flex engine control system check

- WECS components check
- WECS and Flex-View SW Check / Upgrade & Update
- Cabling and communication check.
- Crank angle mechanical component and signal check

Electronic cylinder lubrication system check:

- Lubrication pump condition check
- Measurement of the injected cylinder oil amount at each pump
- Lubrication quill tightness and opening pressure check
- Cabling and Software check
- Charging of Nitrogen accumulators.

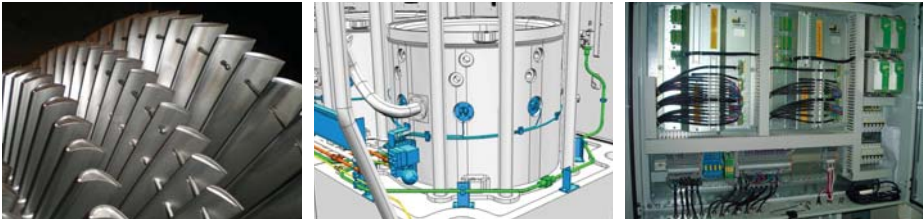
Engine and Turbocharger performance check

- Performance is compared with earlier measurements.
- Improvements and solutions are identified.

Piston running condition check

- Piston ring and cylinder liner condition check
- Piston ring groove wear measurement
- Piston centering check.
- Expertise in Piston Underside Inspection.

2-STROKE ENGINE FITNESS PACKAGES



YOUR BENEFITS

- Trouble-free operation of the electronic components of “intelligent” engines
- No surprises and early warnings about the piston-running condition
- Preventive maintenance and checks according to the equipment manuals
- Onboard checks during a normal port stay without any off-hire needs

OUR CAPABILITIES

We offer custom-made packages that fit your needs and available time during the vessels’ port stay. The work scope will be agreed and communicated prior to the service.

Our engineers will visit your vessel with all needed tools to perform the agreed work.

The reports are made with standardized templates and measuring sheets allowing a proper follow-up of the engine condition over time.

Recommendations are added after each inspection for required actions and improvement proposals.

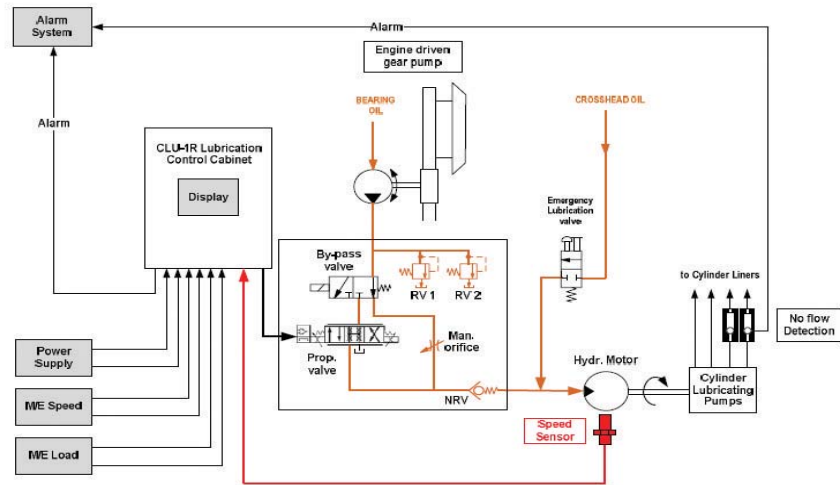
WÄRTSILÄ Engine Services

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OUR SERVICES

Installation of the main component includes :

- Pulse lubricating module consisting of a dosage pump with electronically controlled timing
- New lubricator quills
- Filter and measuring system
- Servo oil supply unit
- Control system
- Crank angle sensors
- Pipe & electrical work

Commissioning

- Parameter set in RPLS FlexView software
- Cylinder oil consumption measurement
- Piston / Liner inspection

RETROFIT PULSE LUBRICATION SYSTEM (RPLS)



YOUR BENEFITS

RPLS reduces CLO (Cylinder Lubricating Oil) consumption by 30 to 50 percent leading to a remarkable reduction of total operation costs. The system also guarantees accurate metering and precise injection of cylinder oil into the piston ring package and the environmental benefits of reduction in solid particle emissions due to reduced lube oil consumption.

OUR CAPABILITIES

We have highly qualified and skillful RPLS installation teams with lots of retrofit experiences for Wartsila All RTA engine type on numerous vessels (over 100 installation)

With only one contact, you can cover your entire retrofit workscope including dismantling of existing systems, piping remake, fitting of new components, electrical work, and recommissioning of new RPLS systems including training of operators.

We maximize the satisfaction of our clients.

RPLS can be installed during normal service hours of the engine and / or at port with no off-hire time

- 15 hours engine stand-still for CAS (Crank Angle Sensor) installation
- 7 days sailing with 4 men onboard for installation
- 24 hours engine stand-still for pre-commissioning, switch over and commissioning
- Short commissioning voyage from port to port for validation and eventual fine-tuning of the system

Alternatively RPLS can also be installed during dry-docking of the vessel.

OUR SERVICES

Modifications of existing system

- Removal of the mechanical components which control the old load indicator dependent cylinder lubrication system
- Removal of the former control valve

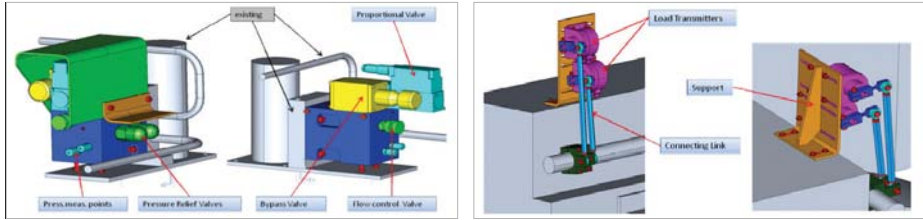
CLU-1E system

- The new electronic lubrication control system is installed in an engine room mounted cabinet.
- A new proportional valve controlled by the CLU-1E system adjusts the load dependent cylinder oil pump speed.
- The CLU-1E is a stand-alone system, independent from the existing Remote Control System (RCS)
- Engine speed and load indicator signals are used to calculate the actual engine power and the optimal cylinder oil feed rate.

Installation

- Engine speed and load indicator signals are used to calculate the actual engine power and the optimal cylinder oil feed rate.

CLU (CYLINDER LUBRICATION) 1-E UPGRADE



YOUR BENEFITS

- Optimized cylinder lubrication curve based on the engine power and not on the load indicator only
- Improved specific cylinder oil feed rate
- Reduction of cylinder oil costs & carbon deposits
- Improved reliability and increased safety
- Simple installation, eliminating weak mechanical parts

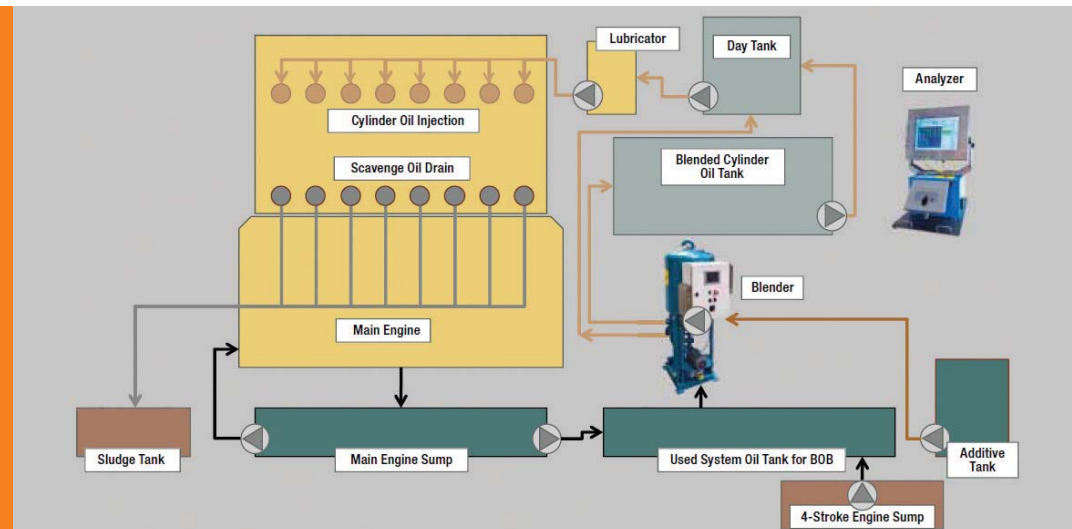
OUR CAPABILITIES

We offer the full retrofit package including materials, installation, commissioning and crew instructions.

WÄRTSILÄ Engine Services

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OUR SERVICES

What is BOB?

- The BOB system consists of a blender with a control panel, and an optional XRF analyzer.
- The BOB produces the cylinder lubricating oil by blending used main engine system oil with additives.
- Instead of purchasing commercial cylinder oil, the operator can use main engine or auxiliary engine system oil and add the additives.
- Some modifications to the existing piping and tank allocation will be necessary. (no new tank installations)
- The blended cylinder oil is pumped to the cylinder oil tank or directly to the cylinder oil daily tank.
- BOB is already approved by ABS and Lloyds Register.

BOB Solution

- Optimize the overall engine lubrication performance and costs
- Keep constant low cylinder oil feed rate also at high fuel sulfur contents
- Keep the engine crankcase and system oil clean

BOB (BLEND ON BOARD)



YOUR BENEFITS

- Lower costs compared to using commercial cylinder oil
- Overall lube oil consumption reduction by re-use of used system oil
- Optimal constant low cylinder oil feed rate by variable BN blending, matching the fuel sulfur content
- Engine cleanliness and reduction of deposits due to regular replenishment of new system oil in main & auxiliary engine
- Optional XRF analyzer: Analysis of HFO for cat fines, fuel sulfur level and all lubricated systems, as well as onboard analysis of used lube oil and fuel oil analysis

OUR CAPABILITIES

We provides full support and advise in required layout, installation, commissioning, and piping/tank adaptations.

We also offer a range of support services, from operational advice and overall lubrication optimization programs to supply of additives and system oils. The system supply and support services can also be packaged in an Engine Lubrication Management Agreement, which will provide additional guarantees and benefits.

OUR SERVICES

Scope of supply: on a turn-key basis

- Pre-inspection before modification
- Engine performance analysis before and after modification
- Turbocharger shut-off valves, new piping, manifold compensators, cabling, control system, and all other parts and materials, including transport to ship
- Installation and commissioning
- NOx emission measurement and certification

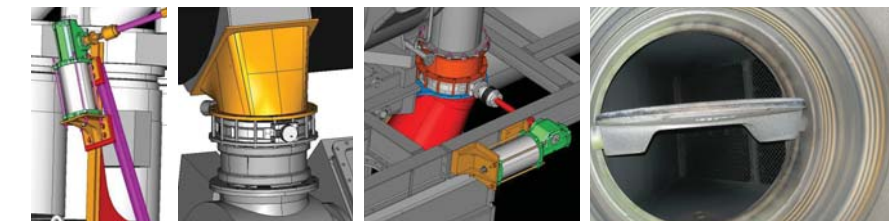
Concept of upgrade kit:

- Cutting out a turbocharger when the engine is to be operated at low load
- Increasing of the scavenge air delivery at low load for better combustion and more optimum temperatures of engine components
- Fitting remotely controlled shut off valves on the exhaust duct and air ducts
- Fitting a control system to operate the valves

Option:

- RPLS: although not included in the standard scope of supply for the kit, it is highly recommended that the engine is equipped with the Pulse Lubricating System (PLS). This well-proven electronically-controlled cylinder lubrication system will ensure reliable engine operation during prolonged slow steaming.

SSUK (SLOW STEAMING UNIT KIT)



YOUR BENEFITS

- Major savings in fuel costs and a major reduction in BSFC (brake specific fuel consumption)
- Extend the load range of engine for continuous operation
- Prevent the risk of engine fouling and excessive component temperatures in case of continuous operating that is below 50% of engine load

OUR CAPABILITIES

We provide a total service ranging from pre-inspection of the location where the equipment is installed, installation, commissioning, engine performance analysis, NOx emission measurement to trouble shooting.

We can install the upgrade kit for all RTA and RT-flex engines with multiple turbochargers. The modified engine can be operated at any time up to its full installed power for full sea speed.

The installation and commissioning of the upgrade kit can be completed during normal commercial operation of the ship and during normal port calls for the majority of engine types.

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OUR SERVICES

FAST fuel injection nozzles
(Fuel Actuated Sacless Technology) have reduced sachole volume by more than 90%. This allows to reduce emissions and fuel consumption by improving fuel injection performance.

FAST nozzle has been introduced in 2012 for newbuild Wärtsilä 2-stroke engine.

FAST nozzle can be fitted on below engine types irrespective of the IMO compliance status (none, Tier 1 or 2, if not explicitly mentioned otherwise in the table).

- RTflex50
- RTflex58T
- RTflex60
- RTflex68T, Tier 2
- RTflex82C, Tier 2
- RTflex82T
- RTflex84T, Tier 2
- RTflex96C, w/o WHR

*For the engine not mentioned along with RTA engine, FAST nozzle development will be continued and validated solutions will be released accordingly.

FAST INJECTION NOZZLE



YOUR BENEFITS

- Reduced fuel operating costs at part load operation
- Reduced maintenance cost
- Increase environmental friendliness

OUR CAPABILITIES

The modification of standard nozzles to FAST nozzles and respective installation can be installed within normal vessel schedule. Depending from port stay length and number of cylinder 2 to 4 port stays are required.

A minimum port stay of 20 hours is required to modify up to 3 cylinder covers by Wärtsilä service engineers.

The detailed schedule and work flow need to be aligned between customer and Wärtsilä

OUR SERVICES

- Fuel injection pump and nozzle overhaul
- Piston and cylinder liner overhaul
- Cylinder head overhaul
- Injection timing adjustment and camshaft overhaul
- Crankshaft replacement
- Engine block replacement
- Engine control system maintenance (WECS, UNIC)
- And more in accordance with maintenance manual requirements; please contact us for further information.

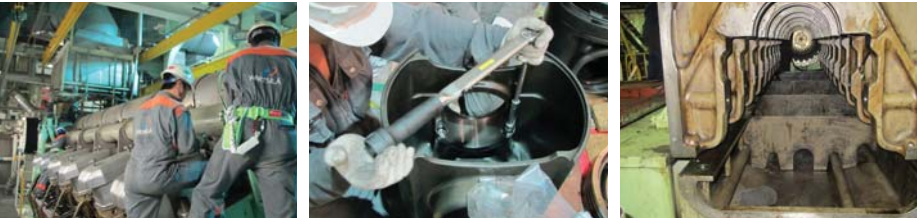
Our service can cover

Wärtsilä product engines;

- Wärtsilä DIESEL VASA 14 22/26 22ABC 22HF 22MD 24TS 32 32DF 32GD 32LN 32LNGD 34SG
- Wärtsilä W175 W200 W220 W32 W32GD W34DF W34SG W46 W46F W46GD W50DF W50SG W26 W38 W38B W64 W38A
- CREPEL CR26
- GRANDE MOTORI G1K G42 G55 GMT210 GMT230 GMT300 GMT320 GMT420
- SULZER AL20 AL20H AL25 AS25 ASL25D ASL25H ASV25D ASV25H AT25 ATL25D ATL25H ATV25D ATV25H AV25 S20 S20D S20H S20U Z40 ZA40 ZA40S ZA50S
- STORK WERKSPORE 150 190 210 240 280 410 620
- DEUTZ MARINE D1822 D2016 D232 D234 D327 D350 D358 D366 D440 D441 D444 D484 D500 D501 D510 D511 D518 D528 D536 D540 D545 D601 D602 D603 D604 D604B D616 D618 D620 D628 D640 D645 D716 D816 DPA6
- SACM UD150 UD18 UD23 UD25 UD30 UD33 UD45 UDPZ UDX

All other makes

4-STROKE ENGINE OVERHAUL



YOUR BENEFITS

- Improve vessel operation efficiency through planned maintenance
- Maintain operation sustainability and engine risk reduction through our services
- Fast reaction for parts and flexible man power arrangement
- Technical support from respective engine makers

OUR CAPABILITIES

We provide full package services for Wärtsilä 4-stroke engines and other makes .Overhauls can be done during sailing, dry docking, along side, anchorage, etc. We ensure the reliable performance of our customers installations, from regular running hour based maintenance to accidental repair.

We are confident in achieving the highest levels of satisfaction as an engine maker by providing the utmost level of quality and service to our clients.

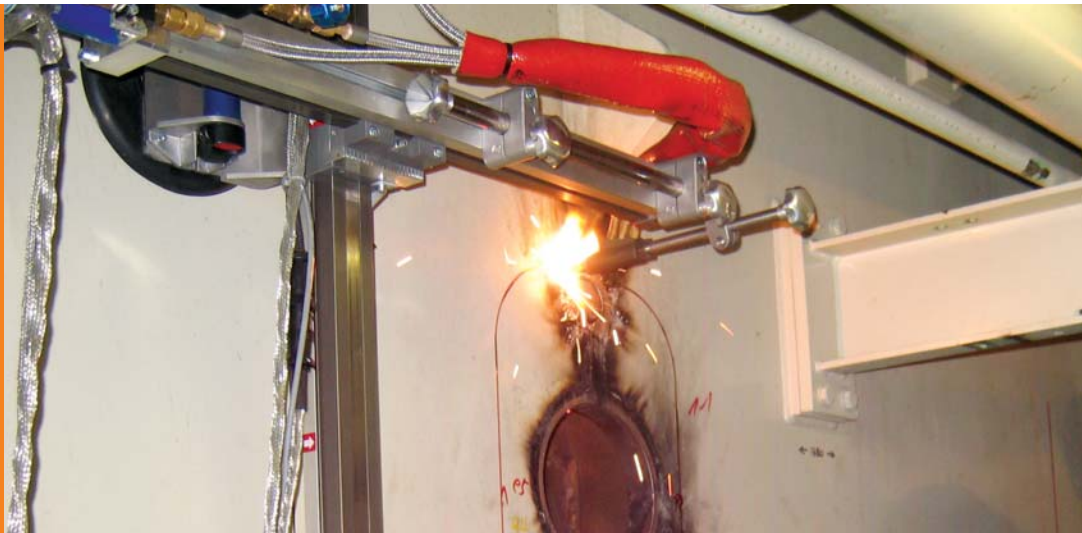
Through our services we strive for an economical feasible way to extend the lifetime of our customers' equipment through efficient product development to meet future operational and environmental requirements

Provide right level of services to our customers by understanding their business.

- Engine Services
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OUR SERVICES

- Overhauling of injection equipment :**
- Fuel injection valves (2-S, 4-S, DF)
 - Fuel pumps (2-S, 4-S)
 - Relief valves
 - 2-Stroke fuel pumps blocks
 - High pressure pipe
 - Gas admission valves

FUEL INJECTION EQUIPMENT OVERHAUL



YOUR BENEFITS

Well maintained fuel injection equipment has a great impact on engine performance and installation operating costs.

OUR CAPABILITIES

By applying the latest technology, expertise and design with our state of the art equipment, we provide the highest standard of quality and warranties for all remanufactured components.

In accordance with our overhaul procedure, only genuine spare parts are used. Each overhauled component will be delivered to the end customer with the overhaul protocol and test records as hard copy files.

OUR SERVICES

- Engine structure**
- Bedplate and gear column crack repair
 - A-frame crack repair
 - Air receiver crack repair
 - Engine modification
- Piping work**
- Engine room and deck piping system renewal or modification
 - Charge air cooler drain system modification
- Hull repair**
- Hatch cover crack repair
 - Hull steel plate repair
 - Water tight door crack repair
 - Ballast tank, tank top, etc.

STRUCTURAL WELDING



YOUR BENEFITS

- We provide the optimum solution.
- With only one contact, you can cover your entire workscope including dismantling, welding, inspection by CWI ('Certified Welding Inspector according to AWS Standard'), machining and reassembling.

OUR CAPABILITIES

Our experienced welding specialists are the leading force in carrying out the structural repair on diesel engines in the world.

All structural welding repairs are carried out in accordance with Classification Societies and in closer cooperation with manufacturer specific procedures. (SRP: Specific Repair Procedure). All our welding personnel are certified by the leading shipping business Classification Societies.

'We are ready to move' with a full package of the necessary parts and equipment in our 'flying containers' wherever our customers need us to be.

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OUR SERVICES

- All types of crankshafts:**
- Main bearing journal repairs
 - Crank pin repairs
 - Pin and journal diameter between 170 - 1'200mm
 - Possibility to machine the 2-Stroke main bearing girders (saddles) without lifting the crankshaft
 - Material can be removed by cutting (bits) rotating grinders or superfinish oscillating head
 - The machining depth can be reduced by heat treatment (anealing) of the overheated surface

IN-SITU CRANKSHAFT MACHINING



YOUR BENEFITS

You can save long auxiliary engine downtimes or minimize off-hire times of your main engines. By machining the crankshaft in place without dismantling it from the engine, the repair time and costs are drastically reduced. With our many years of experience in crankshaft repairs we can guarantee a desirable result.

OUR CAPABILITIES

- Since every damage case is unique, our engineers and machining experts assess the damaged components and are able to offer the best combination of repair methods:
- Crankshaft heat treatment in order to lower the hardness of the overheated areas
 - Material removal by cutting, which is the safest method to prevent further heating damages of the crankshaft material
 - Grinding of radius areas and oil inlet holes
 - Superfinish (polishing) of the final surface

Fretting between main bearing shells and girders on large 2 - Stroke engines can roughen up the girder surface and complicate the bearing shell exchange. We are available to customize the machining basket to any journal size so as to machine or polish the affected girder areas located under the fitted crankshaft.

OUR SERVICES

- Realignment of bearing channels
- Machining or restoring of large threads
- Machining of flange coupling pin-holes
- Bearing boss machining on 2-Stroke engine columns after welding repairs
- Restoring damaged liner sealing surfaces
- Machining oversized bearing bores

IN-SITU BORE AND FLANGE MACHINING



YOUR BENEFITS

Line boring is often the only possibility to restore worn down or damaged bores and flanges. We can suggest a suitable repair method and guarantee a desirable result.

OUR CAPABILITIES

- With our wide range of line bore machines and experience from various repairs, our innovative machining experts are able to propose a suitable repair method. In-line bores and cylindrical surfaces can be machined by a cutting bit rotating on a well supported shaft.
- Machining of in-line bores from 80 mm up to 600 mm in diameter
 - Maximizing the length of the machining channel up to 6'000 mm
 - Machining of flanges and sealing surfaces up to diameters of 700mm (expandable) 120mm axial machining length possible

Our laser alignment equipment can be used to align the boring bar in long bearing channels and can also be used to verify the final result.

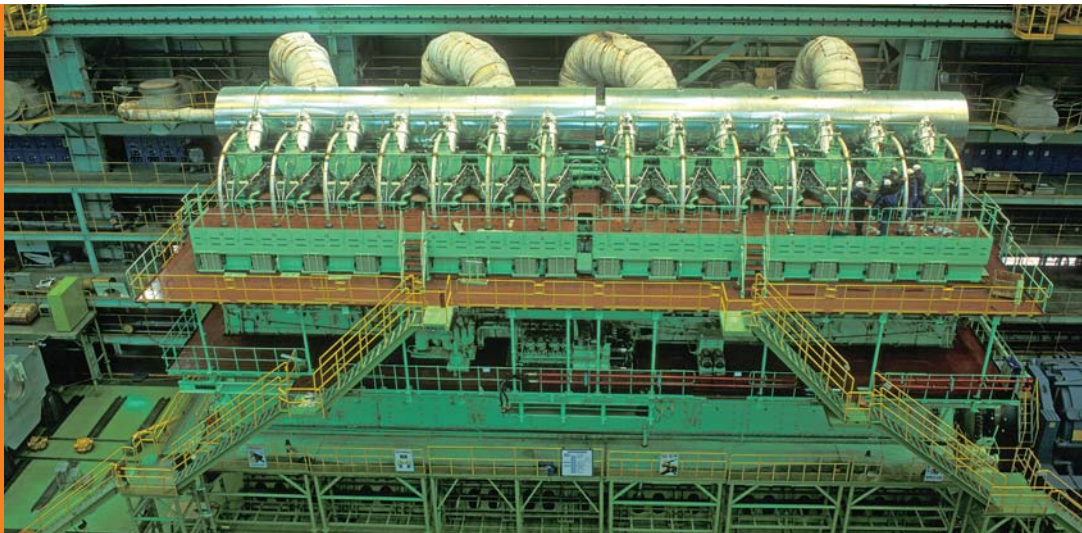
WÄRTSILÄ Engine Services

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OUR SERVICES

- Guide rail machining of 2 stroke crosshead engines
- Machinery foundations (crane pedestals ect)
- Rudder stock keyway machining

IN-SITU MILLING AND GRINDING



YOUR BENEFITS

In-situ machining can achieve results with a high level of accuracy within a short period of time. Combined with our laser alignment measuring methods we guarantee a desirable result.

OUR CAPABILITIES

Over the years our machining experts have developed portable milling and machine frames with various heads:

- Portable plane milling machine with a maximum range of 1'700mm
- Portable rotating frame for diameters up to 3'500 mm.

Different milling head arrangements allow parallel or perpendicular machining angles to the main sliding plane, grinding heads, superfinish heads etc.

Tailor-made applications are possible.
Possibility to combine with in-house 2-D Laser alignment

OUR SERVICES

- Regular surveys (Preventive Maintenance)
- Dry-docking Surveys
- Shop test and sea trial attendance
- Damage investigations
- Engine performance evaluation
- Tribological investigations (piston running)
- Engine and shaft alignment

SITE SURVEYS



YOUR BENEFITS

Have real experts on site capable of solving your problems and extend the lifetime of your equipment.
Receive a high quality survey report with recommendations for improvements.

OUR CAPABILITIES

We have experts specialized in marine and land based 2 - Stroke and 4 - Stroke installations and propulsion products.

Our experts in each field are available 24/7 around the globe and ready to assist the operators.

Supported by a strong local technical service team and by utilizing our expert service capabilities, our first priority is to ensure a trouble free and efficient operation of the machinery or plant.

High quality and accurate reporting with action recommendations is a basis for proper planing and follow-up of the installation.

Site surveys can also be part of Operation and Maintenance Agreements between the operator and Wärtsilä.

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WÄRTSILÄ Propulsion Services

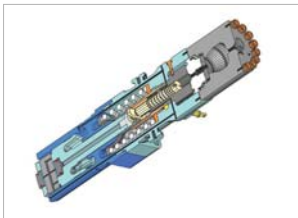
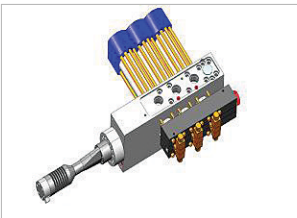
- Engine Services
- Propulsion Services
- Seals & Bearings Services
- Electrical & Automation Services
- Environmental Services
- Service Agreements
- Training Services
- Expert Services
- Boiler Services



OUR SERVICES

RT-flex Engine component renewal service includes :

- ICU (Injection control units)
- FOP (Supply unit fuel injecton pumps)
- SOP (DYNEX Servo oil pump)
- IFA (Intermediate fuel accumulator)
- PCV (Pressure control valve for rail unit)
- CLU-4(-4C) (Pulse Lubrication Pump)



YOUR BENEFITS

Wärtsilä is offering renewed engine components on an exchange basis for RT-flex engine types.
By returning used RT-flex engine components, you will receive a price reduction on renewed components.

OUR CAPABILITIES

Our warehouse maintains a pool of renewed RT-flex engine components for immediate exchange which are service tested in our qualified renewal centre.
Costs for renewed RT-flex engine components are substantially lower compared to the cost of new components.

OUR SERVICES

CPP / FPP Service

- Installation of shafting and propeller
- Installation commissioning
- Overhaul of blades, hub, oil distribution box
- Control system maintenance / upgrade
- Spare parts

Thruster

- Installation of thruster
- Installation commissioning
- Overhaul of blades, hub, oil distribution box
- Spare parts

PROPELLER / THRUSTER



YOUR BENEFITS

With one contact, you can cover your entire proplusion system overhaul and installation.
The risk of costly reworking can be minimized when your propulsion system is serviced by our experts.

OUR CAPABILITIES

We have supplied and commissioned many different types of propulsion products and therefore, we are able to provide an entire propulsion service package.
This includes support, maintenance, installation and commissioning and periodical repair by our skilled experts with exclusive use of genuine parts.
Our services can be executed at shipyards, while dry docked, under trimmed condition / afloat and underwater.

WÄRTSILÄ Propulsion Services

- Engine Services
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- Boiler Services



WÄRTSILÄ Propulsion Services

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- Boiler Services



OUR SERVICES

- Propeller repair**
- Propeller straightening
 - Propeller welding repair
 - Propeller cleaning / cutting / polishing / Superpolishing
- Trailing modification**
- TEM (Trailing Edge Modification)
 - Diameter reduction
 - Replacement with a propeller of new design
 - Anti-Singing modification
- Non Wärtsilä makers**
- Propeller welding repair / straightening / polishing
 - TEM (Trailing Edge Modification)
 - Diameter reduction and providing a new design
 - Anti-Singing modification

PROPELLER REPAIR & MODIFICATION



YOUR BENEFITS

The propeller is a vulnerable piece of equipment that can be seriously damaged by underwater objects. For all kinds of propeller damage, we have a team of expert technicians at your disposal.

- Save fuel costs / efficiency of ship's operation costs.
- Reduce working time / transportation time and costs.

OUR CAPABILITIES

We have a group of class-approved welding technicians available to carry out propeller repairs at local ship repair yards or afloat.

Wärtsilä Korea achieved WPS CU3 certification from DNV.

We are able to cut or straighten distortions on Wartsila Korea achieved WPS CU3 certification from DNV blades which is a way to keep propeller efficiency as high as possible.

As we are linked to a wide network, we have specialized toolboxes available at several of our main hubs.

OUR SERVICES

- Electrical & control part upgrades**
- Improvement controls and electrical equipment
 - Hydraulic & digital systems
 - Lipstronics 4000 / UNIC propulsion control system extended in old control system
- Mechanical part upgrades**
- Replacement of the OD (Oil Distributor) box
 - Replacement of pitch positioner
 - Hydraulic installation / propeller shaft seals
 - Propeller shaft seals
 - Environmental safe solution
 - New hub / blade design for efficiency
 - Propulsion improvement package

PROPULSION UPGRADES



YOUR BENEFITS

A retrofit optimizes the entire installation resulting in better accuracy and an up to date system.

- Decreasing fuel consumption by optimized scheduling of pitch and shaft speed
- Reducing maintenance costs
- Wave filter : More effective load control reduces wear
- More reliable control and availability of spare parts

OUR CAPABILITIES

We have accumulated a considerable amount of experience over a century in the shipping industry and also integrated know-how of propulsion systems and control systems.

Our strength lies in having a global network with large installed bases and possibilities to upgrade both Wärtsilä and other OEM (Original Equipment Manufacturer) equipment.

- Wärtsilä Korea Propulsion Services cover the following:
- Upgrade to advanced & effective versions
 - Extension to old control system
 - Mechanical upgrades or replacement
 - Upgrades of hydraulic system
 - Upgrades to new design propulsion products

WÄRTSILÄ

Propulsion Services

Engine Services

Propulsion Services

Seals & Bearings Services

Electrical & Automation Services

Environmental Services

Service Agreements

Training Services

Expert Services

Boiler Services



WÄRTSILÄ

Propulsion Services

Engine Services

Propulsion Services

Seals & Bearings Services

Electrical & Automation Services

Environmental Services

Service Agreements

Training Services

Expert Services

Boiler Services



OUR SERVICES

Tunnel Thrusters

- Tunnel thruster grate repairs or inspection
- Blade repairs, straightening and welding
- Blade seal or other seal replacement
- Gear lash inspection / any maintenance or repairs

Stern Tube Seals

- Stern tube seal inspection
- Stern tube seal overhauling and bonding

Propellers

- Inspection of damaged or leaking propellers
- Replacement of CPP blades and seals
- Hub removal & variable components maintenance
- Propeller straightening
- Propeller welding
- Propeller modification with new design

UNDERWATER REPAIRS



YOUR BENEFITS

Owners and operators can maximize the performance of their assets and minimize costs by reducing off-hire times while, at the same time, maintaining the equipment in accordance with recommended service intervals. Improvements in hydrodynamic efficiency can also provide faster returns on investment.

OUR CAPABILITIES

We offer a full range of underwater repairs, as an option that decreases the vessel's downtime and eliminates the need for dry-docking. For underwater repair work, we have developed a unique procedure with the standard OEM (Original Equipment Manufacturer) repair guarantee.

OUR SERVICES

FOR ALL SHIP TYPE EQUIPPED WITH FPP

The Wärtsilä EnergoProFin is suitable for all new builds and existing vessels regardless of propeller make. The EnergoProFin is only applicable to vessels with fixed pitch propeller

ENERGO PROFIN



YOUR BENEFITS

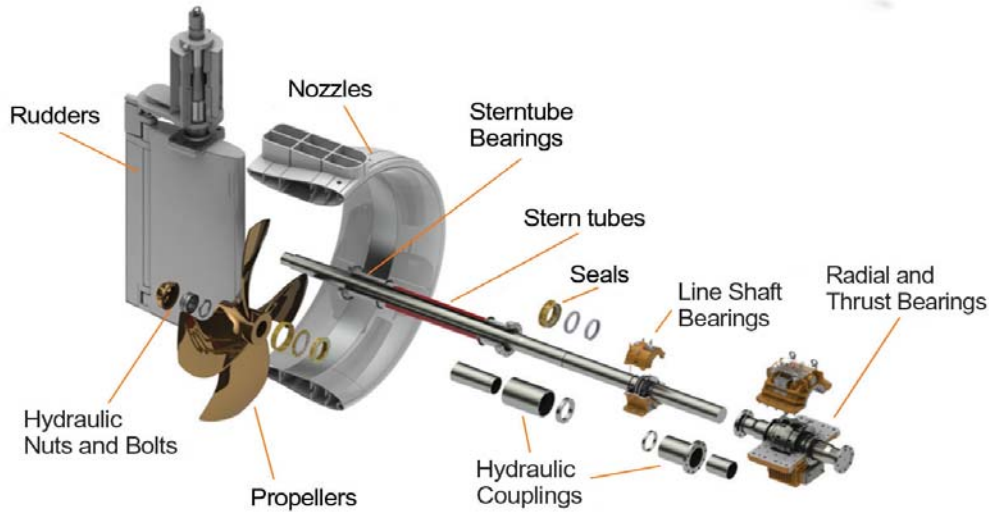
Wärtsilä is continuously improving the energy efficiency of propulsion solutions. Our aim is to reduce the fuel consumption and the operational costs of seagoing vessels. We optimize our solutions to specific customer requirements, utilizing our extensive marine propulsion experience and state-of-the-art, modern techniques, such as CFD (Computational Fluid Dynamics).

OUR CAPABILITIES

The Wärtsilä EnergoProFin is designed as an integral part of the propeller. The installation of the EnergoProFin will not affect the manoeuvrability of the vessel. The EnergoProFin will be delivered including all required mounting materials and tools. Mounting of the EnergoProFin is simple and can be performed by the shipyards. A clear installation manual will be provided with the order. If required, Wärtsilä can provide skilled service engineers for local installation support.

WÄRTSILÄ **Seals & Bearings Services**

- Engine Services
- Propulsion Services
- Seals & Bearings Services**
- Electrical & Automation Services
- Environmental Services
- Service Agreements
- Training Services
- Expert Services
- Boiler Services



WÄRTSILÄ **Electrical & Automation Services**

- Engine Services
- Propulsion Services
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- Electrical & Automation Services**
- Environmental Services
- Service Agreements
- Training Services
- Expert Services
- Boiler Services



OUR SERVICES

WÄRTSILÄ SEALS

- Stern Tube Seal
- Lip Seal
- Face Seal
- Rudder Seal
- Bulk Head Seal
- Pot Seal
- Thruster Seal
- Water-jet Seal

STERN TUBE SEALS

- LIP type stern tube seals bonding & overhauling
- Face type stern tube seals overhauling
- Cedervall type stern tube seal overhauling
- Stern tube bearings / liner installation / inspection
- Net guard installation
- Spare parts

WÄRTSILÄ BEARINGS

- Stern Tube Bearing
- Generator Bearing
- Line Shaft Bearing
- Intermediate Thruster Bearing
- Rudder Bearing

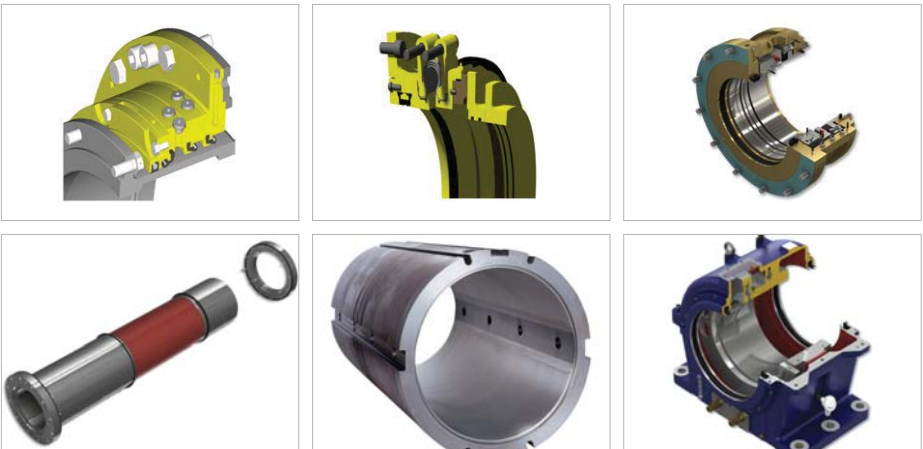
WÄRTSILÄ Oil and Water Lubricated Stern Tube Solutions (Oil & Water Lubricated Stern Tubes)

WÄRTSILÄ OTHER PRODUCTS

- Rudder
- Nozzles and Tunnel
- Hydraulic Couplings, Nut and Bolt

UNDER WATER SERVICE

STERN TUBE SEALS & BEARINGS / BIO SEAL



YOUR BENEFITS

With only one contact, you can cover your entire workscope; seals, bearings, liners, hydraulic systems etc. We are the most specailized seal & bearing solution provider from new constructions to repairs and upgrades.

The new Wärtsilä Bio seal ring TM is designed for Environmental Acceptable Lubricants (EAL's) We offer seal ring lifetime of at least 5 years to meet your service schedule without compromise

OUR CAPABILITIES

We provide all kinds of seals & bearings for military vessels including submarines and merchant marine vessels. We gaurantee the best quality products and lifecycle maintenance service when our specialized engineers do installation and repairs; shipyard installtions, docking repairs, bonding repairs, underwater repairs and upgrade of system

OUR SERVICES

WOODWARD GOVERNOR

- SG,PSG
- UG-5.7/7/8/10/15/25/40
- PG-16/29/58/200/300/500
- 3161
- PG_EG ACTUATOR
- EGB-3P/10P/29/58

ELECTRICAL ACTUATOR

- Woodward proact
- Heinzmann

EUROPA/RUSSIA(PH-30/50)

DIESEL KIKI(RHD6/10)

GOVERNOR OVERHAUL, CALIBRATION & INSPECTION



YOUR BENEFITS

- Authorized business partner with Woodward
- Optimized governor tuning based on engine characteristics
- Exchange service available for most commonly used types of governor

OUR CAPABILITIES

Governor and actuator overhaul & calibration service with test bench

1. Accumulator oil pressure checking
2. Speed droop check & setting
3. High & low speed setting
4. Load feedback condition checking
5. Electric & pneumatic fuel start limiter setting
6. Electric shutdown device setting
7. Hydraulic seals and needle valve setting
8. Hunting and jiggling check & adjusting
9. Governor oil leak checking
10. Temperature checking at normal running condition on our test bench

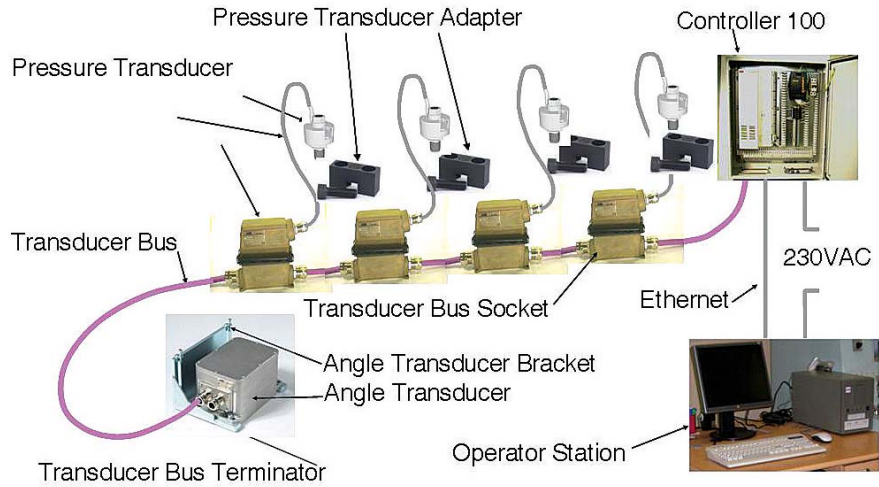
WÄRTSILÄ Electrical & Automation Services

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WÄRTSILÄ Electrical & Automation Services

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OUR SERVICES

General electric works

- Complete electric system recovering from fire / sunken disaster
- Power analysis service
- Insulation test and thermo graphic analysis
- Control console and cabinet upgrade
- Electrical trouble shooting
- Pneumatic system repair and maintenance

Wärtsilä automation system upgrade

- SBC -7 M/E remote control system
- Wärtsilä Engine control system

Wärtsilä Electrical & Automation product

- Switchboard (SWBD)
- Frequency Converters (VSD)
- Power Management System (PMS)
- Intergrated Automation System (IAS)
- Alarm Monitoring System (AMS)

UPGRADES OF AUTOMATION SYSTEMS



YOUR BENEFITS

With only one contact, you can cover your entire workscope including electrical and pneumatic equipment, automation, repair, maintenance, troubleshooting and upgrades.

OUR CAPABILITIES

We provide electrical and automation services from installations, retrofitting and commissioning with experienced engineers. Our work is supported by contracting with several automation companies and good cooperation with other major BMS (Bridge Maneuvering System) suppliers. We are producing own E&A products and providing commissioning service, trouble shoot and upgrade service.

OUR SERVICES

ICM(Intelligent Combustion Monitoring)

Based on real-time monitoring of the Cylinder pressure Wärtsilä provides an electronic mate who assists reliable and economic operation of 2-stroke diesel engines at marine propulsion and power generation plant

Scope of supply

- Combustion pressure sensors
- Crank angle sensors and brackets
- Controller and operator station
- Cabling, brackets & consumables etc.

ICC(Intelligent Combustion Control)

After gaining positive service experience in the field, it has been decided to introduce this product as an option on new engines in order that they can take advantage of the following benefits from the very beginning:

- Optimised fuel consumption over the whole load range
- Reduced maintenance costs and downtime
- Fully automated balancing
- Real-time data
- Reduced workload for crew and technical department
- Maximised availability and reliability through a safer, finely balanced engine operation
- no changes to the WECS-9520 function checklists
- the IMO Technical File is not affected

Scope of supply

If FCM-20 Hardware 7 is not installed, new FCM-20s need to be mounted.
If older ABB pressure transducers (build 2005/2006) are still installed, transducers need to be exchanged with new type.

ICC / ICM



YOUR BENEFITS

ICM is an established means of measuring and evaluating cylinder pressure data, ICC from ensures that an engine is operated as intended with maximum safety and efficiency. You will benefit from better maintenance planning and higher fuel efficiency and longer lifetime of components.

OUR CAPABILITIES

We offer, install, commission and verify the entire ICM product line. Your crews can be trained at our training centre 'WLSA Korea', as well as on board by our experts. 12 - 24 hours engine standstill in port is required for sensor installation on engine side, cabling and operator station installation can be completed in port or on sea.

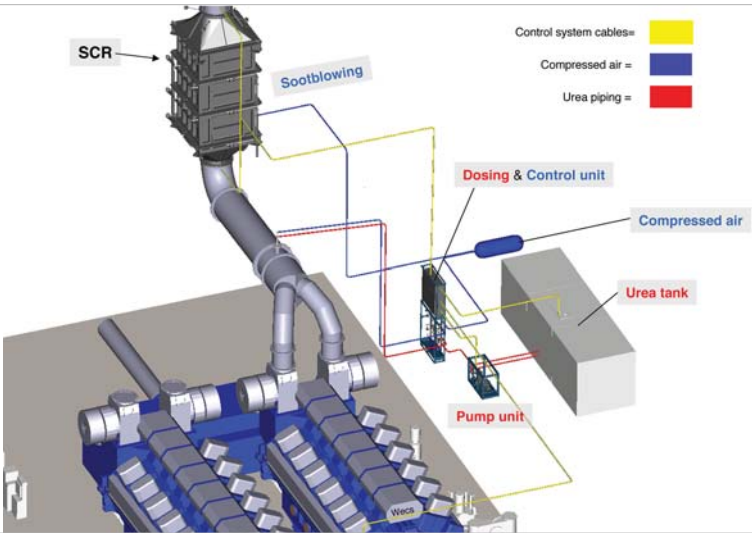
WÄRTSILÄ Environmental Services

- Engine Services
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WÄRTSILÄ Environmental Services

- Engine Services
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OUR SERVICES

- Unit and part sales
- Installation
- Commissioning
- Servicing
- Training

* Note
Detailed product specifications can be found on the website.

OILY WATER SEPARATION SYSTEM



YOUR BENEFITS

SENITEC M - and P - Series are approved according to IMO solution MPEC 107(49) and the US Coast guard according to the US 46 CRF 162.050. The units can be operated on low maintenance / operation costs, high capacity with low space requirements and the summarized advantages below :

- Reduces sludge / bilge disposal need
- Smaller harbour fees and less maintenance
- Fouling of sludge tank can be avoided by separating discharges of solids
- Works in low and high temperature ranges
- Can handle 0 - 100% oil
- Not sensitive to soot or cleaning chemicals
- Fully stainless steel housing - long lasting quality

Today, the Senitec M- and P-Series are the most complete sludge and bilge treatment units on the market.

OUR CAPABILITIES

We offer a complete Wärtsilä Senitec oily water separation system for land and marine based applications. Together with a design that can handle today's tough conditions in the marine or land based environment, we can offer a complete installation, commissioning, maintenance and training program. Retrofitting of complete units on existing installations is possible without interrupting operations.

OUR SERVICES

WÄRTSILÄ SOx SCRUBBER
WÄRTSILÄ NOR (NOx Reducer)

- Emission matter solution consultant
- Emission measuring service
- Installation service
- Commissioning and approval service
- Maintenance and repair service
- Spare parts

SELECTIVE CATALYTIC REDUCTION (SCR) / SCRUBBER



YOUR BENEFITS

SOx-scrubbing is the most economical way to comply with IMO regulations regarding SOx (Regulation 14). In SOx Emission Control Areas the savings to costs is immediate. Wärtsilä fresh water scrubber solutions are fit for new buildings and retrofits, for any engine and boiler brand. WÄRTSILÄ NOR (Nitrogen Oxide Reducer) is based on selective catalytic reduction technology. The NOR portfolio covers Wärtsilä's medium-speed engine portfolio mainly for marine applications. The size of the NOR is optimized in terms of modularity, performance and costs. NOx emissions are reduced up to 90%.

OUR CAPABILITIES

We provide an optimized solution for the latest emission regulations, evaluate your vessels/plants/installations and select the appropriate equipment size. We offer installation, commissioning, test running, maintenance and spare parts.

WÄRTSILÄ Environmental Services

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WÄRTSILÄ Environmental Services

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OUR SERVICES

We provide a total solution for environmental equipments and services.

WÄRTSILÄ BALLAST WATER TREATMENT

- Ballast water matter consultant
- Installation and retrofitting service
- Commissioning and approval service
- Maintenance and repair service

BALLAST WATER TREATMENT (BWT)



YOUR BENEFITS

The system is purpose-built and optimized for the treatment of ballast water, with all active components fitted within the same housing. This allows for an easy installation, and since both treatment process steps are handled in a single unit, it offers a high degree of predictability for any pressure drops. No extra pipes are required to join the two treatment units, which means no additional pressure losses.

OUR CAPABILITIES

Our service team can install BWT systems during sailing without interfering with the ship's schedule and onboard daily operation. We can inspect vessels and provide recommendations for optimized installations. We provide a total service package, such as pipe work, installation of the unit, welding, electrical installation, commissioning and crew training on site.

OUR SERVICES

Measurement of Emission according to IMO Technical NOx code 2008 ANNEX VI Simplified on-board verification

Measuring equipment and measuring procedures fulfill the IMO and class requirements for amendments of the technical file in case of Tier I / II upgrades, changes of engine tuning or changes of IMO controlled components.

- Emission concentration measuring ranges:
- Nitrogen Oxides (NOx) up to 2'500 ppm
 - Sulphur Oxides (SOx) up to 3'000 ppm
 - Carbon Dioxide (CO2) up to 20% vol
 - Carbon Monoxide (CO) up to 5'000 ppm
 - Oxygen (O2) up to 25% vol

In case a continuous emission monitoring is required, Wärtsilä can offer the Continuous Emission Monitoring System (CEMS) with full reporting capabilities in accordance with customer / authority requirements. Alternatively, a simpler analyzer / feedback system (e.g. after treatment systems) can be offered.

EMISSION MEASUREMENTS



YOUR BENEFITS

- Verification of compliance with applicable emission legislations after modifications, upgrades and legislation changes and prototype Fuel
- Emission measurements also support engine condition and performance checks.

OUR CAPABILITIES

A multihole sampling probe is inserted into the exhaust manifold to measure gas concentration. The exhaust gas sample is extracted via a heated filter and a heated sampling line into the conditioning unit where the humidity is removed. From there the concentrations of the individual exhaust components: NOx, SOx, CO, CO2 and O2 are measured by the portable analyzer HORIBA PG-250. The analyzer is calibrated before and after the measurements with zero and span calibration gases corresponding to the measured ranges. Typically the emissions are measured on 25%, 50%, 75% and 100% engine load steps. A detailed report with the measuring results and description of the measuring procedure is issued after each measurement.

WÄRTSILÄ

Service Agreements

Engine Services

Propulsion Services

Seals & Bearings Services

Electrical & Automation Services

Environmental Services

Service Agreements

Training Services

Expert Services

Boiler Services



WÄRTSILÄ

Service Agreements

Engine Services

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Training Services

Expert Services

Boiler Services



OUR SERVICES

Supply Agreement

- Parts
- Information
- Workshop Services

Technical Management Agreement

- Inspection
- Spare parts
- Technical support
- Training & competence

Maintenance Agreement

- Manpower & Parts
- Performance Guarantee
- Global coordination & supply
- Power Plant Agreement
- Marine Agreement

Asset Management Agreement

- Operations & Maintenance
- Manpower & Crew
- Equipment Installation
- Power plant agreement
- Marine agreement

SERVICE AGREEMENTS



YOUR BENEFITS
By entrusting your systems to us, you can free yourself from many day-to-day operational or maintenance concerns, with confidence that your assets are in expert hands and performing to the highest possible, sustainable standard.

- OUR CAPABILITIES**
- Day-to-day operation
 - Scheduled and unscheduled maintenance
 - Sufficient level of stock and tools
 - Logistics management and security
 - Technical support
 - Planning and administration
 - Establishment of operational infrastructure
 - Human resources, health & safety management
 - Recruitment and training of local personnel

AGREEMENTS

SUPPLY AGREEMENT

- 1. Parts**
- 24/7 global logistics of spare parts
 - Shortened lead time
 - Correct spare parts
- 2. Information**
- Online services Manpower
 - Availability to a global network of trained and skilled service professionals with the right tools
 - On board / On site manpower supply

TECHNICAL MANAGEMENT AGREEMENT

- 1. Inspection**
- Regular inspections expert assistance & monthly reporting
- 2. Spare parts**
- Exchange program
 - Remanufacturing
- 3. Technical support**
- Maintenance planning, online condition monitoring
 - Software updates and 24/7 technical support (call-in)
- 4. Training & competence**
- Training agreements: A global network of training centres
 - Competence development at Wärtsilä Land & Sea Academy (WLSA)

MAINTENANCE AGREEMENT

- 1. Power plant agreement**
- Long-term service agreements with fixed fees for the duration of the agreements
 - Spare parts and /or labour supply for maintenance work
 - There can be performance guarantees
 - Inspection, technical support, spare parts, training / competence
- 2. Marine agreement**
- Long-term service agreements with fixed fees for the duration of the agreements
 - Spare parts and/or labour supply for maintenance work
 - There can be performance guarantees
 - Global agreements
 - Risk management

ASSET MANAGEMENT AGREEMENT

- 1. Power plant agreement**
- Full operation management & maintenance services
 - Supply of required manpower, parts and knowledge to be able to take full responsibility for the operation of a plant
 - Performance guarantee
 - Responsibility for unscheduled maintenance and breakdowns
 - Risk management
- 2. Marine agreement**
- Wärtsilä provides manpower as a part of the crew
 - Supply of required manpower, parts and knowledge to be able to take full responsibility for the operation of the engine room
 - Performance guarantee
 - Responsibility for unscheduled maintenance and breakdowns
 - Risk management

WÄRTSILÄ

Training Services

Engine Services

Propulsion Services

Seals & Bearings Services

Electrical & Automation Services

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Boiler Services



WÄRTSILÄ

Expert Services

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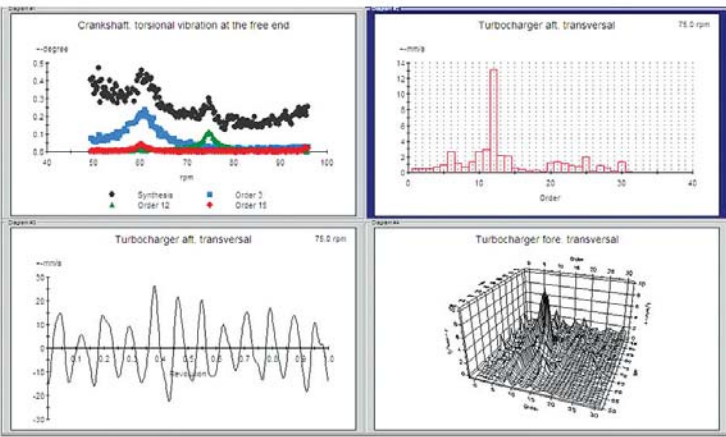
Environmental Services

Service Agreements

Training Services

Expert Services

Boiler Services



OUR SERVICES

We provide a wide range of education services.

- In-class training, hands-on and simulation
- Wärtsilä 2-Stroke Engine Courses
- Wärtsilä 4-Stroke Engine Courses
- Engineering Courses (NDE, Welding)
- Electrical & Automation Courses
- Cylmate Intelligent Combustion Monitoring / ICM
- Environmental Courses (SENITEC)
- Seals & Bearing Courses

To find out more about our training solutions please refer to our WLSA-Korea Training Brochure or you may contact us directly at +82 51 329 0500.

PRODUCT & OPERATOR TRAINING, TRAINING AGREEMENTS



YOUR BENEFITS

Our training facility is located near the biggest shipyards and engine builders ideally for training your crew before taking over new building installations. There can be no margin for error, and our full scale simulators and model engines will allow your crew members to fine tune their skills.

OUR CAPABILITIES

We guarantee that your investments in employee development will translate into solid business results. We have a large range of training solutions and we can also define programs that meet the specific requirements of your organization and installations. Our professional instructors will teach and demonstrate the necessary skills to your employees to become competent and confident in their daily work. We fulfill international training standards in accordance with ISO, IMO and STCW95 requirements and permanently monitor delivery standards.

OUR SERVICES

- Torsional vibration measurements
- Axial (structural) vibration measurements
- Portable 3D measurements (metrology)
- Portable cylinder liner roundness measurement
- Noise measurements
- Stress measurements (strain gauge)
- Shaft power measurements
- Fuel consumption (coriolis massflowmeters)
- Oil and water ultrasonic flow measurements
- Cylinder pressure measurements (gas and diesel)
- Data acquisition: temperature, pressure, signals

MEASURING SERVICES



YOUR BENEFITS

Our wide range of measuring services supports; verification of calculated temperature, pressure, vibration levels, troubleshooting, engine performance evaluation and preventive maintenance planning

OUR CAPABILITIES

Our experts and our portable measuring and data acquisition equipment can be dispatched worldwide.

The various measurements are supported by our calculation Software for:

- Torsional Vibration Calculations (Torsvib)
- Engine and Shaft dynamics (EnDyn)
- Engine Performance (Win GTD)

The recorded data can be visualized with Fluke Scope View and Dasilab

High quality reporting is provided with every measuring job containing actual findings and possible counter measures for improvement.

WÄRTSILÄ

Expert Services

Engine Services

Propulsion Services

Seals & Bearings Services

Electrical & Automation Services

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WÄRTSILÄ

Expert Services

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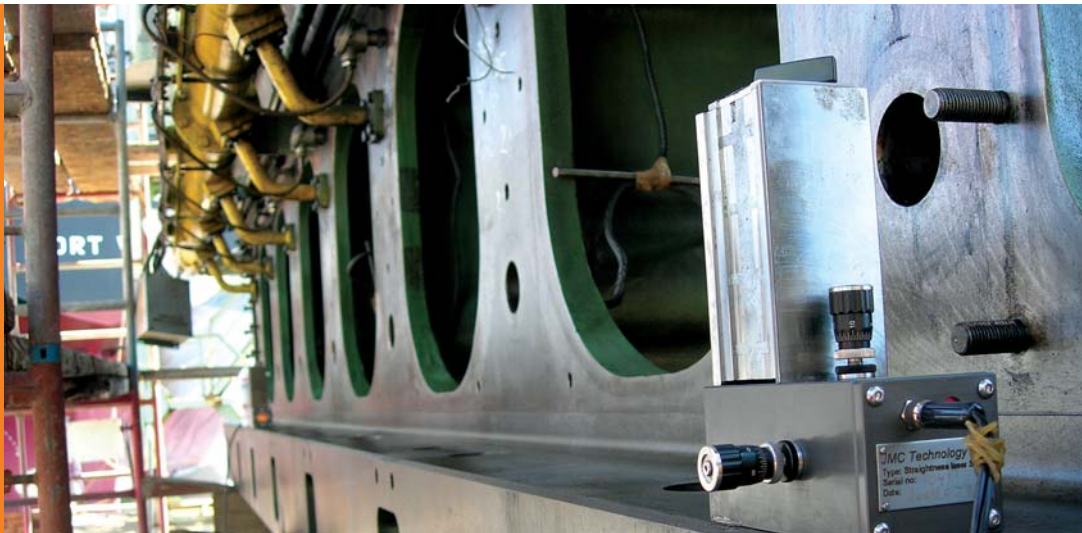
Environmental Services

Service Agreements

Training Services

Expert Services

Boiler Services



OUR SERVICES

- Alignment check of bearing channel

- Measurement of bore shape and Inclination

- Measurement of cylinder liner roundness

- Alignment engine to tailshaft bearings

BORE - LASER ALIGNMENT



YOUR BENEFITS

High accuracy fast alignment measurements are used to verify the theoretical calculated values.
Laser alignment gives correct results even when the vessel is under floating condition.
We are able to provide full alignment packages including bore alignment measurements.

OUR CAPABILITIES

All equipment is portable and can be installed on site.
By moving the receiver to different positions, it is possible to measure the height deviation to the reference line.

The bore centre is determined by rotating the analogue distance gauge attached to the receiver around the bore. In case a full rotation is not possible due to some obstruction, the centre can also be determined by a smaller rotation angle.

Maximum measuring distance is 30m with a laser accuracy of 0.005mm/m.

Bore laser alignment measurements can be combined with other alignment measurements, such as, bearing reaction measurements (Jackup tests) crankshaft deflection measurements, Pianowire or laser straightness measurements in order to get the overall picture of the installation.

OUR SERVICES

Straightness measurement of one axis:

- Engine bedplate SAG measurement

- Guiderail straightness

Flatness measurement of a plane:

- Bedplate height alignment

- Crane pedestal alignment measurement

- Inspection of machined large components

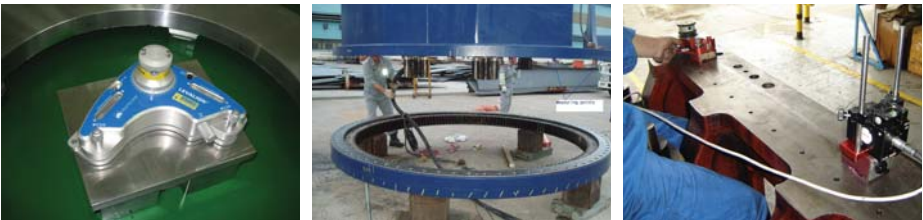
- Engine foundation measurement

- Rectangular alignment axis

- plane

Steering gear - propeller shaft alignment

PLANE - LASER ALIGNMENT



YOUR BENEFITS

High accuracy fast alignment measurements are used to verify the theoretical calculated values.
Laser alignment gives correct results even when the vessel under in floating condition.
We are able to provide the full alignment packages including plane alignment measurements.

OUR CAPABILITIES

Plane measurements: The laser can be rotated 360 degrees by a rotating mirror. By moving the receiver within the plane, the distance relative to the rotation plane is recorded.

Axis Plane Alignment is possible after removing the rotating mirror. The laser direction becomes rectangular to the rotation plane.

The three dimensional shape of the measured plane can be visualized.
Straightness measurements are possible up to 30 meters and flatness measurements are possible up to 10 meters.

Flatness measurements can provide corrections for In-Situ machining.

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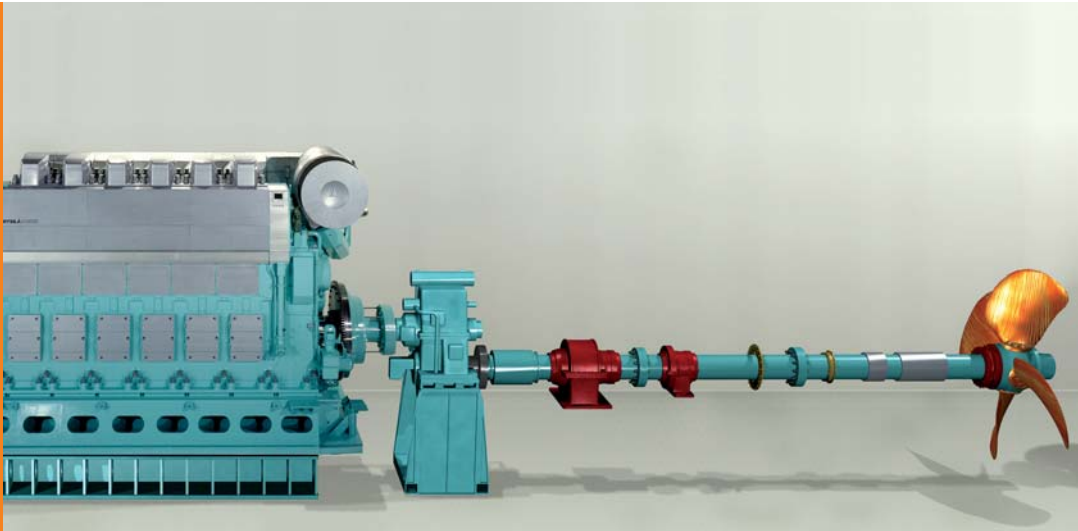
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Training Services

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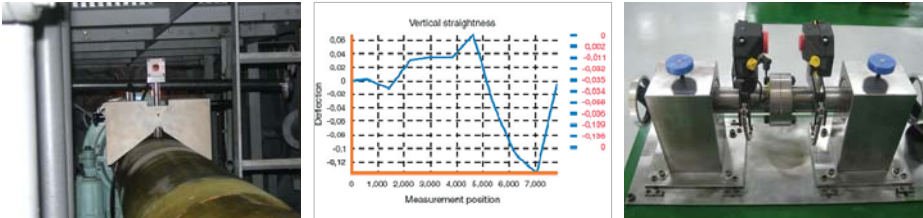
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OUR SERVICES

Shaftline straightness measurement
Camshaft alignment
Crankshaft straightness

- Coupling measurement Sag & Gap:**
- Hot coupling condition check between generator engine and alternator
 - Alignment of every rotating flange connection

SHAFT - LASER ALIGNMENT



YOUR BENEFITS

High accuracy fast alignment measurements are used to verify the theoretical calculated values.

Laser alignment gives correct results even when the vessel under in floating condition.

We are able to provide the full alignment packages including shaft alignment, measurements.

- OUR CAPABILITIES**
- Measurement of shaftline shape by use of laser, V-blocks and angle transmitters
 - By moving the receiver to different positions it is possible to measure the height deviation from the reference laser line to the shaft surface.
 - The Shaft centre is determined by measuring the shaft diameter.
 - Different shaft diameters can be compensated by shims.

A coupling condition check is carried out by attaching a laser and receiver on each flange. By rotating both flanges by several degrees the SAG and GAP values are calculated.

OUR SERVICES

- Metallurgical analysis:**
- Specimen preparation, cutting, hot embedding
 - Specimen polishing, etching
 - Microstructure analysis with metallurgical software
 - High definition pictures up to 1'000x magnification
- Mechanical testing:**
- Tensile strength test (Force - Elongation graph)
 - Impact test: Charpy
 - Hardness (Rockwell, Brinell, Vickers, Micro-Vickers)
 - Hardness profile (Micro-Vickers)

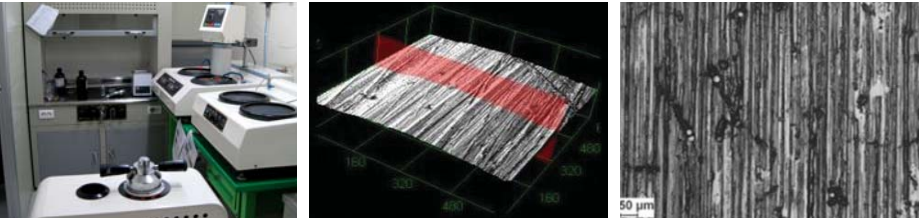
- Chemical analysis:**
- Optical emission spectrometer element analysis
 - SEM - EDS material analysis

Replica analysis

Non destructive examination : UT, PT, MT.

Root Cause Analysis Reports

MATERIAL AND DAMAGE INVESTIGATIONS



YOUR BENEFITS

Dedicated material experts who have access to Wärtsilä's know-how, drawings and specifications provide metallurgical and damage investigations within a short period of time by using modern well maintained equipment.

OUR CAPABILITIES

Metallurgical & Replica Analysis : Metallurgical microscope (50x - 1'000x magnification) and image analysis software is used to report the component condition. A portable microscope camera (up to 300x magnification) and surface replicas enable on site inspections of components that cannot be moved to the laboratory.

Mechanical Testing : Mechanical properties of components can be tested according to ISO and ASTM standards.

Non Destructive Examination : Liquid Penetration, Magnetic Particle and Ultrasonic testing can help to identify defects before they cause problems without destroying the component or sample.

Root Cause Analysis (RCA) : Documentation of the RCA is done by use of Apollo RCA Software.

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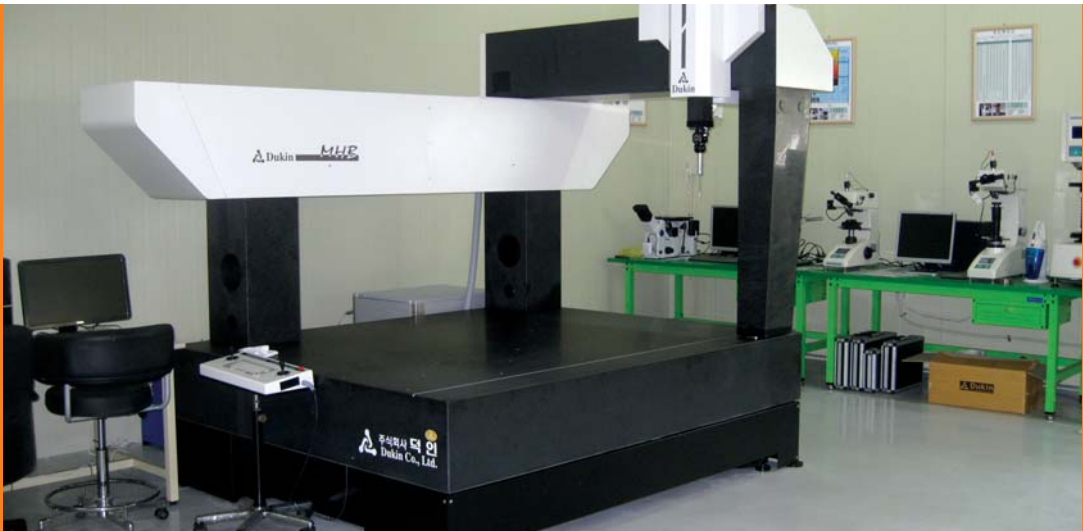
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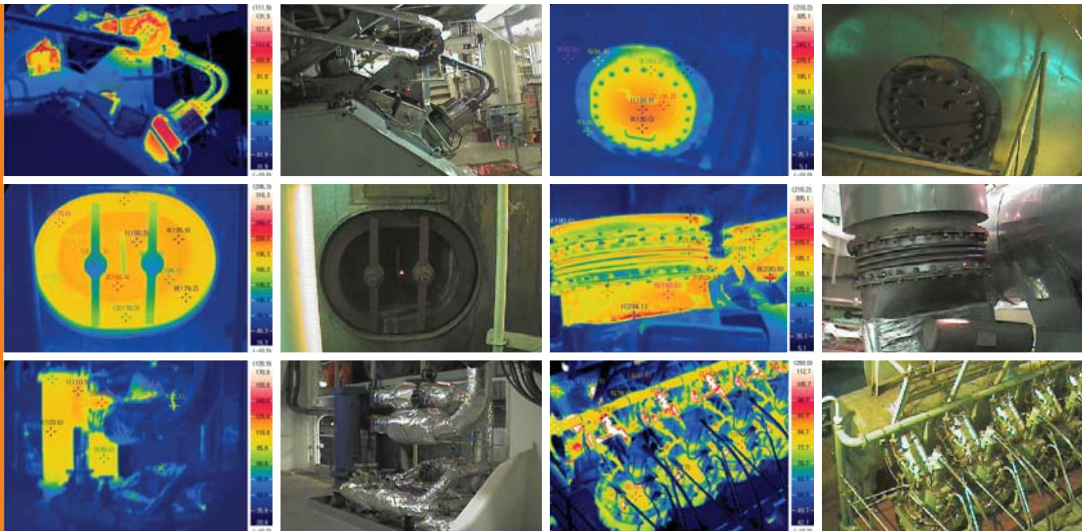
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OUR SERVICES

Measuring Range:
X : 1'200 mm (Horizontal Axis)
Y : 2'000 mm (Horizontal Axis)
Z : 1'000 mm (Vertical Axis)

Resolution: 0.005 mm

Maximum weight for measuring object
is limited to 2'500 kg.

3D MEASURING SERVICES



YOUR BENEFITS

- Simple and easy access to a large 3D coordinate measuring machine.
- Consultations with our measuring experts regarding the measuring procedure and results.
- High quality measuring reports with drawings, dimensions and measuring results are available.

OUR CAPABILITIES

Our Quality Department operating the 3D coordinate measuring machine has acquired wide experience in measuring remanufactured and new components, such as pump components, Injection components and large engine parts. We offer our measuring services to external customers for their quality assurance, claim or damage investigations. Located in a climate-controlled room with a 3 tonne overhead crane, supported by air dampers, our 3D measuring machine achieves the highest level of precision.

OUR SERVICES

- SOLAS conformity check (220°C)
- Detection of overheated electrical connections and components
- Detection of overheated bearings
- Level monitoring of storage and sludge tanks

THERMOGRAPHIC ANALYSIS



YOUR BENEFITS

Quick identification of machinery installations for fulfillment of the SOLAS requirements in regard to surface temperatures and shielding which can be carried out without disturbance of ongoing machinery operator. A bad connection results in increased resistance and the current flow generates excessive temperature that can be detected with infrared thermography. If not rectified, this connection or component might break and cause much bigger damage.

OUR CAPABILITIES

Our trained and certified experts can carry out accurate thermography measurements and report results with recommendations for immediate rectification. Rectifications can also be carried out by our electrical experts upon availability of required spare parts. A thermal imaging camera is a reliable non contact instrument which is able to scan and visualize the temperature distribution of entire surfaces of machinery and electrical equipment quickly, accurately and safely.

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OUR SERVICES

We provide a wide range of support services.

- 24/7 Service Call Support
- Technical Support
- Logistics Support
- Warranty Management Support

24/7 SUPPORT



YOUR BENEFITS

We are committed in taking excellent care of you by providing technical support and by managing warranty claims in a professional manner. By knowing our products and your machinery history and specification we are your ideal partner to support you technically and logistically during the complete lifespan of your installations.

OUR CAPABILITIES

We manage technical support in an efficient and systematic way in order to solve technical problems. Our primary focus is on establishing customer confidence and satisfaction. The long-term strategy is to provide proactive customer service based on customer feedback and accumulated experience. Every installation, not only under warranty but during its complete lifetime has one contact person within Wärtsilä. Spare parts are readily available and kept in our Busan warehouse based on customer installation specification. Our logistics team operates 24/7 to ensure on-time delivery.

OUR SERVICES

- Inspection service
- Burner service
- Boiler repair
- Custom replacement boilers
- Low sulfur fuels
- boiler system conversions
- Service agreement
- Tailored solutions
- Spare parts

BOILER SERVICES



YOUR BENEFITS

In order to operate a boiler plant as economical and environmentally friendly as possible a proper adjustment of the burner is essential. Whether the required service is a simple adjustment or an advanced commissioning of the plant we have the engineers with the experience to perform the job.

OUR CAPABILITIES

We offer a complete range of boiler services, including inspections, service, repairs, conversions, upgrades, and spare parts for any brand, including economizers and control systems. We will service any marine vessels as well as all types of industrial installations and can offer travel squads.

Our welders are certified by the classification societies. With decades of experience in marine boiler services, we are able to provide customers with the satisfaction of knowing that their vessel's boiler is kept in safe and efficient working order.

WÄRTSILÄ IN KOREA

① WÄRTSILÄ KOREA LTD. WÄRTSILÄ LAND & SEA ACADEMY

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Tel. + 82 51 329 0500
Fax. + 82 51 324 4348
24hrs Phone: +82 17 546 0202

② WÄRTSILÄ-HYUNDAI ENGINE COMPANY LTD.

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Tel. + 82 61 983 1000
Fax. + 82 61 983 1110

③ WÄRTSILÄ Site Office in GEOJE

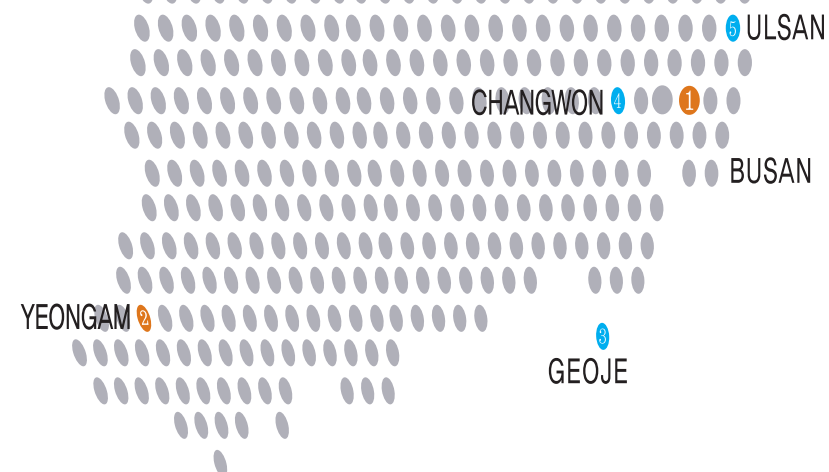
4th Floor, leesong Building, 27,
Jangpyeong 1-ro, Geoje-si,
Gyeongsangnam-do,
656-305, Korea
Tel. + 82 55 634 2400
Fax. + 82 55 634 2401

④ WÄRTSILÄ Site Office at DOOSAN

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Fax. + 82 55 261 8658

⑤ WÄRTSILÄ Site Office at HYUNDAI

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682-792, Korea
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Fax. + 82 52 234 5916



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70 Countries, 200 locations, 11,000 Service professionals
Installed base 182,000 MW, Widest range of offering and expertise

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WÄRTSILÄ 24HRS WORLDWIDE SERVICE CONTACTS

COUNTRY	CITY	NUMBERS
ARGENTINA	Buenos Aires	54 911 4577 8906
AUSTRALIA	Huntingwood	61 418 256 339
AZERBAIJAN	Baku	994 50 250 4662
BANGLADESH	Dhaka 1	880 17 1300 8040
	Dhaka 2	880 17 1140 1945
BRAZIL	Rio De Jaibeiro	55 21 3077 7919
CANADA	Halifax	1 902 468 1264
	Vencouver	1 604 244 8181
CHILE	Valparazio	56 962 186 310
CHINA	Hong Kong / Guangzhou	86 400111 0056
	/ Shanghai	
CYPRUS	Limassol	357 25 812 194
DENMARK	Hirtshais	45 99 569 9008
DOMINICAN REPUBLIC	Santo Domingo	1 809 564 4440
ECUADOR	Quito	593 99 461 298
FINLAND	Turku	358 10 709 090
	Vaasa	358 10 709 080
FRANCE	Marseille / Gennevilliers	33 389 666 969
	Mulhouse / Surgeres	33 389 666 969
GERMANY	Hamburg (Engine)	49 170 187 4068
	Hamburg (Propulsion)	49 172 515 8611
	Hamburg (Deutz Engine)	49 175 221 0365
GREECE	Piraeus / Aspropygos	30 694 459 4562
GUATEMALA	Guatemala	502 5204 7756
HUNGARY	Budaors	36 30 743 2701
INDONESIA	Baesaki	62 81 190 9662
IRELAND	Dublin	353 1 462 6700
ITALY	Trieste / Napoli / Genova	39 335 784 1217
JAPAN	Kobe	81 90 1913 0474
KOREA	Busan	82 17 546 0202
KENYA	Nairobi 1	254 733 609 279
	Nairobi 2	254 733 609 284
MEXICO	Veracruz	52 229 155 3299
LITHUANIA	Klaipeda 1	370 614 292 30

COUNTRY	CITY	NUMBERS
LITHUANIA	Klaipeda 2	370 614 971 67
NETHERLANDS	Zwolle	31 38 425 3253
	Drunen	31 416 388 115
	Schiedam	31 10 427 7100
NORWAY	Rubbestadneset	47 53 422 500
PAKISTAN	Lahor	92 301 820 6311
	Karachi	92 300 201 1012
PERU	Lima	51 199 701 281
PHILIPPINES	Laguna	63 918 910 8392
POLAND	Warszawa	48 604 137 495
PORTUGAL	Electrical Service	351 93 723 1644
	Mechanical Service	351 93 723 1643
PUERTO RICO	Carolina	1 787 605 0512
RUSSIA	St. Petersburg	7 812 448 3248
	Vladivostok	7 4232 401 600
SAUDI ARABIA	Jeddah	966 2 651 9001
SINGAPORE	Pandan Crescent	65 9835 8200
SOUTH AFRICA	Cape Town	27 83 658 6789
	Durban	27 83 265 6395
SPAIN	Bermeo / Malga /	34 607 416 998
	Las Palmas	
SWEDEN	Göthenburg	46 709 690 291
SWITZERLAND	Winterthur	41 52 262 8010
TAIWAN	Taipei	886 912 121 035
TURKEY	Istanbul	90 533 695 0577
UNITED ARAB	Dubai	971 50 550 8402
EMIRATES	Abedeen	44 7775 807 172
UNITED KINGDOM	Segensworth	44 7775 807 100
	Montrose	44 1674 678 429
U.S.A	Ft Lauderdale / Houston	1 877 927 8745
	Long Beach / New Orleans	1 877 927 8745
VENEZUELA	Valencia 1	58 412 443 0444
	Valencia 2	58 412 443 2222
VIETNAM	Ho Chi Minh City	84 9 17 569 360