Professional product training & support

TECHNICAL SUPPORT AND APPLICATIONS

www.chris-marine.com
Always ready!

The Technical Support and Applications (TSA) crew is always standing by to support you, remotely or at your site (in-situ) wherever you are. TSA can offer:

- Training, service and technical support for Chris-Marine and IOP Marine machines
- Rental agreements for Chris-Marine and IOP Marine machines, optionally including service engineer(s)
- Installation services for own and partner’s equipment

From our workshops in Sweden, Denmark, Singapore and China we dispatch personnel and/or machines to your vessel, workshop or power plant no later than 24 hours after your call.

Professional & Certified Crew

Our TSA Crew consist of well trained, experienced, and dedicated experts with many years of experience as marine engineers, chief engineers and work managers at leading shipyards. We offer a wide range of problem shooting, technical support and maintenance.

Worldwide workshops

We operate from hubs equipped with Chris-Marine and IOP Marine machines and maintenance equipment.

Our stationary workshops are located in Sweden, Singapore and Shanghai.
## Repair

Do you need to repair your Chris-Marine or IOP Marine machine? Contact TSA to find an optimal solution. Machines can be repaired in-situ or in the TSA workshops.

## Service

Does your workshop have several Chris-Marine and IOP Marine machines? Do you need to be sure that the machines are operational when needed? Contact TSA to obtain an in-situ service agreement.

Qualified service engineers dispatched from the closest hub will keep your machines in good condition in a cost-effective way.

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<td>Liner wear edge removal</td>
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<td>Engine &amp; Engine Block</td>
<td>Sealing surfaces grinding, milling and lathening.</td>
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<tr>
<td>Cylinder Head / Cover</td>
<td>Sealing surfaces grinding, milling and lathening</td>
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<td>Sealing surfaces grinding, milling and lathening</td>
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<td>Fuel injector pocket machining (MAN 2-stroke slide valve)</td>
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<td>Other</td>
<td>Flatness surface blade machining (propellers, liners, flanges)</td>
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<td>LinerSCAN - online monitoring of cylinder liner wear, 2-stroke</td>
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<td>Hans Jensen Lubricators, SIP Machining</td>
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Training & Demonstration

Chris-Marine and IOP Marine machine training can be conducted at any time in the TSA workshops or at the customers own premises. We can offer wide training programs for workshops or specific training courses combined with service jobs for vessels and power plants.

We recommend using real engine components during training sessions to be able to establish the most efficient working methods.

TSANP CAN HELP YOU WITH:

Our skilled crew have extensive experience in engine overhaul and can help you with a wide range of engine care problems.

For example, we can provide training and education instructors for:
- Cylinder liner surfaces machining
- Cylinder honing / wear edge removal
- Wave cut grinding
- Oil pockets machining
- Preparation and machining for anti-polishing ring
- Milling o-ring groves
- Grinding and/or lathing of landing surfaces
- Special machining for insert rings
- Condition monitoring of cylinder liner, piston and piston rings
- Injector valve and fuel pump condition testing
- Special applications on request

Training of the surface grinding machine, CPS, on a K98MC cylinder liner at MAN PrimeServ Shanghai.

Demonstration of the fuel injector test unit for workshop use, VPA 1190-5 in the showroom at IOP Marine.
Cylinder Liner Maintenance

TSA can assist you with cylinder condition monitoring services as well as recommending appropriate actions based on the recorded cylinder condition.

A cylinder overhaul can be done at a port stay or during dry docking. To save time, honing can be carried out in-situ and without pulling liner and piston.

The result is evaluated with cylinder diameter measurement and replica.

MAINTAINING A GOOD LINER CONDITION

Cylinder liners, pistons and piston rings in poor condition can incur greatly increased operational costs through extensive overhauls, high cylinder lubrication oil consumption and operational disturbances caused by engine break-downs.

These problems can be avoided by ensuring good cylinder running conditions through condition monitoring and maintenance with correct equipment.

TSA can offer appropriate equipment and train you in how to use it, or supply highly skilled service engineers for carrying out the liner overhaul.

EXAMPLES OF CYLINDER CONDITION PROBLEMS AND SOLUTIONS

<table>
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<th>2- &amp; 4-STROKE ENGINES</th>
<th>Solution:</th>
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</thead>
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<tr>
<td>Cylinder, piston and piston ring wear incurred in service.</td>
<td>Wear-edge removal and/or cylinder honing/deglazing.</td>
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<tr>
<td>Cylinder polishing during low-sulphur fuel operation, leading to high lube oil consumption or scuffing.</td>
<td>Cylinder deglazing or honing.</td>
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</table>

2-STROKE ENGINES:

<table>
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<tr>
<th>Problem:</th>
<th>Solution:</th>
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<tr>
<td>Increased lube oil feed rate on some cylinders.</td>
<td>Check cylinder condition including liner diameter, ring groove and piston ring measurements. Plan cylinder overhaul according to findings.</td>
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<tr>
<td>Broken piston rings.</td>
<td>Find root cause, plan overhaul.</td>
</tr>
<tr>
<td>Excessive liner wear on all cylinders</td>
<td>Find root cause (cat fines or other fuel contaminant or corrosion). Recommend appropriate actions.</td>
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</tbody>
</table>

THE PROCESS

Honing of a 2-stroke engine cylinder liner takes 6-12 hours depending on bore size. The honing will restore the circular geometrical shape of the cylinder, preventing blow-by as well as removing abrasive particles and polished/hardened material from the running surface to ensure appropriate lube oil distribution on the liner surface for safe operation.

The effect of honing will be lower lube oil consumption or less cylinder / ring wear and less risk for cylinder scuffing due to blow-by or topland deposits.
Engine & Engine Block

ELIMINATE LEAKAGES
Stop cooling water leakages between engine frame and cylinder liner as well as reducing corrosion and the cooling water treatment chemical dosage.

Special attention is paid to landing surfaces and machining for insert ring.

Cylinder Head / Cover

ENSURE TIGHT SEALINGS
Machining or grinding of valves, valve seats and landing surface towards cylinder liner as well as slide valve machining and pockets for oversized seats.
Other Services

FLATNESS SURFACE BLADE MACHINING

Even well-proven blade foot sealing systems get worn. The normal procedure is to change the O-ring and to machine the blade foot.

Chris Marine has developed a new lathe and has been tested with very good results.

Time for alignment and cutting on a blade with foot diameter at 420mm is about 30 min.

FUEL INJECTOR POCKET MACHINING

MAN 2-stroke engines are often retrofitted with slide valves to allow for slow-steaming operation.

The slide valve leads to improved combustion quality during low load operation and is a requirement for smooth operation during slow-steaming.

To allow for slide valve installation, the injector pocket needs machining, which is a service offered by Chris-Marine.

USON SERVICE PARTNER

Uson Marine provides waste management systems for the maritime and offshore industry, and provides custom-made services and systems for different types of installation and applications.

Uson Marine help their customers to reduce the cost and effort of handling generated waste while also reducing the environmental impact of their operations.

Chris Marine provides the commissioning, repair and crew training of Uson systems.
SIP-Installations

SAVE LUBRICATION OIL

The Chris-Marine TSA crew is a certified partner of Hans Jensen for preparation of the engine for installation of SIP fuel valves, and has performed numerous SIP installation jobs over the past years.

In connection with the installation of the SIP valves, the TSA team often prepares a liner condition inspection report, which the ship manager can use when considering whether the liners need to be changed, honed, wave-cutted etc.

SIP is an abbreviation for ‘Swirl Injection Principle’ and refers to the principle of using the scavenging air swirl of the engine to distribute the lube oil.

As the installation of the HJ SIP I Valves requires either complete new holes or that the existing holes in the liners from older valves are modified, the cylinders need to be modified on both on the inside and the outside.

The SIP installation jobs are in high demand as many customers wish to reduce their lubrication oil consumption.

Lubrication is a crucial factor for maintaining a good cylinder condition on 2-stroke diesel engines, as it limits the wear and corrosion on piston rings and cylinders. From an economic point of view, cylinder lubrication is a significant part of the ship operation due to the fact that the lube oil price has been increasing and significantly more expensive than ordinary diesel oil.
**Fuel Analyzer installations**

**AVOID CAT FINE DAMAGES**

Major engine designers conclude that cat fines contribute to increased wear and engine failures for a large number of vessels operating on HFO. These situations can be avoided though proper operation of the on-board fuel treatment plant.

The Chris-Marine Fuel Analyzer allows easy monitoring of the performance for each of the critical fuel treatment cleaning processes, i.e. storage, settling, purification and filtering.

Prior to installation, Chris-Marine will make a pre-inspection of the vessel. The observations are used for adapting a tailor-made user interface for the specific vessel. After installation, the user interface can be viewed remotely from the superintendents office (through internet) or from the engine control room. An alarm will be generated if the Fuel Analyzer is detecting abnormal operation in the critical fuel treatment processes and recommended counter-measures will be given through the user interface.

The Fuel Analyzer makes it possible for customers to lower costs for off-hire and minimizes disturbance of operations and emergency repair. Maintenance costs are lowered through less engine wear and tear. Chris-Marine can offer complete Fuel Analyzer packages including pre-inspection, equipment supply, installation, commissioning, service and technical support.

**LINER SCAN**

**MONITOR CYLINDER WEAR RATE**

Chris-Marine cooperates with Parker Kittiwake and has a license to sell, install and commission LinerSCAN systems. LinerSCAN is a condition monitoring system that measures the ferrous content in scrape down oil. The iron comes from cylinder wear, meaning that the instant cylinder wear rate can be monitored real-time for each cylinder equipped with a sensor.

LinerSCAN makes it possible to exercise condition-based maintenance for cylinders. The lube oil consumption and the time between overhauls can be optimized and the device acts as an alarm protecting the engine against fuel and lube oil related damage.
Our container - your movable workshop!

Our tools are always available for you - anywhere. You can rent or buy them. Do you need many tools or a complete workshop?

Chris-Marine can supply a mobile workshop fully equipped with Chris-Marine and IOP Marine maintenance machines of your choice. The container can be placed on-board or close to a vessel, at a diesel power plant or in any location where a fully equipped workshop is needed. The container just needs air and electrical power to turn into a modern workshop with the latest tools and machines on the market. Optionally the container can be equipped with diesel generator and air compressor when no such auxiliaries available

BENEFITS OF THE MOVABLE CONTAINER:

- Fast way of establishing a new workshop
- Always latest version and well maintained tools
- Good way of testing tools before buying
- Can be placed close to engines (movable)
- Flexibility – rent only when needed
Machine Rental

Time is money!

Do you urgently need a Chris-Marine / IOP Marine tool?

Have you considered renting it?

Contact our specialists to find the right configuration!

We will deliver the tool of your choice from the closest TSA workshop.

The tool will be in perfect condition when you receive it to maximize your uptime.

Do you need tool training as well? No problem - we can dispatch a specialist from the TSA workshop!
SOLUTIONS FOR THE FUTURE

For five decades we have designed, manufactured and sold maintenance machines for diesel engines. Today these machines are world-renowned for being operator friendly and of high quality. Now and since the 1960’s, quality, reliability and usability remain to be our key trademarks.

We are constantly growing and are represented with offices worldwide and well-equipped workshops in Sweden, Denmark, Singapore and Shanghai.

A close cooperation with local agents also helps us to serve our customers independent of their location.

WELL EDUCATED AND DEDICATED STAFF

120 well educated men and women worldwide are working to improve our products and services. They are constantly increasing the quality, and are the hallmarks of Chris-Marine® and IOP Marine.