



Chris-Marine

Service & Aftersales

- ▣▣▣▣▶ Technical support
- ▣▣▣▣▶ Spares & consumables
- ▣▣▣▣▶ Repair
- ▣▣▣▣▶ Service agreements
- ▣▣▣▣▶ Product training, super-users and equipment for rent
- ▣▣▣▣▶ Special engineering and installation services
- ▣▣▣▣▶ Data evaluation and reporting services

Innovative engineering since 1962



Chris-Marine Service & Aftersales

Highly dedicated team

The Chris-Marine® Technical Support & Aftersales team (TSA) consists of well trained, experienced and dedicated aftersales representatives and super-users that help you optimize the performance of your Chris-Marine®, Obel-P® and LEMAG® equipment.

Our offering

We offer service agreements, rental equipment, spare parts, consumables, repairs and super-user services for all Chris-Marine®, Obel-P® and LEMAG® equipment.

Our promise to customers

Quality – ensuring that the end results will fulfill the most recent process quality criteria.

Time – making your business more efficient and competitive by using state-of-the-art process know-how.

Documentation – ensuring that our customers receive first class documentation at the end of a job.

Our main application areas

- **Performance Monitoring**
Vessel and engine performance monitoring
- **Condition Monitoring**
Fuel pump & injector valve testing
Liner wear and piston ring condition monitoring
- **Cylinder Liner Maintenance**
Liner wear-edge removal, honing, deglazing and wavecutting
Lubrication quills and grooves machining
Sealing surfaces grinding, milling and lathe turning
- **Engine & Engine Block Maintenance**
Sealing surfaces grinding, milling and lathe turning
Cooling water leakage repair
- **Cylinder Head/Cover Maintenance**
Valve seat, recess, spindle grinding
Sealing surfaces grinding, milling and lathe turning
- **Cleaning**
Spray-wash cleaning and ultrasonic cleaning of engine components
- **Other**
Flatness surface blade machining (propellers, liners, flanges)
Instrument calibration services



Technical support, repair, spares & consumables

We have a stock of the most common equipment, spares and consumables available for immediate dispatch to your site. We will deliver from the closest available hub or from a combination of hubs, depending on your need and our availability.

Repair jobs are most often carried out at one of our hubs. The average lead time for a repair job is about two working weeks, but can vary from a few days up to several weeks depending on equipment type and repair needed.

Remember to ask for a rental offer before sending equipment for repair if you need to minimize equipment downtime.

Some situations where Chris-Marine® TSA finds the best solutions

Case 1 - Malaysian workshop

A workshop in Malaysia needs a machine because the current one does not generate a good surface and at the same time there is a service job going on.

Solution 1: Customer rents a machine from our Singapore office and orders a repair kit for the broken machine at the same time. We send an instruction describing how to overhaul the machine. The repair kit contains recent product upgrades intended to prolong the time between overhauls.

Solution 2: Customer purchases a new machine and we include a rental machine at a fixed price.

Solution 3: Customer rents a machine from our Singapore office and sends the broken one for repair to Singapore. We offer a fixed price rental & repair agreement.

Case 2 - Measuring cylinder liners

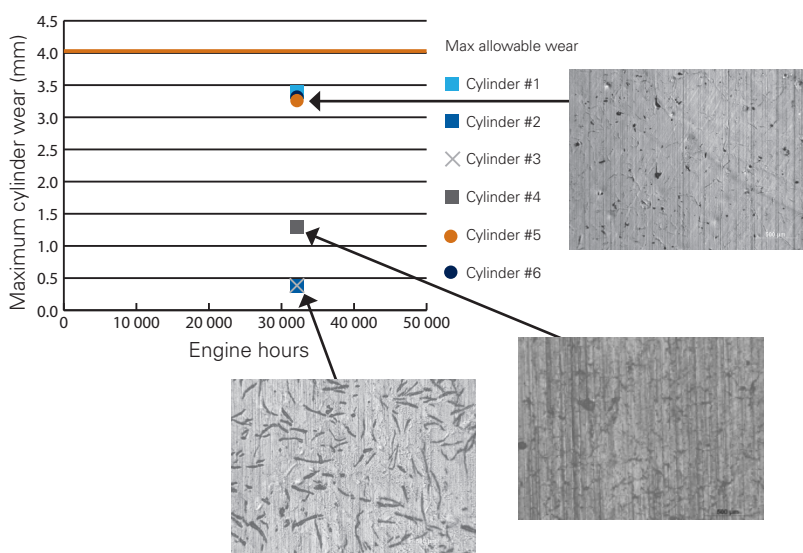
A customer is planning to measure cylinder liners with the Liner Diameter Measuring tool (LDM), but is not sure if the existing equipment is capable of measuring this specific engine type.

Solution: We trace the customer's LDM configuration through the serial number and offer needed accessories. We also share our experience from measuring the engine type in question so that the service job can be carried out smoothly.

When the job is done, the customer would like a specialist opinion on the measurement results. We then summarize the results in an official Chris-Marine® report, including microscopic analysis of replicas collected by customers.



LDM measurement + microscopy



Super-user services

The Chris-Marine® TSA super-users can work alone or together with your staff anywhere in the world. Our super-users deliver the best support to our customers and can handle all Chris-Marine®, Obel-P® and LEMAG® equipment.

Our super-user services can complement your own services when:

- You have a service job coming up but are lacking capacity or know-how for carrying out the job.
- You would like to make sure that your team is using state-of-the-art procedures when carrying out jobs with equipment from Chris-Marine®, Obel-P® or LEMAG®.

Product training & Installation services

If you recently purchased equipment from us we can assist you remotely, invite you to one of our hubs or dispatch a super-user to your site in order to give product training. We can also assist you with installing and commissioning equipment.

Rental services

Rental is a good alternative under many different circumstances:

- When the customer does not have an approved CAPEX for purchasing equipment but would like to engage in a service job where the equipment is needed.
- When the customer is not sure that the equipment will be used for more than a few service jobs, i.e. return on investment is uncertain.
- When the customer needs equipment urgently or just wants to test new equipment prior to investing in it.

Simple to calculate the costs

The rental fee is 1% of the new equipment price per day. 50% of the fee is discounted when new equipment is ordered during the rental period.

The rental period starts when the equipment arrives to the customer site and stops when it arrives back at the Chris-Marine® hub.

The rental fee is 10% of the new equipment price when ordered together with new equipment or repair services.

Example 1: A customer decides to purchase new equipment and rent the same type of equipment while waiting for delivery. Total price: 110% of new equipment price.

Example 2: A customer decides to rent equipment. Ten days into the rental period the customer decides to purchase new equipment instead, but would like to keep the rental equipment while waiting for delivery. Total price: 115% of new equipment price.



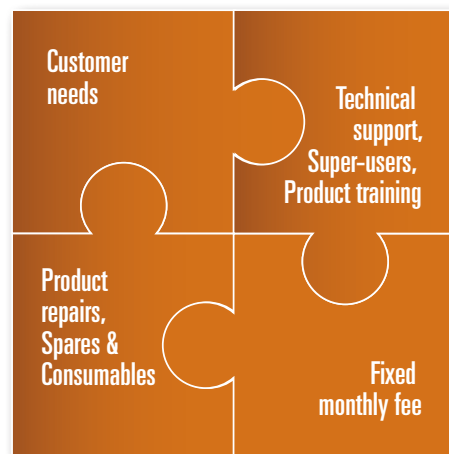
Service agreements

Service agreements help the customer to make sure that processes are always performed using the latest know-how and that the equipment is always ready for the next service job. Service agreements normally include a combination of spares & consumables, in-situ services and repairs.

Before entering a service agreement a TSA sales manager will visit your site in order to summarize your needs and the current status of your equipment. You will then get a tailor-made proposal of what we think would be wise to include in a service agreement as well as the status of all your existing equipment.

A service agreement lasts for 12-36 months and includes most of what you need during that period at a fixed monthly fee. You may change the content of the agreement as new requirements arise. Super-users will visit your site every 6 or 12 months depending on your need. Each visit lasts for a few days up to a few weeks, depending on your needs and the size of your business.

The visits may include commissioning of new equipment and processes, in-situ servicing of existing equipment, time and quality optimization of certain processes as well as training of staff.



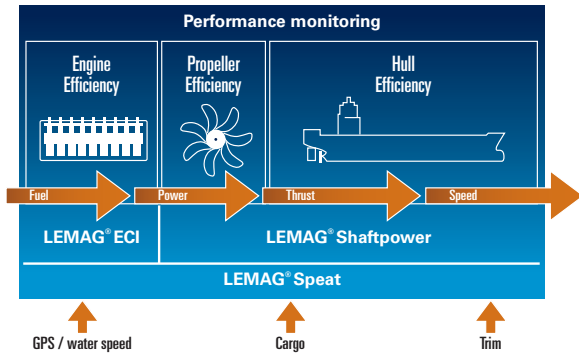
Other services

- ▣ Storage
- ▣ Calibration
- ▣ Re-configuration
- ▣ Data evaluation and reporting

Some customers find it convenient to let us store equipment at one of our hubs. This is useful when it comes to shared measurement tools and calibration tools as well as tools that need to be re-configured between service jobs. Chris-Marine® can then make the necessary preparations and dispatch the equipment to the job site with minimal administrative involvement from the customer.

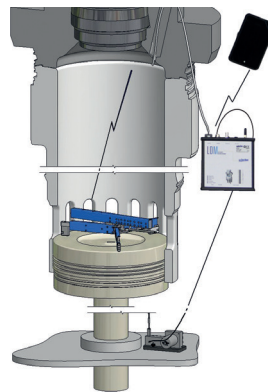
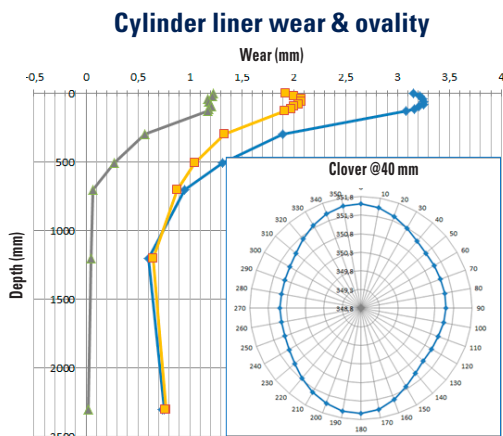
Service examples from some of our application areas

Performance and condition monitoring



10/2/2017 8:25:12 AM TO 11/1/2017 8:59:34 AM UTC			
M/E Running	720.54 hours	Distance Sailed (o.G)	2907.6 nm
Avg. Power	2204 kW	Distance Sailed (t.W)	5156.5 nm
HFO Consumed	1404552 kg	Average Speed o.G	4.0 kn
DFO Consumed	0 kg	Average Speed t.W	7.2 kn
M/E Efficiency	739.2 g/kWh	Propeller Slip	29.18 %
		Propulsion Efficiency	272.4 kg/nm
A/E HFO Consumed	44936 kg		
A/E DFO Consumed	0 kg	Total HFO Consumed	1458433 kg
Boiler HFO Consumed	8945 kg	Total DFO Consumed	8898 kg
Boiler DFO Consumed	8898 kg	Total Efficiency	504.6 kg/nm

- Installation, commissioning and equipment calibration
- Data compilation and reporting
- Verification of data collection and trouble-shooting of sensors
- Laboratory analysis of material microstructure and fuel / lubrication oil samples.
- Assistance when tracing root cause for deviating performance of vessel, engine, cylinder liner, fuel pump or fuel valve.

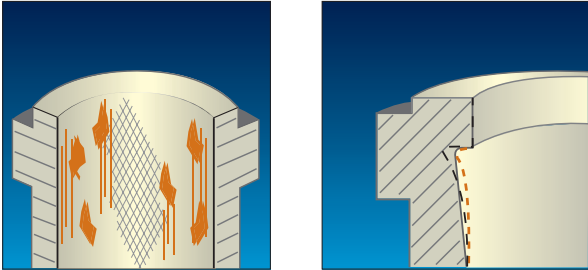


Expected cylinder liner life time for vessels measured by Chris-Marine in 2015-2017

	<5 years	5-10 years	10-20 years	>20 years
All	7%	16%	28%	49%
500-700	7%	20%	23%	50%
>700	7%	10%	37%	47%

Cylinder liner maintenance

- In-situ honing, wave-cutting and wear-edge removal
- State-of-the-art geometry / surface measurement, honing and documentation
- Upgrading and servicing of equipment for achieving operational excellence
- Sealing surfaces restoration



Typical honing process times when using state-of-art processes:

- 4-stroke liners: 20-60 mins / liner
- 2-stroke liners: 1-3 hrs / liner



Engine, engine block and cylinder head/cover maintenance

- Engine re-sleeving for re-sealing cylinder coolant leakages
- Restoration of cylinder head and cylinder cover surfaces
- Valve seat, recess and spindle maintenance

Cleaning services and other services

- Commissioning of ultrasonic / spray-wash cleaning equipment
- Cleaning process performance optimization
- Restoration of sealing surfaces on variable-pitch propeller blades

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*Contact one of our offices to
get in touch with your local agent.*

TSA contact information

When contacting us, please have the following data at hand for fastest possible support:

- ▣ Type of equipment
- ▣ Serial number of equipment
- ▣ Type of consumable or spare part and part number printed on part (if any)
- ▣ Description of need: technical support, spares & consumables, training, rental, repair, etc

