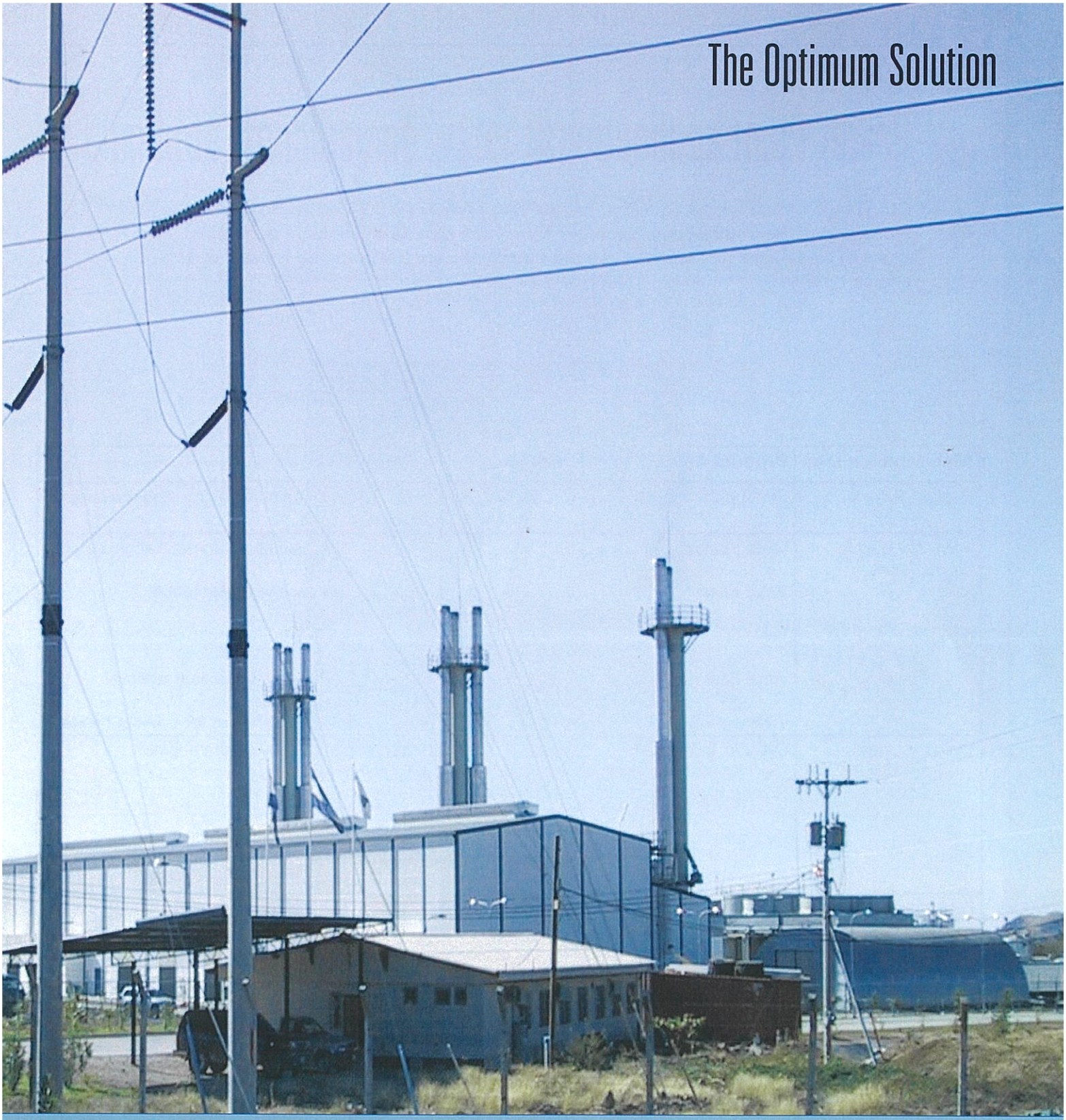


The Optimum Solution

Superior Engine Care Products for

Power Plants

CHRIS-MARINE®

members of KrisMa Group

IOP MARINE

OBEL-P PRODUCTS

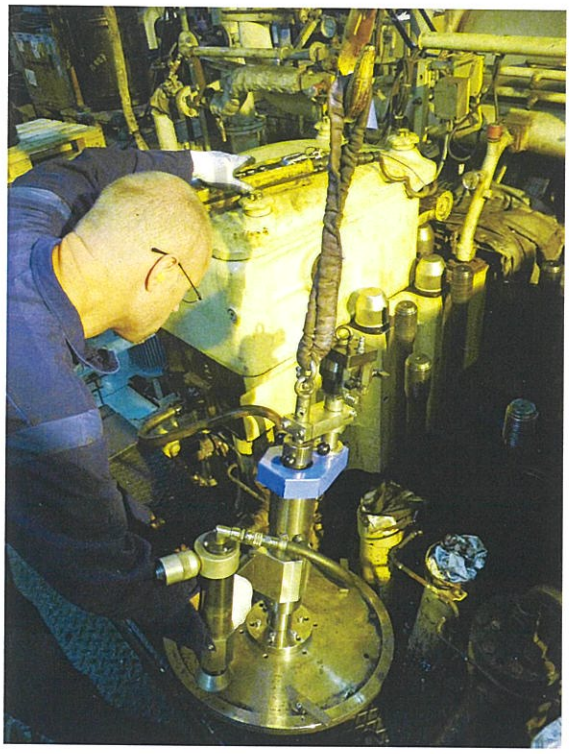
Power Plant applications

Our standard machines are used in thousands of power plants worldwide. They cover all types of engines with cylinder diameter 150 - 1000 mm. With standard packages for all types of diesel- and gas engines, we offer machines exactly prepared for your specific engine type.

Maintenance area	Product Area	Product	Information
Sealing Surfaces	Surface Grinding	CPL/CPM	Grinding of sealing surfaces on medium bore diesel engines.
Valve spindles & Valves Seats	Valve Spindles	BSP 30	Fully automatic use and automatic angle setting
	Valve Seats	VSL	Fully automatic use with fast result
	Valve Seatx & Recess	VRL	Combi-machine when doing many seat inserts
	Valve Seat Remover	MPI	Induction machine for valve seat removal
	Working Rig	WR	Safe and easy-to-use holder for cylinder heads
Cylinder Liners	Cylinder liner Honing	HON S	Honing in-situ directly on the engine
	Honing Rig	HR	Stand alone honing rig
	Hydraulic Power Pack	HPU	Fast removal of hydraulic bolts
	Surface Roughness	SRM	Documentation of the honing result
Fuel Injectors & Fuel Pumps	Fuel Injector Tester	VPA/VPUD	Automatic use incl. documentation
	Fuel Pump Tester	FPT	Final verification
	Fuel Body Grinding	FPG	Complete Grinding Machine
Cleaning Equipment	Ultrasonic Cleaner	USC 1000/4600	Superior engine parts cleaner
Fuel System	Purifier monitor	FAR	For monitoring the performance of purifiers and other components
Container Solution	Workshop Container	Container	Movable or permanent product workshops for fast installations and safe storage

Eliminate Troublesome water & gas leaks

When experiencing engine problems such as water and gas leakages the Chris Marine surface grinding equipment will repair the sealing surface according to the engine makers' specifications.
The machines are versatile and flexible for surfaces that require the highest precision. They are portable allowing for cost savings by in-situ grinding, and are easy to use.

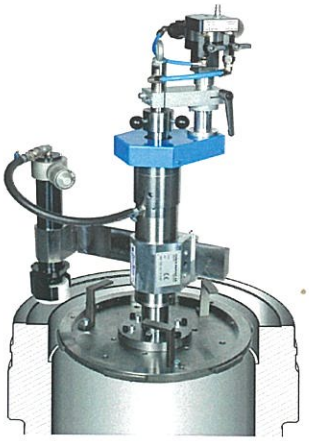


CPL

For grinding of sealing surfaces between cylinder head and cylinder liner and between cylinder liner and engine frame on small and medium bore diesel engines.

The manually driven CPL machine will bring about great savings from in-situ grinding and milling of cylinder heads, liners and engine blocks.

The machine can also be used for grinding of sealing surface between piston crown and piston skirt.



CPM

For grinding of sealing surfaces between cylinder head and cylinder liner and between cylinder liner and engine frame on medium bore diesel engines.

The air motor driven CPM machine is ideal for in-situ grinding and milling of cylinder heads, liners and engine blocks.

Optimize valve seats and spindles

Today's diesel engines are exposed to significant loads, and it is therefore important that the valves and valve seats' sealing surfaces are carefully rectified to provide a tight seal.

At Chris-Marine, our continuous cooperation with companies such as MAN and Wärtsilä results in customized solutions that ensure easy operation for the onboard crew.

Precise grinding of valves and seats

Designed for the grinding of valves and valve seats on high and medium-speed diesel engines, the valve grinding machines are easy to use and features anti-vibration mountings as well as a self-centering systemt to ensure that both valves and valve seats can be easily set up and maintained to the finest ground tolerances with minimal material removal.

Automatic Valve Spindle Grinding - BSP 30

The BSP is an electrically driven machine for grinding of valve spindles on high and medium speed diesel engines.

The machine is available in semi- or fully automatic versions and comes delivered with precision settings for required grinding angles and can also be adjusted by the operator.

In-situ Machining - VSL

For in-situ machining of valve seats
- Up to 6 times faster than traditional grinding machines
- Simple to use
- Delivered with preset angles for absolute accuray
- Eliminates the risk of mistakes
- Not sensitive regarding vibrations.

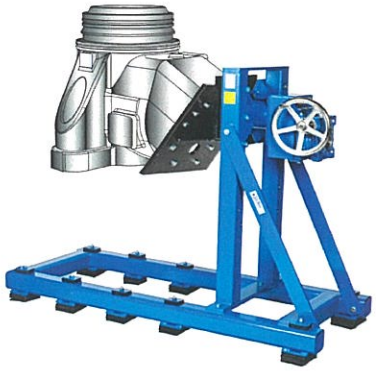
Combined Machining - VRL

A combined machine for in-situ machining of valve seats and seat recesses on medium speed diesel engines.
- Time saving on site machining.
- Precision machining of seat locations.
- Unique tool for optimal cost-efficiency.
- Compact machine fits most cylinder heads.

Facilitate Overhaul Work with the Working Rig

The working rig comes in 8 configurations, ranging in capacity from 300 kgs all the way up to 2600 kgs so as to be useful for all sizes and shapes of exhaust valve cages and cylinder covers.

The WR is safe and efficient with a self locking turning gear and facilitates a multitude of maintenance operations, particularly when operating a valve seat grinding machine.



Remove Valve Seats with the MPI

We recommend the MPI (Multi Purpose Induction heating tool) for easy removal of valve seats, shrink fitting and other applications.

The MPI unit generates heat directly in metal objects.

It is very precise and there is no open flame with noxious gasses, soot or heat loss to the surroundings.

For use in several different applications

Reduce Lub Oil Consumption

Cylinder liners in poor condition in terms of ovality, bore polished surface and unnecessary high cylinder liner oil lubrication feed result in reduced performance and increased lub oil consumption.

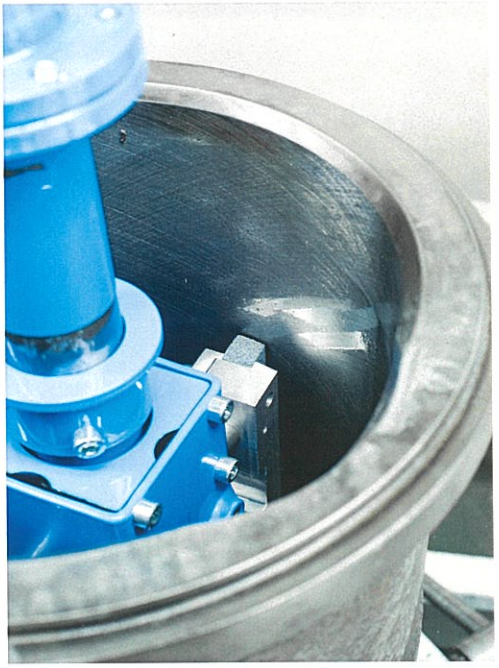
Increase the Lifetime of Your Cylinder Liner

When maintaining your liners, you not only reduce future liner- and piston ring wear and increase their life-time, but also reduce engine fouling and problems related to blow-by eliminating the need to "over-lubricate" and keeps the cylinder liner running costs at minimum.

Benefits of Liner Maintenance

The Chris-Marine cylinder liner maintenance products provides our customers with a range of benefits regarding economy and safety, as it:

- Minimizes the lub-oil consumption and increases the service life of cylinder liners and piston rings.
- Reduces cylinder liner wear and thus generates significant savings in operation costs.
- Minimizes the risk of blow-by
- Easy to operate, even for un-skilled crew members



Clever investment

When investing in a cylinder liner maintenance machine from Chris-Marine, we will guide you towards the correct honing heads and shafts, the different ceramic stones for coarse and plate honing and the correct gearbox for you to achieve the optimal cross pattern, as well as all other necesessary accessories for your specific engine model.

Step-by-Step procedure for cylinder liner maintenance

• Loosen the bolts with HPU

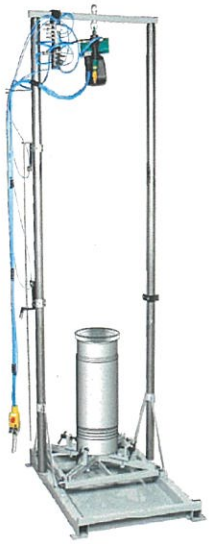
By using our reliable Hydraulic Power Units (HPU) with hoses and couplings you will loosen the stud bolts fast, efficiently and in a safe way. After assembling all parts, we secure everything with the HPU according to the engine manufacturer's specifications.

Approved and recommended by major engine builders!

• Hone or deglaze to restore the liner

Perform deglazing or honing in accordance with the manufacturer's specification using the portable deglazing machine DGL or the portable honing machine HON S.

Since Chris-Marine supplies all relevant equipment and data, you do not require a skilled engineer to perform proper honing.



Honing Rig

The HR Honing Rig fits all service workshops and has been specifically developed for honing cylinder liners out of the engine. It has a robust and compact design and provides the optimal platform for the honing of cylinder liners.

• Ensure correct surface profile with SRM

During the honing operation, we strongly recommend our Surface Roughness Measuring device to measure the liner in order for you to be well aware of the condition during and after the operation.

By using the device frequently, you will know when you have achieved the correct surface profile according to the engine manufacturer's specification, and avoid removing more material than needed.

Reduce emissions & engine fouling

When a fuel injector performs less than optimal it can start opening at the wrong time as well as leak fuel before or after injection. This results in unnecessary fuel consumption and engine maintenance.

Fuel Injector test unit for 2- and 4-stroke engines

The IOP Marine Injector SafeTest technology developed for correct testing of slide-valve fuel injectors has evolved into a new generation of digital fuel injector testers designed for easier and more efficient onboard maintenance of 2- and 4-stroke engine fuel injectors.

The guiding system ensures a much easier way to verify details critical to the actual injector performance and prevents insertion of injectors that previously would have caused excessive fuel consumption, higher emission and engine fouling, thus improving the fuel efficiency.

Approved & Recommended by MAN Diesel & Wärtsilä

VPA

- Touch panel for easy and fast operation
- Step-by-step test procedure allows testing of all 2- and 4-stroke slide valves, incl. MAN Diesel slide valves.
- Pre-set required values to be more operator independent
- Max. and min. values to determine whether an injector passed or failed the test.
- Built in printer minimizing the risk of errors by ensuring full documentation
- Test reports stored in permanent memory or transferred to PC via USB. The information can therefore be used electronically as documentation.

VPUD

- Features the patented IOP SafeTest Technology
- Ensures optimal fuel injector performance
- Helps avoid unnecessary fuel consumption and particle emissions
- Operator guiding system to eliminate the possibility of human errors
- Test both M/E and A/E

Optimal Fuel Pump Performance

FPT

Determine wear condition of medium speed engine fuel pumps and compare it with existing performance data.

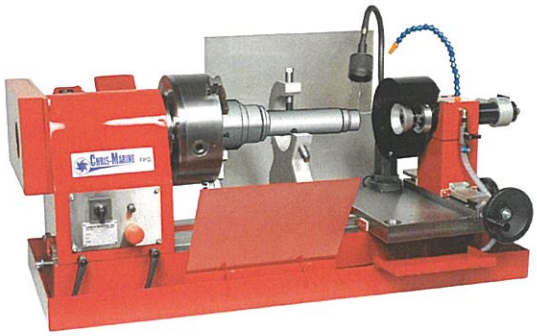
- Pneumatic test method - does not require a large setup.
- Accurate, reproducible and well documented determination of pump condition.
- Automated test sequence for each pump type.
- No disassembly necessary before testing.
- No cleaning necessary after testing.
- Data reports generated automatically, available in MS Excel format for further processing.
- Pump manufacturer independent.
- Adapters can be made for most 4-stroke engine fuel-pumps.

FPG

For grinding of fuel pump and fuel valve components for diesel engines.

Developed for the grinding of fuel pump and fuel valve components for diesel engines, the FPG has a wide range of applications and operation.

The machine is timesaving as no lapping is required. It is electrically driven with a pneumatically driven grinding head and is intended for workshops ashore.



Superior Patented Engine Parts Cleaning

The Ultrasonic cleaning system offers a solution to the cleaning requirements of both power generation and marine industries.

With the patented frequency sweep maximizes the ultrasonic efficiency, and helps to reduce the cleaning time, thus saving both time and money as a result of the fast and efficient cleaning.

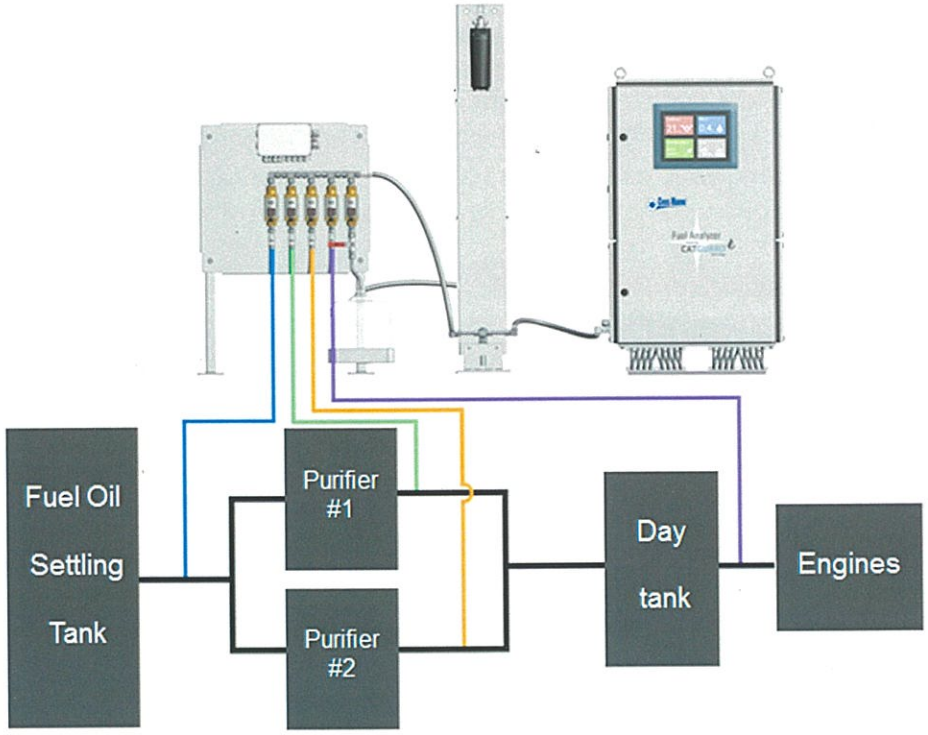
Suitable for cleaning of engine parts such as:

- pistons
- valve spindles
- fuel injectors
- cylinder heads
- intercoolers
- heat exchangers

Monitor Purifier Performance to Improve the Fuel System

Cat fine particles are produced during the refinery process and may cause wear in fuel pumps, fuel injectors, cylinder liners, piston and piston rings in main engines and auxiliary engines if not filtered out by the fuel treatment system. Hence, it is important to keep the onboard fuel treatment system in good condition.

Until today there has been no on-line measurement tool for cat fines on the market. This changed when Chris-Marine introduced the Fuel Analyzer. Unlike any other product in the industry, the device monitors the cat fine level continuously in the fuel treatment system and the result may be reviewed from the superintendent's office.



By monitoring the cat fine level throughout the fuel treatment system with the Fuel Analyzer, preventive maintenance actions of critical components can be performed before an increased wear level is detected in the main engine.
It is furthermore possible to precisely adjust the purifier according to actual cat fine levels and thereby reduce sludge and improve fuel efficiency.

FUEL ANALYZER - FAR

- Allows for safe and efficient management of the fuel oil system.
- Real time cat fine monitoring -even at the superintendent's office
- Precise monitoring of cat fine concentration (±2 ppm) in up to seven sampling points plus one manual sampling point
- No consumables and easy to maintain.
- User-friendly touch display and remote internet access.

TSA - Optimum Service at your Power Plant

The mobile TSA crew delivers first class service onboard ships, at power stations and in shipyards independent of location, or reconditions used and damaged engine parts in our own workshops.

The international diesel engine service is performed by marine engineers with solid experience and knowledge in diesel engine repair and maintenance.

Container Workshops - The Mobile Solution

Our mobile workshops, shaped as 10-, 20- and 40-feet containers, are completely tailor-made workshops fully equipped with Chris-Marine and IOP Marine maintenance equipment.

The turn-key containers can be placed in addition to your power plant or as stand alone. Just connect the unit to air- and power supplies to get a modern workshop with the latest tools and machines on the market. As an option Chris-Marine offers containers with diesel generator and air compressor to make the plant fully independent of external power supply.

Rent, lease or buy our mobile workshop containers, with or without the TSA Crew.

Benefits of the TSA mobile hub:
- Located near the engine in need of maintenance
- Qualified maintenance at shortest time
- Best quality
- High performance
- High accuracy
- Time saving
- Superb supervision
- Flexibility
- Cost efficiency

The Optimum Solution for Power Plants

All types of diesel- and gas fueled power plants

Chris-Marine® products are made for all types of diesel- and gas engines that provide electricity for base load, grid stability, emergency generators and industrial self-generation, as well as oil- and gas applications. Chris-Marine® machines are designed to last the lifetime of the power plant.

Reduce costs by maintaining the engines optimally

Demands for energy continue to increase, with a corresponding rise in the numbers of power stations producing electricity, operating district heating and cooling systems.
The best way to reduce costs by maintaining the engines in an optimal way, is to use the Chris-Marine® complete service concept that include complete systems for controlling the status as well as doing the service when needed

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