



## CHANGE IS IN THE AIR

The shipping world has changed forever!  
The impact of air pollution from your ships is now under constant scrutiny from the world's media. The marine industry has to act now in order to catch up with what other industries have been doing for years.

At the same time, the new MARPOL legislation restricts you from operating your engines in the most efficient way possible, so you burn more fuel. You have more emission reduction regulations coming soon from the IMO, the introduction of new worldwide ECAs (emission control areas) and geographic zones where you will be taxed on your emissions.

You need to be prepared for these regulations; you need to be in control of how you report your emissions data; you need to be free to run your ships exactly as you wish. You need to invest in MariNOx Evolution™ ...

As an innovator in the marine industry, you fully understand that corporate social responsibility is vital to the future success of your organisation. You also know that applying environmental best practice can be an opportunity! It's an opportunity to set yourself apart from your competitors; an opportunity to make your ships the most desirable in the industry to charterers.

Fitting a MariNOx Evolution™ on-board emissions monitoring system is a statement of environmental leadership and corporate social responsibility that will solve your compliance problems, free you from major operational risk and restrictions imposed by the regulations, whilst delivering major cost savings to your operations.

MariNOx Evolution™ is the on-board emissions monitoring system of choice and is trusted by leading shipping companies.

Once you've invested in MariNOx Evolution™ you will wonder why you didn't do so years ago.

**MariNOx Evolution™ - Experience is Everything**

## WHY CHOOSE MARINOX EVOLUTION™?

When it comes to emissions monitoring, experience is everything and we've got more of it than all the other suppliers combined together - much more!

Martek pioneered emissions monitoring on ships - we have over 20 years of ship engine emission system design experience spanning >600 engines with more than 6million engine operating hours experience. No one comes close to matching this level of experience.

In 2010 to address the new requirements of the revised 2008 NOx Technical Code and MED certification, we introduced our second generation MariNOx Evolution™. This new system benefits from engineering enhancements gained from our experience of millions of operating hours on all ship and all fuel types — proof that experience is everything.

- Reduced component count, manufacturing time & cost of the system;
- Improved user interface;
- Optimised gas filtration arrangement (ask us more!) for enhanced protection & extended maintenance interval - CRITICAL consideration;
- Maintained 98% of original system proven components

MariNOx Evolution™ remains the market leading ships emissions monitoring system because:

- It's guaranteed to be the most reliable on the market;
- It's the only system proven in long term operation on >600 engines clocking > 6million operating hours;
- It's the only system proven long term on heavy fuel oil operation;
- It's the simplest & quickest system to install - GUARANTEED;
- It's backed by a market leading 3-year warranty

NOTE: It's likely you'll come across various sources of information in the market comparing emissions monitoring technology/systems. Before you make your judgement on the truth, please ask for a copy of our document "Destroying the Myths about ships emission monitoring" - we GUARANTEE you'll be glad you did!







## ENVIRONMENT

### Environmental Leadership

You're an innovator, forward thinking, committed to environmental leadership. You set the standards that others try to follow. Your organisation may be one of the growing number of public listed companies annually reporting their emissions to shareholders along with traditional financial data. It's easy for some to claim to be an environmental leader, but in your case, your whole corporate philosophy is committed to environmental best practice. Installing MariNOx Evolution™ on your vessels is a statement of your environmental commitment, showing you care about protecting our planet for YOUR children and future generations.

### Reducing CO<sub>2</sub> Emissions and Fuel Consumption

Installing MariNOx Evolution™ can enable the optimisation of your engines in order to reduce your vessels' fuel consumption, which reduces your carbon dioxide emissions. For every tonne of fuel saved, your vessels' carbon dioxide emissions are reduced by 3.4 tonnes. Installing MariNOx Evolution™ across your fleet could reduce your carbon footprint by the equivalent emissions of hundreds of thousands of cars per year.

### Total Emissions Reporting

Major charterers are now looking for detailed and accurate reporting of the total air emissions from vessels for each voyage undertaken whilst under their charter. These large organisations are influenced by both ISO14001 environmental standards and a need to be totally transparent to their shareholders, consumers and the various regulatory bodies. MariNOx Evolution™ delivers all emissions data for you and your customers in a user-friendly format, remotely accessible via the Internet.

### Differentiation of Your Fleet to Oil Majors

Oil majors have already adopted 'green chartering' policies when considering which tankers they will accept to carry their oil. MariNOx Evolution™ differentiates your ships as being 'green' and employing environmental best practice to help you win, and more importantly retain, premium charter business.

### Proof of Emissions Reductions

The new IMO Tier II (2011) and Tier III (2016) NO<sub>x</sub> regulations provide even more stringent emission limits than the current ones. Tier III regulations in particular require the fitting of NO<sub>x</sub> abatement systems such as SCRs and proof of their operation whilst in ECAs. MariNOx Evolution™ provides the mandatory proof that the system is performing correctly. Our unique DataLINK emissions software in combination with PURPLEFINDER allows you to view your vessels' air emissions in real time at the touch of a button via the Internet at your desk.



**PROVEN  
FUEL  
SAVINGS  
OF 2.45%**

30,400 KG  
67,200 LBS  
2.185 KG  
4.826 LBS  
28,295 KG  
62,380 LBS  
332 CU.M  
1,173 CU.FT.

MCW  
TARE  
NET  
CU.CAP.





## **COST SAVINGS & INCREASED PROFIT**

### **Reducing Fuel Consumption**

Amazing fuel savings have been achieved using MariNOx Evolution™ to enable the adjustment of engine settings outside the restricted settings imposed by the parameter check compliance method. Successful engine optimisation has been carried out on tankers and container ships with fuel savings of up to 2.45% achieved across a number of independently audited projects, saving hundreds of thousands of dollars per year for the owners and charterers.

The CO/CO<sub>2</sub> ratio in exhaust gases is a key indicator of combustion efficiency – a rising ratio indicates rising fuel consumption. Monitoring this ratio enables alarms to be set and maintenance strategies developed to further ensure reduced fuel consumption.

### **Use Non-OEM Spare Parts & Service**

As vessels age it is not always economically or practically viable to always use OEM NO<sub>x</sub> critical spare parts. Under MARPOL Annex VI, unless your vessel has an approved on-board NO<sub>x</sub> verification system installed, you must purchase only original engine maker spares. By installing MariNOx Evolution™ you can save many thousands of dollars in NO<sub>x</sub> critical spares such as fuel injectors and cylinder liners.

### **Optimising Fuel Changeover for SECA Area**

Low sulphur fuel is of course more costly than normal bunker, therefore choosing the optimum time to change over bunkers when moving into a SECA is very important. The simplest way to prove compliance upon entering the SECA is by monitoring the SO<sub>x</sub> emissions from the exhaust to verify the sulphur content of the fuel. With the MariNOx Evolution™ SO<sub>x</sub> analyser you can quickly see how long it takes for the fuel changeover, allowing you to optimise all future changeovers and reduce your consumption of low sulphur fuel. MariNOx Evolution™ provides you with a real-time record for the authorities to confirm compliance whilst in SECA.

### **Higher Charter Rates/More Days on Charter**

Adopting environmental best practice by fitting MariNOx Evolution™ to your ships to access the benefits described in this brochure will clearly differentiate your ships amongst charterers. The competitive advantage that you create will help drive up your charter rates and achieve more days on charter.



**FREEDOM  
TO WORK  
RATHER THAN  
PAPERWORK**







## **FREEDOM**

MariNOx Evolution™ brings freedom to you as a shipowner, freedom to operate your fleet the way you want to. Complete freedom from the unwanted burden of restrictions imposed by the parameter check compliance method.

### **Your Engine Settings**

MariNOx Evolution™ gives you the freedom to adjust the settings of your engines to suit your own operating preferences, whether that be in low NO<sub>x</sub> or fuel efficiency mode, or a combination of both, based on your geographical area of trading. It's your choice!

### **Your Choice of Parts and Servicing Partners**

Fitting MariNOx Evolution™ means you're free to choose your supplier of NO<sub>x</sub> critical spare parts and who you use to service your engines and parts. Without MariNOx Evolution™ you're limited to only the engine maker's original sources. Whilst it may be your general policy to use only original spare parts, in an emergency breakdown situation you have a choice.

### **Freedom from Disruptive Surveys and Excessive Record-keeping**

Though policing of MARPOL Annex VI may have been low key in the past, implementation is getting ever tighter. In addition, the proper upkeep of the 'Engine Technical File' in-line with MARPOL Annex VI is at best time-consuming and often considered unmanageable. When you choose MariNOx Evolution™ you are freed from all the detailed administration such as keeping a purchase log of parts and record books of engine parameters. Moreover, you avoid potentially intrusive surveys of such things as turbochargers, cylinders and other NO<sub>x</sub> critical parts in order to check that they bear the correct IMO numbers. With MariNOx Evolution™ you're simply free to get on with running your ships in the way you see fit.

### **Freedom to Use the Latest Technology**

Engine makers are continually making technological advances in engine parts that improve efficiency or lower NO<sub>x</sub> emissions. Unfortunately you're restricted from installing these new technically advanced parts (such as slide valves) in existing engines unless you can prove your emissions on-board. Fitting MariNOx Evolution™ frees you from that restriction, allowing you to benefit from lower fuel consumption, lower NO<sub>x</sub> emissions and all the other benefits that these new parts deliver.

### **Freedom to Use Fuel Additives**

There are many fuel additives on the market that claim to reduce sludge, reduce particulate emissions, reduce engine deposits, reduce NO<sub>x</sub> emissions and improve fuel consumption. The use of these additives can have a significant effect upon a vessel's air emissions.

Without fitting MariNOx Evolution™ to your ships to prove the effect of the fuel additives on NO<sub>x</sub> emissions, you can't use many of the additives.

## REGULATION COMPLIANCE

### **MARPOL Annex VI Regulation 13**

MariNOx Evolution™ remains the simplest way to comply with MARPOL Annex VI Regulation 13, and is the emissions monitoring system chosen by many of the world's leading shipowners. The latest amendments to MARPOL Annex VI have resulted in major reductions in allowable NO<sub>x</sub> emissions levels over the course of the next few years. These reductions will necessitate emissions-reduction technology and on-board emissions monitoring as standard.

### **ISO 14001**

Many modern shipping companies commit to the ISO14001 environmental performance management system. Under ISO14001, the direct monitoring and reporting of air emissions using MariNOx Evolution™ is considered to be best practice. MariNOx Evolution™ delivers totally accurate emissions data rather than relying upon relatively inaccurate modelling based purely on fuel consumption models.

### **CO<sub>2</sub> Indexing and Emissions Trading**

Pressure is now focused on the shipping industry to fall into line with other industries and begin emissions trading. Recent studies have shown that over 65% of shipowners believe CO<sub>2</sub> indexing followed by emissions trading is the way forward. The MariNOx Evolution™ system is already being used by leading shipping companies for the CO<sub>2</sub> indexing of their vessels.

### **Classification Society Environmental Notations**

Classification societies are now introducing environmental notations to encourage the highest level of environmental performance on new ships. In 2006, Bureau Veritas led the way by introducing their CLEANSHIP SUPER NOTATION, which made the installation of a Type Approved on-board NO<sub>x</sub> monitoring system mandatory. Other class societies are reviewing their highest level environmental notations in relation to shipboard air emissions.

### **The Future**

The MariNOx Evolution™ system has been designed to be 'future-proof' against future regulations, allowing simple 'plug and play' analyser inputs that ensure no additional emissions-reporting systems will ever need to be purchased.



MARINOX  
SYSTEM  
ANALYSIS  
14.1g/kWh  
in compliance



**Emission Monitoring System**

## SYSTEM CAPABILITIES

<b>REPORTING CAPABILITIES</b>	<p><b>NO<sub>x</sub></b> Compliant with MARPOL Annex VI Reg. 13 Instantaneous specific NO<sub>x</sub> g/kWh Totalised mass NO<sub>x</sub> emissions kg/tonnes (ISO 14001 reporting) Automatic monthly NO<sub>x</sub> compliance tests during normal vessel operations Pre-configured for Tier I, Tier II and Tier III emission limits.</p> <hr/> <p><b>SO<sub>x</sub></b> Compliant with MARPOL Annex VI Reg. 14 (4) (b) i. SO<sub>2</sub>/CO<sub>2</sub> ratio ii. Fuel oil sulphur content (% w/w) iii. Totalised mass SO<sub>x</sub> emissions kg/tonnes.</p> <hr/> <p><b>CO<sub>2</sub></b> Instantaneous % totalised mass CO<sub>2</sub> emissions kg/tonnes CO<sub>2</sub> emission indexing in line with MEPC Circ. 471, e.g. g CO<sub>2</sub>/tonne nm' CO/CO<sub>2</sub> combustion efficiency ratio capability.</p>
<b>STANDARD ANALYSERS</b>	NO <sub>x</sub> , CO <sub>2</sub>
<b>OPTIONAL ANALYSERS</b>	SO <sub>x</sub> , CO, O <sub>2</sub> , NH <sub>3</sub> , CH <sub>4</sub> , Hydrocarbons & Particulate matter.
<b>ANCILLARY INPUTS</b>	Engine performance parameter sensors, ambient temperature, pressure & humidity sensors, as required by 'The NO <sub>x</sub> Technical Code (2008)'.
<b>SECURITY</b>	Date encryption to ensure tamperproof emissions reporting.
<b>ENVIRONMENTAL TESTING</b>	Certified to IACS E10 / LR ENV 2 / DNV Class A/B/BV spec Pt C, Ch 3, section 6.
<b>APPROVAL</b>	MED Approved by LR
<b>SYSTEM DIAGNOSTICS</b>	Automated system condition monitoring with maintenance indicators.
<b>EMISSIONS REPORTING</b>	Windows-based user emissions reporting software, displays multi-engine details and emissions values in a simple, user friendly format.
<b>ONLINE EMISSIONS REPORTING</b>	Utilising a secure Web portal for corporate access to individual vessel or full fleet reporting. Your secure Web access provides you with: vessel position; speed; direction data; instant emissions; cumulative emissions data; and sulphur in fuel reporting. Other data available on request.
<b>EMISSIONS CONTROL AREA (ECA) ALERTS</b>	Determines applicable emission limits based on geographical location, and provides an automatic alarm notification. Reports show emissions snapshot via Inmarsat 'D' by email, SMS, etc.
<b>ENGINE PERFORMANCE MANAGEMENT</b>	Integration facility with your engine performance management system to enhance engine optimisation capability.



## WHAT OUR CUSTOMERS SAY

“The MariNOx Evolution™ system was professionally installed in-passage aboard MT Crudestar without any detrimental effect on the operation of the vessel. By monitoring NO<sub>x</sub> and CO<sub>2</sub> emissions the engine was optimised to achieve audited fuel savings in the region of 2.45%. Due to the complete success of the trial we have endorsed the fitting of MariNOx Evolution™ to our vessels.”

Mr T. Pavlidis, Technical Director  
*Metrostar Management Corp.*

“The equipment was installed in-passage by the Martek service team with assistance from the ship’s engineers. The installation did not affect the vessel’s operation. Various trials were carried out on the main engine (Wartsila 10RTA96-C) to measure NO<sub>x</sub>/CO<sub>2</sub> and FO consumption. The trials concluded that fuel savings in the range 0.6%–2.1% were delivered.”

Mr Kurt Brieger, Fleet Manager  
*Peter Dohle Schifffahrts*

“Höegh Fleet Services undertook a thorough analysis of available technology in the market and concluded that Martek’s MariNOx Evolution™ was the most suitable system.”

Mr Per Borstad, Superintendent  
*Hoegh Fleet Services*

For the latest MariNOx Evolution™ news and product updates visit: [www.martek-marine.com](http://www.martek-marine.com)



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***“Winner of 2008 award for Protection of Marine and Atmospheric Environment.”***