www.XBEE.com

XBEE
ENZYME FUEL TECHNOLOGY

BETTER FUEL,
BETTER PERFORMANCE.

BETTER CONSUMPTION,
BETTER EMISSIONS.

XBEE: NATURALLY BETTER.

Three good reasons to use XBEE Enzyme Fuel Technology

1. **XBEE** naturally improves fuel quality
and solves all problems related to organic contaminants

2. **XBEE** reduces your fuel consumption
and quickly pays for itself

3. **XBEE** improves your environmental footprint
and reduces all gas emissions

XBEE® Enzyme Fuel Technology is a registered trademark by XBEE SA

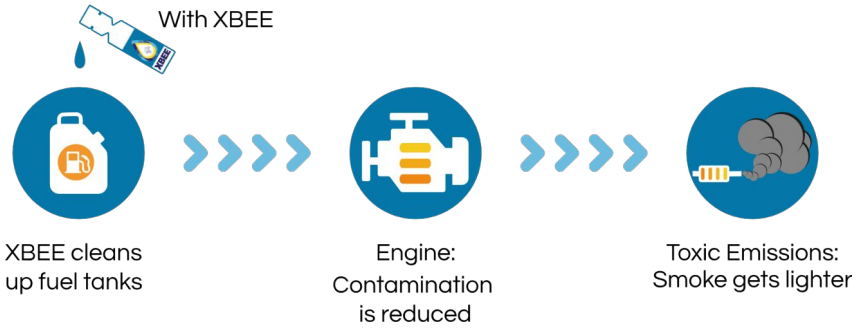
Why use XBEE Enzyme Fuel Technology?

Protect your fuel and engine

Standard fuel is often contaminated and does not burn correctly, building up soot and carbon deposits in engines.

STAGE 1: Easy to use, natural and safe

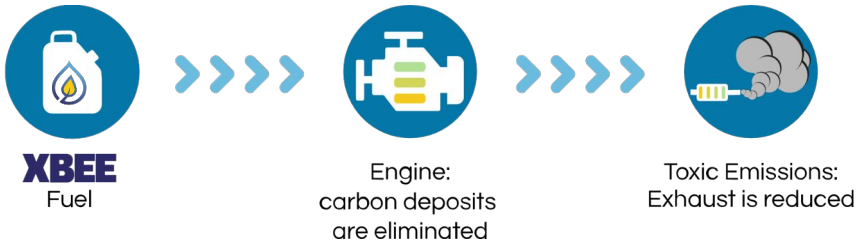
Adding **XBEE** to any type of fuel safely removes water, sludge, and the organic debris that contaminate fuel and damage fuel systems.



How does XBEE Enzyme Fuel Technology work?

STAGE 2: Oxygenation and Combustion

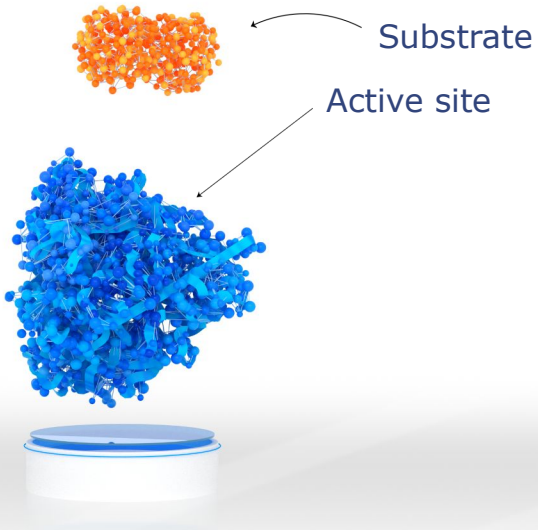
XBEE hyper-oxygenates the fuel during combustion, reducing soot in the exhaust and gradually eliminating carbon deposits.



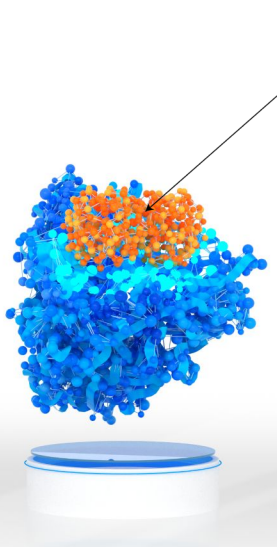
STAGE 3: Reducing pollution

With regular use of **XBEE**, both fuel system and engine are kept clean. This optimizes the combustion performance of your engine and lowers wasted fuel, and exhaust pollution.

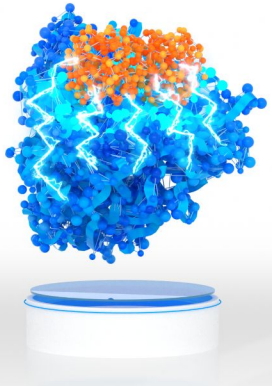
How does an enzyme work?



The hydrocarbon molecule, or "Substrate", binds to the enzyme's Active Site.



The enzyme shifts its shape to induce a tight fit, forming an Enzyme/ Substrate complex.



During the Transition state, the Substrate is split, forming new molecules, or "Products".

The Products are released and the enzyme can act again.

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WARRANTIES

XBEE fuels in compliance with all standards

XBEE contains natural enzymes extracted from tree leaves, in a highly purified petroleum carrier.

XBEE itself is a chemical-free, pure fuel.

Fuels treated with **XBEE** remain in compliance with all liquid fuel standards, even if overdosed.

Date	Laboratory	Country	Fuel standard
Mar. 26, 2019	Bureau Veritas	France	HFO 180 ISO 8217
Dec. 26, 2018	Bureau Veritas	France	HFO 380 ISO 8217
Oct. 22, 2018	Saybolt	Singapore	Diesel Oil 10 ppm
Aug. 17, 2018	Bureau Veritas	France	MGO DMA ISO 8217
Apr. 10, 2018	Bureau Veritas	France	Diesel Oil B7 EN 590

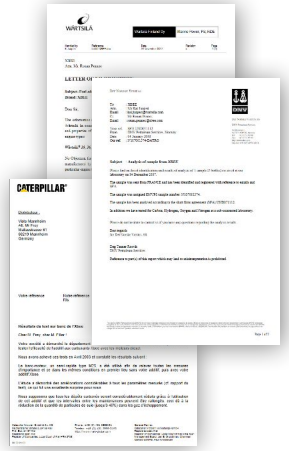
XBEE fuels are compatible with all engines

XBEE is an ashless product that contains no chemicals, no alcohols, no metals, etc. Thanks to its natural composition, it is harmless and completely safe to all alloys in engines.

DNV (Norway) and VPS (Netherlands)
These laboratories analyzed pure **XBEE** and determined that our technology is completely safe for all engines.

Wärtsilä Finland Oy
The engine manufacturer issued a letter of "No-Objection" to the use of the technology in their engines.

Mak/ Caterpillar (Germany)
The OEM conducted diesel engine combustion tests with **XBEE** at their Department of Motor Development and Testing. Consequently, they issued a letter of recommendation noting **XBEE**'s safety and efficacy, as well as its positive effects on the environment.



Date	Laboratory	Country	Engine standard
Nov. 14, 2022	Wärtsilä	Finland	Letter of no-objection
Jan. 4, 2008	Det Norske Veritas	Norway	Composition analysis
Oct. 29, 2018	Veritas Petroleum	the Netherlands	Composition analysis
Jul. 18, 2005	Prodrive	United Kingdom	Diesel CEC F-23-A-01
Aug. 4, 2005	Prodrive	United Kingdom	Gasoline CEC F-05-A-93
May 19, 2003	Mak / Caterpillar	Germany	Letter of recommendation

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BENEFITS

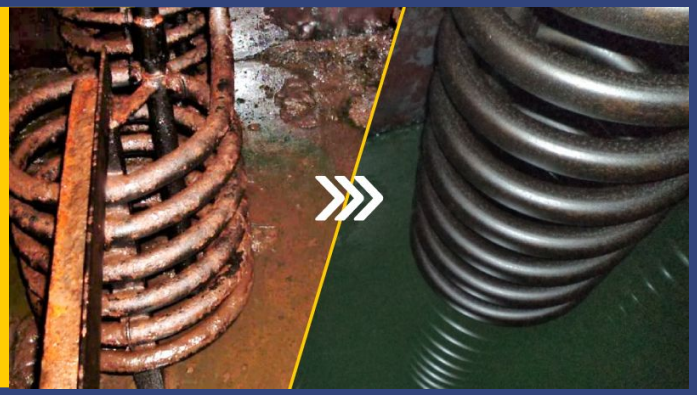
XBEE cleans fuel tanks and engines

XBEE Enzyme Fuel Technology is detergent-free, yet cleans the entire fuel system, including tanks, piping, filters, and water separators, and by improving combustion, carbon deposits are eliminated, cleaning up the engine and exhaust system.

As **XBEE** breaks down organic contaminants into small, combustible particles, fuel filters last longer and water separators function more efficiently.

The same catalytic function that cleans the fuel also breaks down large fuel molecules, particularly Polynuclear Aromatic Hydrocarbons (PAH). This reduces soot. Combustion chamber deposits are reduced, and less soot enters the lube oil through blow-by.

XBEE naturally removes fuel-derived contaminants (water, sludge, etc.)



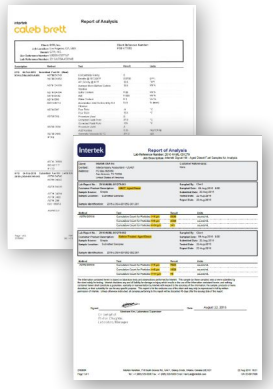
XBEE eliminates abrasive carbon and soot deposits in engines.

XBEE removes impurities and stabilizes fuels

When fuel is in motion, **XBEE** acts as a mild surfactant, slowly dispersing water bottoms as microscopic drops without forming harmful emulsions or damaging fuel lubricity.

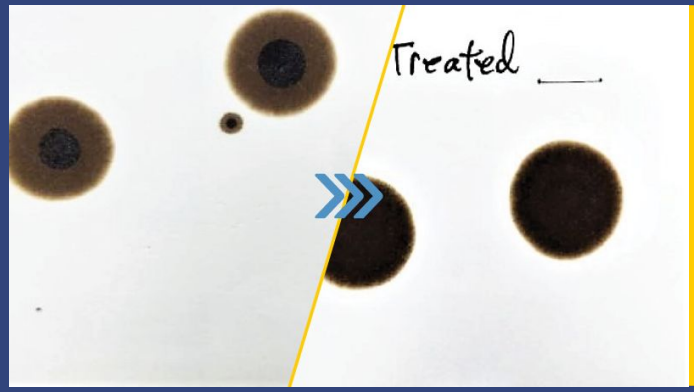
Corrosion is reduced as fuel remains dry and free from water-related problems.

XBEE disperses fuel-derived organic debris, including oxidative gums and asphaltenes that precipitate from aged or contaminated fuel, which forms gums and corrosive sludge.
Reducing asphaltenes also improves the compatibility of fuel oils from mixed-sources, stabilizing fuel oils with low aromatic reserves.



XBEE reduces particles and water droplets in fuels
ASTM D7619
By Intertek, Canada

Test	Units	Neat aged diesel	XBEE aged diesel	Difference
≥ 4 µm	counts/ml	9 339	7 022	-24.81%
≥ 6 µm	counts/ml	2 280	1 608	-29.47%
≥ 14 µm	counts/ml	141	75	-46.81%



XBEE improves heavy fuel oil stability and compatibility ratings
ASTM D4740
By Intertek, USA

XBEE reduces maintenance costs and fuel consumption

Cleaner fuel and better combustion result in:

- Less frequent or even no need for tank cleaning
- Less down time for engine maintenance and repairs
- Extended life of fuel filters, injectors, pumps, exhaust valves, pistons, and rings
- Lower oil and oil filter consumption

Based on a price of $900/ton of MGO, break-even point of **XBEE** is as low as a 0.75% reduction of fuel oil consumption.

Reduction	Savings (1,000 m³ MGO)
0.5 %	-$2,528.59
1.0 %	**$2,563.01**
2.5 %	**$17,837.81**
3.0 %	**$22,929.41**
4.0 %	**$33,112.62**
5.0 %	**$43,295.82**

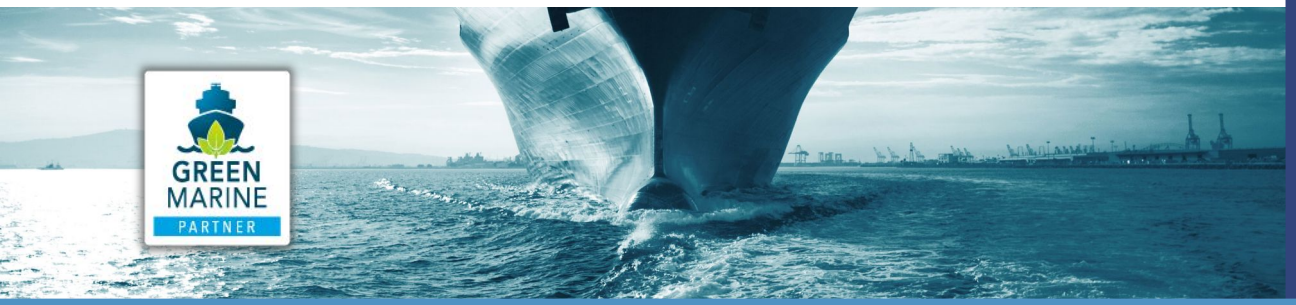
Based on a price of $700/ton of VLSFO, break-even point of **XBEE** is as low as a 0.97% reduction of fuel oil consumption.

Reduction	Savings (10,000 m³ HFO)
0.5 %	-$36,515.91
1.0 %	**$3,170.10**
2.5 %	**$122,228.13**
3.0 %	**$161,914.13**
4.0 %	**$241,286.15**
5.0 %	**320,658.17**

XBEE reduces smoke and Greenhouse Gas Emissions

XBEE Enzyme Fuel Technology improves both fuel cleanliness and combustion, resulting in significant reductions of all exhaust gases and particles, such as toxic soot, unburned hydrocarbons, CO_2, NO_x and SO_x.

Reducing fuel consumption is the easiest way to reduce emissions of carbon dioxide. When you use **XBEE** you are reducing CO_2 and your energy footprint, and saving money at the same time.



MGO	Without XBEE	With XBEE	Difference
Fuel consumption (g/kWh)	254.10	229.10	-9.83%
CO_2 (g/kWh)	788.00	716.00	-9.14%
CO (g/kWh)	1.81	0.58	-67.96%
NO_x (g/kWh)	10.20	7.60	-25.49%

Source: Envirotech Consultancy WLL and Boskalis, dredger Coastway

HFO 380	Without XBEE	With XBEE	Difference
Particulates (mg/Nm³)	121.70	63.94	-47.46%
CO_2 (%)	6.10	5.53	-9.33%
CO (mg/Nm³)	98.43	66.35	-32.59%
NO_x (ppmv)	2 310.33	2 221.90	-3.83%
VOC (mg/Nm³)	41.17	33.45	-18.73%

Source: Ascal and Brittany Ferries, ferry Mont Saint-Michel

XBEE is easy to use and pays for itself

ONE solution to **ALL** your fuel-related problems:

- Standard dosage ratio is 1 litre of XBEE for 4 000 litres of fuel
- Treat fuel directly in the storage tanks
- Treat fuel at EACH and EVERY bunkering operations for optimum performance

XBEE products	Treat up to
1 040-litre IBC [XBEE1IBC]	4 160 000 litres
208-litre drum [XBEE20800]	832 000 litres
20-litre jerrycan [XBEE2000]	80 000 litres
1-litre bottle [XBEE0100]	4 000 litres

XBEE SA · Schifflange, Luxembourg | **XBEE Inc.** · Saint-Jérôme (QC), Canada | **XBEE Ltd.** · London, United Kingdom

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