

exomission FWE Fuel-Water-Emulsion Technology

Energy-efficient exhaust emission reduction
For stationary and mobile applications



Gefördert
durch die
Bundesregierung

exo**mission** 
zero is our vision

09.2019

www.exomission.de
www.exomission.nl

exomission FWE

What is That?

The **exomission FWE** is a fully electronically controlled and fully supervised, engine-independent and closed-loop **Add-On circulation system** for the generation and processing of a **Fuel-Water Emulsion** including a Water Treatment Plant as well as all necessary safety operating and control equipment.

For what is this good?

The **exomission FWE** is an **emission reduction system** and counteracts the formation of the two main exhaust pollutants of the diesel engine, soot and nitrogen oxides within the engine. Depending on the engine type, mode of operation and the specific water content of the fuel-water emulsion, a drastic reduction of the soot emission and a considerable reduction of the nitrogen oxide emission (NOx) are achieved. This in conjunction with a usually consumption-neutral or often slightly fuel consumption-lowering effect.

How is the working principle?

In the case of the **exomission FWE** the fuel is taken from the existing fuel supply downstream the fuel filter of the engine and then roughly premixed in a special device with deionized fresh water according to programmed quantities. Under pressure, a finely distributed, homogeneous fuel-water emulsion is produced in a patented emulsifying unit. This emulsion is fed to the fuel flow line and thus to the combustion process. The unused emulsion, which is in the fuel return line, is returned to the emulsification circuit. As a result, excess emulsion is not passed into the fuel tank, but returned to the emulsification circuit and is thus permanently re-



How it looks

Main Modules of the **exomission FWE**

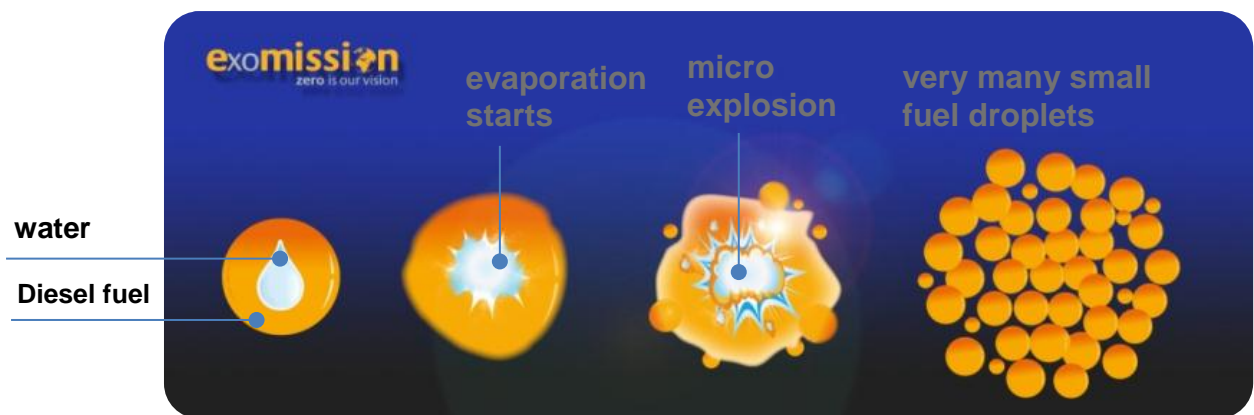


How it works

Overview

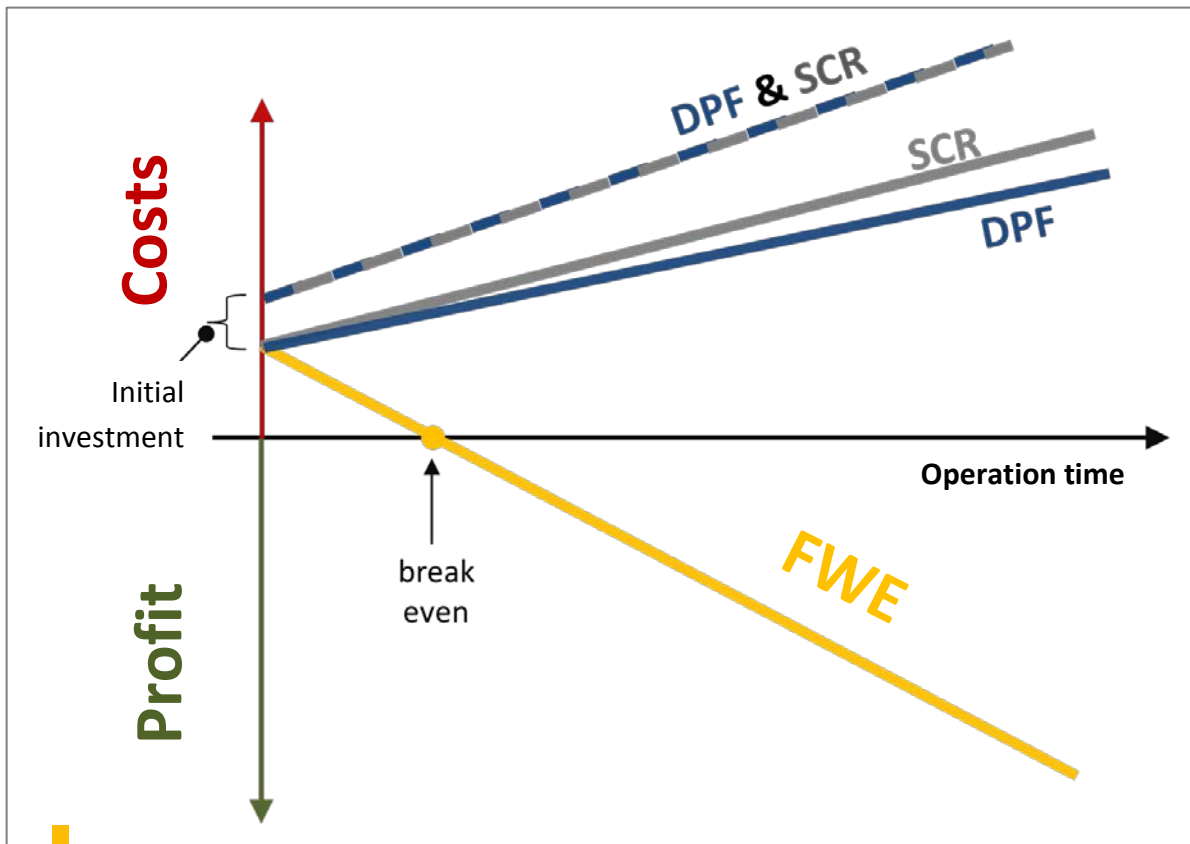
- Redirection of the fuel flow into the **exomission FWE**
- Introducing of water into the Diesel fuel
- Generation of a finely divided, homogeneous fuel-water emulsion
- Returning of the emulsion into the fuel flow
- Combustion of the emulsion in stead of pure fuel

Into the combustion chamber



- water evaporates quickly and explosively in the combustion
 - much faster than the surrounding Diesel fuel
- the Diesel fuel droplets are „torn“ into many smaller droplets
- better, more homogenous mixture preparation
- larger surface for the contact of oxygen with fuel
- more intensive, better combustion
- rich mixture zones are drastically reduced
- massive reduction of soot formation zones
- improvement of fuel efficiency
- fuel consumption and CO2 emissions decrease slightly
- in parallel, the enthalpy of the evaporation of the water reduces the combustion peak temperatures
- thus significant reduction of temperature dependents NOx formation

Save Clean!



Investment and operating costs of various emission reduction technologies

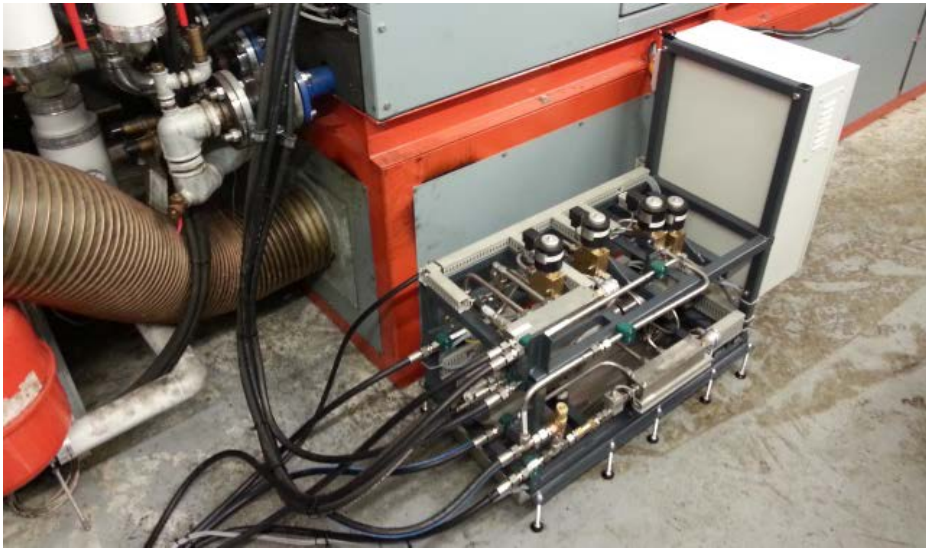
DPF = Diesel Particulate Filter; SCR = Selektive Catalytic Reduction (NOx-reduction)

Unbeatable advantages through parallel reductions of exhaust emission and fuel consumption

- After a short period of time go into the profit zone with the **exomission FWE**
- Compensate the next oil price increase with low operating costs
- Save the money for a new engine - simply retrofit **exomission FWE**
- Get (more) orders from the more environmentally sensitive charterers
- Get higher freight rates from environmentally sensitive charterers
- Continue to travel freely to the port of Rotterdam in the future (inland shipping)
- Save up to 15% on port fees in the Netherlands (inland shipping)
- Save up to 15% on Dutch service providers (inland shipping)

FWE application example

Stationary engine



Scania
DC1643A

330 kWel
Rape seed oil
Ratschings, Italy



Perkins
4006-23 TAG3A

705 kWel
Heating Oil
Bern, Switzerland



Mitsubishi
S12RPTA

1150 kWel
Diesel
Bern, Switzerland

FWE application example

Stationary engine



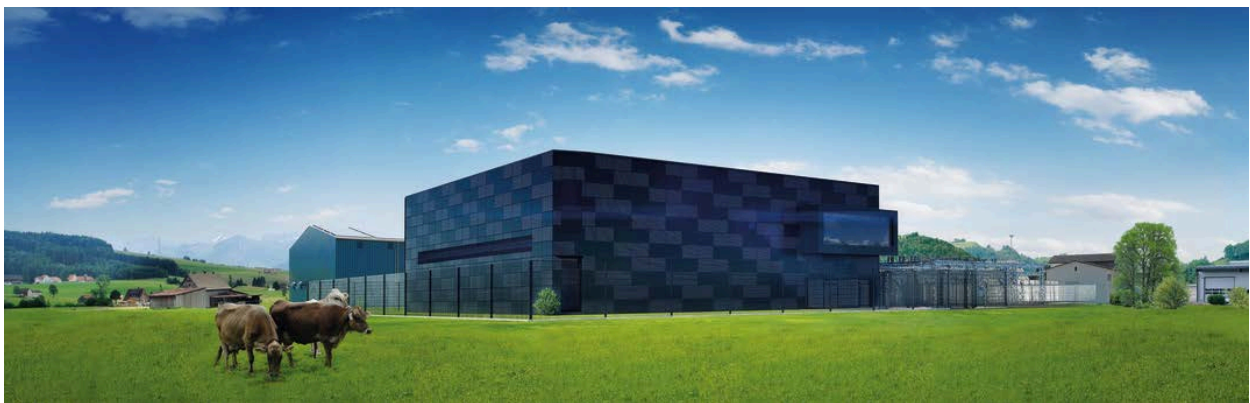
CAT 3516B

2145 bkW

Diesel

Data Center

Gais, Switzerland



FWE application example

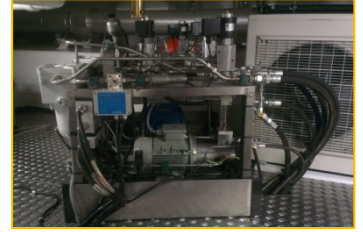
Seagoing Vessel



CAT 3516B 1492kW

FWE application examples

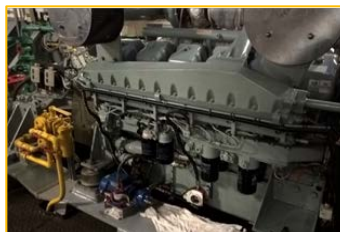
Inland Waterway Vessels



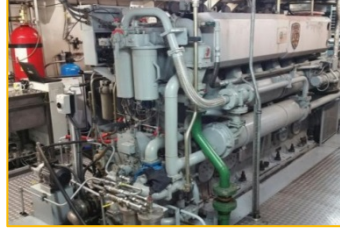
TMS Rudolf Deymann • Main engine: Wärtsilä 6L20 • 1.076 kW • Tanker • 110 m • 2.322 to.



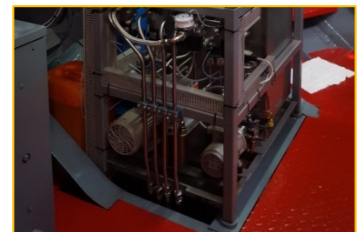
MS Aarburg • Main engine: ABC MDZC-166 A • 1.325 kW • Container Ship • 135 m • 3.297 to.



Imperial GAS 74 • Main engine: 2 x Mitsubishi • 634 kW • Tanker • 85 m • 1.158 to.



KV Heinz Hofmann • Main engine: ABC MDZC-166 A • 1.325 kW • Dry cargo ship • 186 m • 4.788 to.



MS Empresa • Main engine: Deutz 545 • 745 kW • Dry cargo ship • 86 m • 1.500 to.

FWE application examples

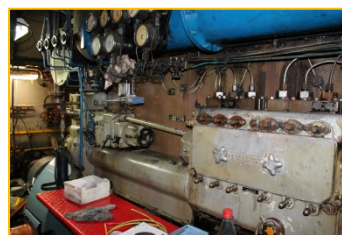
Inland Waterway Vessels



MS Coburg • Main engine: MWM TBD 440 • 720 kW • Dry cargo ship • 86 m • 1.724 to.



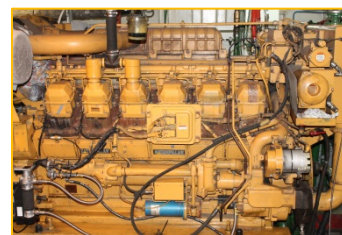
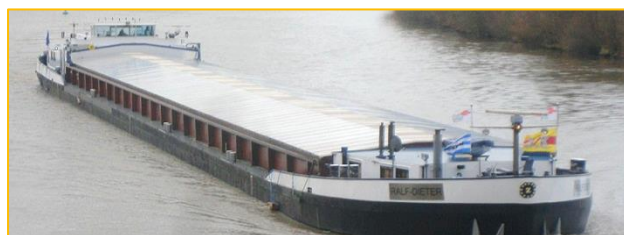
MS Julia • Main engine: Deutz 816 • 826 kW • Dry cargo ship • 105 m • 2.199 to.



MS Danny • Main engine: Deutz 545 • 735 kW • Dry cargo ship • 85 m • 1.346 to.



MS Mainland • Main engine: Deutz 628 • 883 kW • Dry cargo ship • 85 m • 1.516 to.



MS Ralf Dieter • Main engine: CAT 3512B • 1176 kW • Tanker • 105 m • 2.473 to.

The **exomission FWE** modular design

The initial situation

Dockyard or Garage times are tightly scheduled. Time is money and the next freight / Job is already waiting. The access to the machine room is narrow and steep, the space is very limited. At the same time 5 to 10 mechanics who are hectic welding, grinding, drilling and hammering are not uncommon. Effective and focused work is difficult. The fast and reliable installation of new systems - like the **exomission FWE** - is therefore a challenge.

The solution

These realities have prompted us to develop the **exomission FWE** in a consistently prefabricated and lightweight modular design.

Features and advantages of the modulare design

- The modules are completely manufactured and tested at the factory
- The modules are small, light and fit through narrow access hatches
- The setup is variable: side-by-side, one above the other or separately
- Standardized hydraulic connections on the back of the module
- High-quality electrical industrial connectors on the back of the module
- Frame in noble, light and stable aluminum profile technology



The modular design of the **exomission FWE** facilitates the incorporation of the plant in the engine room and drastically reduces the complexity of the installation, thus reducing the installation time and installation errors. That saves time and money

Fast Assembly

Main Modules of the **exomission FWE**



It can not be faster

Power and data transmission with plug connections



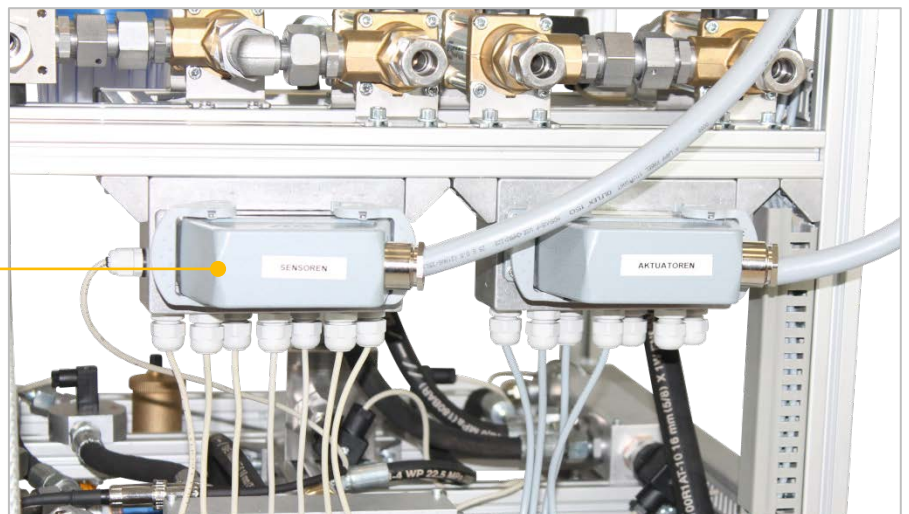
Plug in and you're done

Fully assembled and coded industrial plugs



Sockets on the
Modules

Connected!



Pure Water

Water Treatment Plant

The water to be supplied to the engine via the emulsion must be free of impurities such as sediments and suspended solids, biological components and salts / minerals, to prevent deposits in the engine's injection system and combustion chambers. The Water Treatment Plant consists of various mechanically, hydraulically and electrically interconnected modules. The power supply and the data exchange of the Water Treatment Plant are carried out centrally from / to the **exomission FWE** control. The connection from / to the **exomission FWE** control is made via a multi-plug connection.

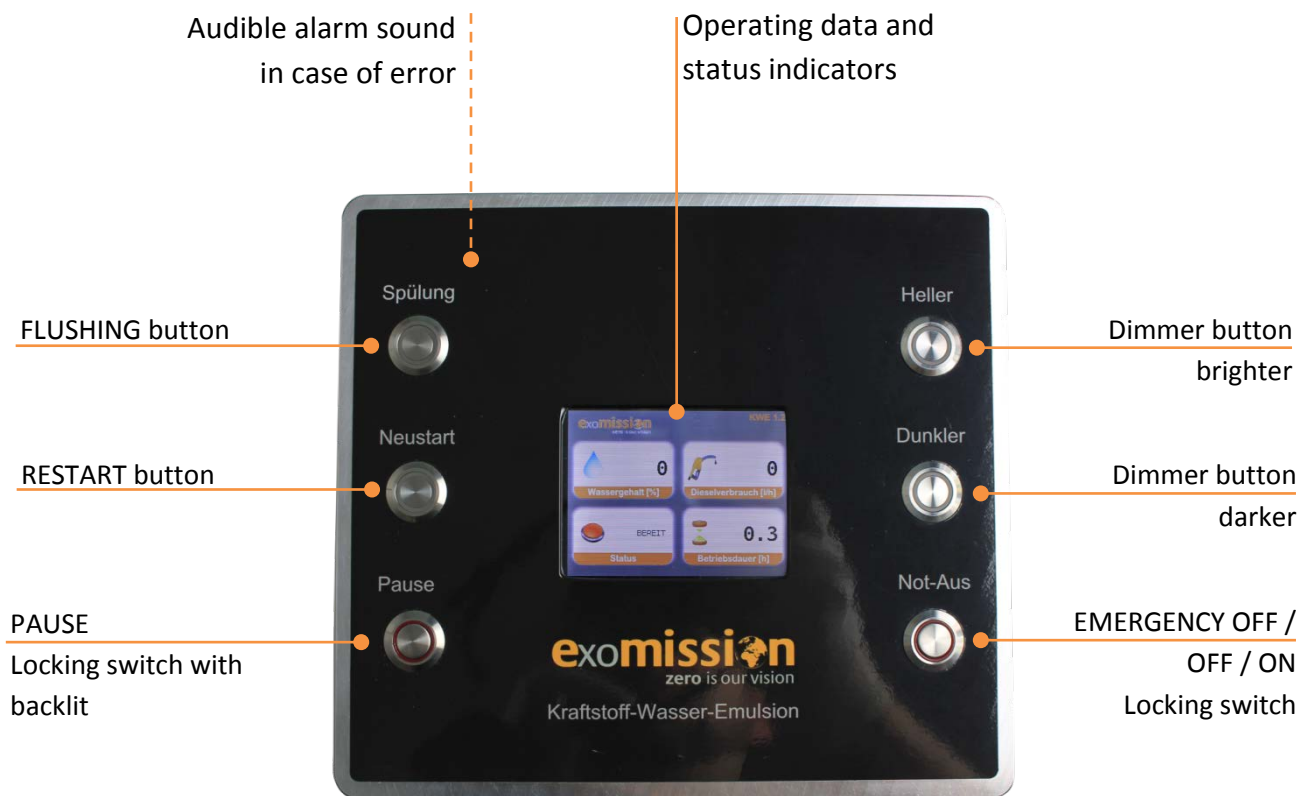


The Water Treatment Plant can contain different, partly optional single modules. The Water Treatment is an integral part of the **exomission FWE**

Everything under Control

External Control Panel

In applications in which the control of the **exomission FWE** takes place spatially separate from the place of installation, the manual control and the operating display are mounted in an External Control Panel. In this case, only the main ON / OFF / EMERGENCY OFF rotary switch, the status lights, NC check and PW check are installed at the Control Cabinet Module, plus optionally an additional operating display.



Wherever You Are

Remote Monitoring System

The **exomission FWE** is optionally be equipped with a remote monitoring system. If necessary, a connection between the **exomission FWE** and a PC / tablet / notebook connected to the Internet can be installed on-site.

With the special software tool ExoApl, Exomission staff can connect to the **exomission FWE** and check all relevant data or settings and can control the system externally.



An awarded Innovation

2013

Inclusion in the funding program of the German Federal Government

Gefördert durch die Bundesregierung



2014

Innovation Prize of the Volksbank Bonn-Rhein-Sieg

2014

Allianz-esa Innovation Award – Forum for European Inland Navigation



2016

Pioneer for climate protection - Award of the state government North Rhine Westfalia

WIR SIND DABEI!
KlimaExpo.NRW
Motor für den Fortschritt

2016

Green Award in Gold for retrofitting the Inland Vessel MS Empresa



exomission KWE

An Investment that pays off twice

ecological and economical

- up to 100% soot / smoke / black carbon reduction
- up to 80% NO_x reduction
- up to 95% particle number reduction
- up to 10% less fuel consumption
- up to 10% lower CO₂ emissions
- high funding rates (in certain countries)
- short payback period
- high return on capital



exomission 
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