

Pure-Fuel

Fuel Polishing | Fuel Purification System

for Emergency Power Generator (EPG) Fuel Tanks / Backup Power Systems and other Applications

NEW

for your
EPG

REMOVES:

- Water
- Particles
- Bacteria
- Sludge
- Acids



Prevents diesel microbial contamination (diesel bug)

Increases operational safety

Increases fuel availability

Extends long-term fuel stability

Reduces operating costs

Reduces maintenance costs

Reduces repair costs

Increases sustainability

Protects the environment

Designed for permanent installation on your fuel storage tanks

- Individually adjustable cleaning cycles and operating intervals
- Custom-built for tank volumes from 1,000 to 100,000 Liters
- Multiple tanks can be connected for alternating cleaning cycles

Play it safe!

A failure of the public power supply poses a high economic and / or safety risk for many organizations. It is therefore essential that the installed emergency power generator functions properly in the event of an emergency.

To ensure that installed EPGs function properly, the systems are regularly maintained, and test runs are conducted to verify their performance. **However, little attention is often paid to the quality of the fuel in the storage tank.** This was also shown by a study commissioned by the German Federal Ministry of the Interior: in **around 60%** of the EPGs examined, the **fuel was no longer usable or only usable to a limited extent.** By far the most common cause of emergency power supply failure is contaminated fuel in the storage tank. **This can have serious consequences that must be avoided!**

With our **Pure-F fuel polishing / purification system**, we can **reliably, permanently, and fully automatically minimize** contaminants such as water, bacteria, and fungi (diesel bug), sludge formation, and particles in the fuel, thereby maximizing the long-term stability of the stored fuel.

Pure-F provides **quality assurance** for stored fuel ensuring diesel engines receive **clean fuel** and operate reliably. This supports the **availability** and **operational safety** of the EPG.

Pure-F helps prevent **costly repairs** to the tank, pipes, and engine caused by clogs and corrosion. It also reduces the need for premature injector replacement, contaminated fuel disposal, and repurchasing fuel. This contributes to greater **sustainability** and **environmental protection**.

The PLC-controlled system can issue warning and fault messages and process external fault messages. Extensive **remote control / remote diagnosis options** via Ethernet, Wi-Fi or 4G are available as an option.

We also build **Pure-F** "customized" - for tank systems from 1,000 to 100,000 Liters. If necessary, multiple tanks can be connected for alternating cleaning cycles.



Would you like to find out more?

Contact us for a no-obligation consultation.

We are here for you!

Uwe Israel

Dipl.-Ing. / Managing Director
Exomission Umwelttechnik GmbH

+49 (0) 2241 23 23 00
mail@exomission.de
www.exomission.de



The Fuel Storage Problem

The often-long-term storage of fuel—sometimes for several years—in the tanks of emergency power generators (EPGs) is problematic due to fuel aging. Contamination with water, particles, sludge, microorganisms, and their residues can also lead to engine damage due to blocked filter and injection systems.

Water Contamination

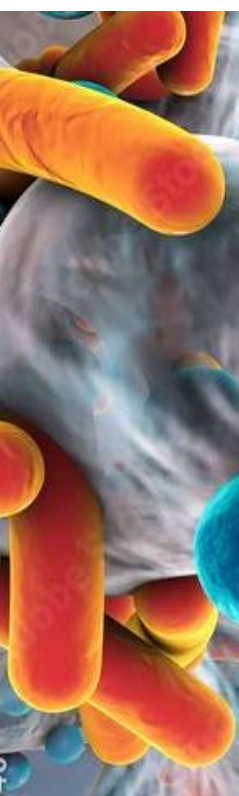
Daily pressure and temperature differences, among other factors, cause a constant exchange of air in the tank via the ventilation system. The moisture in the air can condense on the cold tank walls, especially in the summer months, so that increased **condensation** occurs inside the tank. If diesel is used as fuel, it may contain up to **200 mg of water per kg of fuel**. The water, which is often initially contained in the fuel as an emulsion, separates from the fuel over time. Due to its higher density, the water sinks to the bottom of the tank and accumulates there.



Contamination by Microorganisms

Certain **bacteria**, **fungi** and **yeasts** can colonize and feed on hydrocarbon compounds such as heating oil and diesel. Infection with these microbes can occur during fuel transport, refuelling, maintenance, or repairs, or from the air intake via the tank's ventilation.

- Microorganisms require **nutrients**, **water** and suitable **temperatures** to multiply.
- **Nutrients** are the fuel, and **favourable temperatures** are often found in the tank.
- The **limiting factor** for growth is the **availability of water**, as microorganisms can only survive in the water phase of the medium. The boundary layer between water and diesel is the microorganisms' eco-niche.
- The metabolic products, the excretions of the organisms, agglomerate into **brown**, sometimes **whitish-transparent** bio-slime formations.



Biodiesel Content - FAME

Due to the legally required blending of currently **7%** by volume biodiesel = FAME (fatty acid methyl ester) into **diesel fuel**, the microbes have access to additional biological components easily and thus a rich nutrient supply.

In the future, the biofuel content will increase to 10% (and more). This diesel fuel may be good for the environment, but it is bad for engines, because like any natural product, **biodiesel has a limited shelf life and becomes oxidized ("rancid")**.

In addition, FAME is **hygroscopic**, meaning it attracts water and can absorb up to 5,000 mg of water per kg of fuel.

That is 25 times more than with diesel without biofuel content. While bacteria without biodiesel are confined to the boundary layer between fuel and water, very fine emulsion droplets can thrive throughout the tank when biodiesel is added.

The surrounding **bio-slime** provides additional protection for the bacteria. In this case, **even the water drain valve at the bottom of the tank has only a limited effect.**

The bacterium **Pseudomonas aeruginosa** also feeds on heating oil and diesel fuel with a biofuel content.



Diesel bug

The long storage times of **diesel with biofuel content**, which can be up to several years, often lead to density separation of the biodiesel mixture in the tanks.

This results in a loss of diesel quality. Various components, such as fatty acids, methanol, emulsifiers, and catalysts from biodiesel production, as well as condensed water, settle at the bottom.

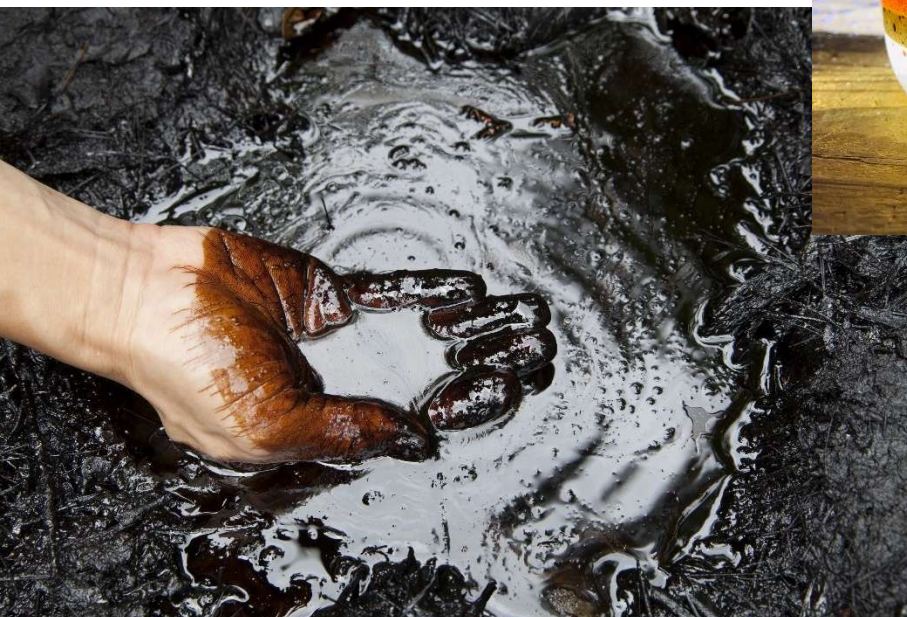
This chemically aggressive mixture already has a highly corrosive effect on the tank, lines, and injection system. At the same time, it forms the basis for microbial growth.

If the medium is sufficiently warm (as in the summer months), uninhibited exponential microbial growth, known as “**diesel bug**”, can occur. This can render the entire fuel in the tank unusable within a very short time.

The bacteria themselves do not impair the functionality of the emergency power system, but the metabolic products of the organisms do. Viscous, dark, sometimes whitish-transparent bio sludge / slime spreads in the tank and, when sucked in, can block / clog the entire fuel system, including filters, pipes, and injection nozzles, so that the engine does not start or stops while running, and becomes inoperable.



Through hydrogen sulfide compounds, the sludge causes **corrosion** in the tank, the pipes, the filter system, the injection pump, and the injection nozzles, thereby leading to EPG failures.

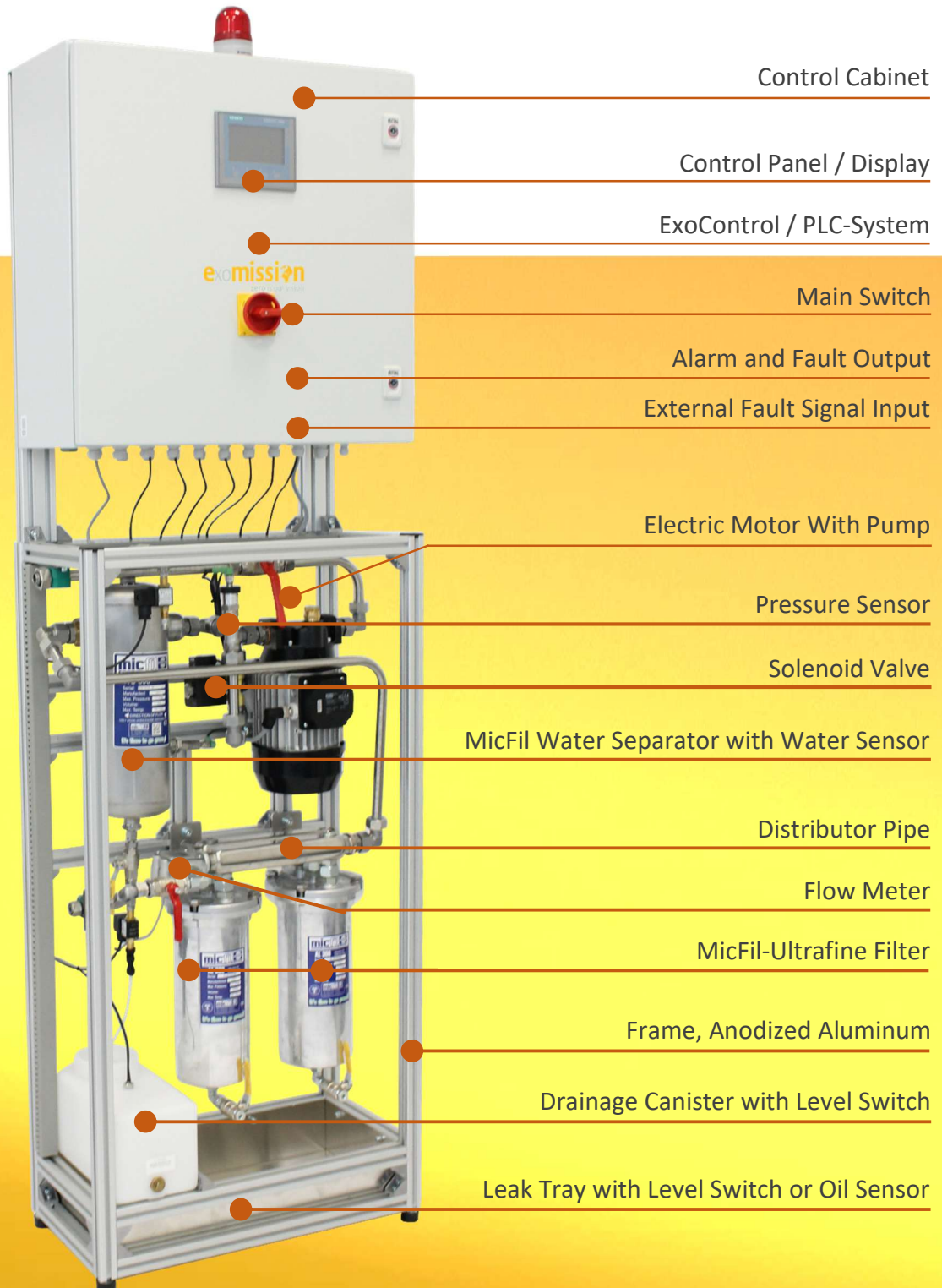


Once a **diesel bug** has occurred, the only solution is a complete, time-consuming, and costly cleaning of all affected components, including engine parts, as well as extraction and fuel disposal, followed by refilling, of the fuel tank.

The Solution

The Pure-F fuel Polishing | Purification System

To achieve long-term fuel storage stability, Exomission has developed the multi-stage, highly effective, automatically operating Pure-F fuel polishing / fuel purification system based on the MicFil Ultrafine Filter and water separation technology.



Overview:
Example of Design
for the cleaning
capacity of max.
1200 l/h

Function Overview

Pure-F sucks the fuel to be cleaned out of the tank and first passes it through a highly effective MicFil water separator and then through the **MicFil-Ultrafine Depth Filter**. In the filter stages, free water, emulsified water, particles, and other sediments, bacteria, fungi, and sludge down to a size of **0.5 µm** are reliably filtered out. The fuel cleaned in this way is returned to the tank via the filtrate line for further use. Through continuous filtration (e.g., every 2 hours every 3 days), all substances that impair the function of the emergency diesel generator are removed from the bottom of the tank. Any hint of microbial growth or fuel decomposition is also prevented right from the start by constant circulation. The result is finely filtered, ultra-clean fuel – free of water.



Overview:

Pure F for max. 1200 l/h

(customer-specific special design)

ExoControl Control System

The core of **Pure-F** is the **ExoControl** control system based on a Siemens Logo PLC in conjunction with the monochrome Siemens TDE text display, as well as, in the optional premium version, a Siemens **S7 1200 PLC** in combination with a Siemens 4" colour touchscreen display as HMI.



Siemens LOGO and
TDE-Display



Optional
Siemens S7 1200 and
4" Colour-Touchscreen-
HMI

Alarm output and fault signal output

To transmit warning and fault messages, **Pure-F** is equipped with potential-free changeover outputs. This allows warnings and faults to be integrated into the building management system or sent to a central control centre.

External fault signal input

For the connection and further processing of external fault messages, **Pure-F** is equipped with a corresponding input. Multiple signals are combined into a collective fault.



Remote Control System

Pure-F can optionally be equipped with a remote-control system, which gives the operator remote access to the system's key functions, acknowledge faults, switch the system on and off, and adjust various configuration parameters. Cleaning times and durations can also be configured individually.

Various **specialized routers** can be installed to enable remote access, selected according to the desired transmission standard (Ethernet, Wi-Fi, 4G).

PC / Smartphone App

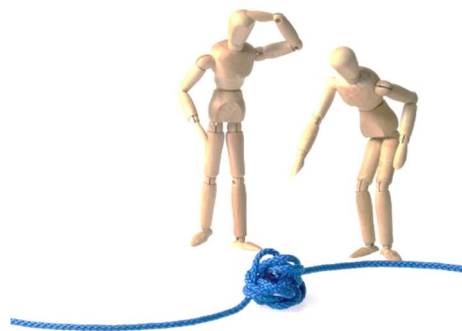
Access to the PLC can optionally be via a PC or smartphone app.

SMS Notification

Finally, the system can also notify the responsible operator via SMS when warnings or errors occur.

Visual fault signalling

The control cabinet is equipped with a red flashing light, which additionally signals faults by flashing.



Pump

An electric motor with optional speed control via **ExoControl** (depending on system size and customer requirements: 24 VDC / 230 VAC / 400 VAC) is directly connected to a self-priming pump. The pump draws fuel from the bottom of the tank via a tank extraction device and pushes the medium at a predefined pressure to the water separator.

Water separator

Free and partially emulsified water in the fuel, as well as larger particles contained in the water, are separated from the fuel in the MicFil water separator and collected in the bowl. When the water level in the bowl reaches a certain level, the optional installed **water sensor** triggers a warning. This ensures that water is continuously removed from the tank, depriving microbes of their breeding ground.

As an alternative to manual drainage, solenoid valves open for automatic drainage into an optional water canister. The operator is notified by a warning if the water canister reaches its maximum fill level and needs to be emptied manually.

MicFil-Water separators are available in various sizes and are designed specifically for the tank volume to be cleaned.



Water Separator
WS500



Water Separator
WS1500



Water Separator
WS4600



MicFil-Ultrafine filter

The MicFil ultrafine filters with cellulose-based depth filter elements and a cleaning performance of **up to 0.5 µm** reliably filter out all particles relevant to wear and even bacteria (approx. 98% in the first pass) as well as residual moisture, including acids and other aqueous and solid substances.

Through the continuous, repeated filtration process, **the substances that have settled at the bottom of the tank are reliably removed. Fuel that has been freed from particles, water, sludge, acids, and bacteria—leaving it crystal clear—is pumped back into the tank and thereby continuously circulated.**

The **MicFil Ultrafine filter systems** are available in 4 basic sizes, each with 1 to 6 versions, depending on the tank size and desired fuel flow rate.



Leak Detection - Filter Contamination - Function Test

Various sensors and algorithms can be used to diagnose faults such as leaks on the suction and pressure sides, filter contamination, and optionally also dry running of the pump, and to issue warnings and fault messages and shut down the system.

Check

To ensure sufficient flow through the cleaning elements, the pressure booster pump is optionally regulated to the volume flow. At the same time, the medium pressure, the **degree of contamination** of the filter elements, the **pump function**, and **leaks** in the suction pipe are monitored. Warnings and fault messages are issued as necessary. Finally, the system is equipped with a **drip tray** in which level switches or oil sensors are installed.



Cleaning Intervals

The times at which **Pure-F** cleans the fuel from the tank can be freely adjusted. The days of the week and times, as well as the respective cleaning durations in hours, can be set (e.g., Monday 10:00 AM, 1 hour, and Thursday from 3:00 PM, 3 hours).

C O U N T D O W N T I M E R

02

DAYS

09

HOURS

20

MINUTES

17

SECONDS

Connection to the Fuel System

- If local conditions permit, separate access points to the tank should be provided for removing untreated fuel from the tank and returning the filtrate – these access points must be independent of the engine's fuel consumption.
- The **extraction pipe** should be installed as close as possible to the bottom of the tank, so that any water that has settled can be extracted, followed immediately by the water-fuel interface.



- The two **solenoid valves** on the tank could be integrated into the safety concept and controlled and monitored by **Pure-F**.
- If the pipelines are laid outside a defined protected area, they can be equipped with separate leak monitoring systems if required and connected to the **fault signal input** of the ExoControl.



Features · Versions · Options

Pure-F is available in two versions. The BASIC version is budget-friendly, while the PREMIUM version includes essential additional features. However, many options are also available for the basic version.

Subsystem included in version ?	BASIC	PREMIUM	Optionally available?
PLC system	Siemens LOGO	Siemens S7-1200	- / -
Display	Siemens TDE	Siemens 4" HMI	Yes / -
Fault signal output	Yes	Yes	- / -
Warning signal output	Yes	Yes	- / -
External fault signal input	Yes	Yes	- / -
MicFil water separator WS	Yes	Yes	yes / -
Drain valve on WS, manual	Yes	Yes	- / -
Water sensor	No	Yes	yes / -
Electric motor with pump	yes	Yes	- / -
Motor, speed-controlled	No	Yes	no / -
Pressure sensor	no	Yes	no / -
Flow meter	No	Yes	no / -
Automatic drainage system for WS	No	Yes	yes / -
Control cabinet, powder-coated	Yes	Yes	- / -
Control cabinet, stainless steel	No	No	yes / yes
Control MV in suction line	yes	Yes	- / -
Control MV in filtrate line	No	Yes	no / -
Micfil ultra-fine filter with distribution pipe	Yes	Yes	- / -
Drain cock on MicFil ultra-fine filter	No	Yes	yes / yes
Drip tray with level or oil switch	Yes	Yes	-
Shut-off valve on suction and filtrate side	Yes	Yes	- / -
Remote Control Exo 2400 Ethernet	No	No	yes / yes
Remote Control Exo 2410 Ethernet & WLAN	No	No	yes / yes
Remote Control Exo 2405 Ethernet & 4G	No	No	yes / yes
Remote Control Exo 2415 Ethernet & Wi-Fi & 4G	No	No	yes / yes
Operation via smartphone app	No	No	yes / yes
Fault and warning messages via SMS	No	No	yes / yes
System enclosure, anodized aluminum, with door	No	No	yes / yes
Control cabinet, separate – in adjoining room	No	No	yes / yes
Integration of additional tanks for cleaning	No	No	yes / yes

Another innovative product:

Emulsion Technology – **KWEgen3**

For the parallel and energy-efficient reduction of the main pollutants **soot, NOx, CO, and HC** from **diesel engines** in mobile machines or stationary applications – such as combined heat and power plants, diesel-powered pumps, electricity and **emergency power generators (EPG)**.



With our patented **KWE** technology (fuel-water emulsion technology), we mix diesel or other liquid fuels with a proportion of water to form a homogeneous emulsion and feed this into the original injection system.

As a result, **combustion is massively improved**, and internal engine soot formation is almost completely **prevented**, NOx formation is significantly reduced and often fuel consumption is even slightly reduced.





Pure F: Clean and safe!

- Prevents diesel bug!
- Separates free water
- Absorbs residual moisture in the depth filter elements
- Removes emulsified water and acids
- Ultra-fine filtration of particles and sludge down to 0.5 μm
- Eliminates bacteria and fungi down to 0.5 μm
- Smart PLC control in robust industrial quality
- Integration into building management/control center possible
- Comprehensive remote control and remote diagnostics options
- Increases availability and operational reliability

Pure F produces perfect, ultra-clean fuel and ensures that your EPG can operate reliably!

Contact Person:

Uwe Israel

Tel: +49 (0)2241 23 23 00

Mob: +49 (0)171 40 94 248

mail@exomission.de

www.exomission.de



Exomission Umwelttechnik GmbH
Redcarstraße 2b
53842 Troisdorf
www.exomission.de



exomission 
zero is our vision