



TOTAL
COMMITTED TO BETTER ENERGY

TOTAL fuel Biocide Technical Booklet



TOTAL ADDITIFS & CARBURANTS SPÉCIAUX

TOTAL fuel Biocide

Technical Booklet



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FAQ

What is a bacterial proliferation?

The major cause of bacterial proliferation is water presence in the fuel. In suitable conditions (heat, humidity), microorganisms (bacteria, fungi, yeast, algae) will develop at the fuel-water interface

They live in water and feed on fuel, generating by-products (metabolites). Some of these metabolites contribute to sludge formation or make organic acids, which make fuel and associated water bottoms corrosive. Others act as "biosurfactants", enabling microbes to move into fuel phase.

What are the consequences?

Major consequences of bacterial proliferation are:

- Water content increase in fuels → turbidity
- Corrosion
- Slime/sludge build up → filter plugging
- Strong smell

How do I know?

Hereafter are a few signs you are facing a bacterial problem in your tanks:

- Increased filter changing frequency
- Slime deposits on filters

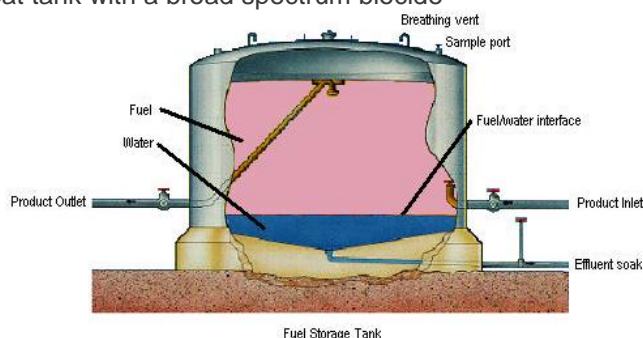
The following signs indicate heavy bacterial proliferation that needs curative treatment:

- Plugged filters smell yeasty/sulfur
- Turbid fuel

What can I do?

The first (preventive or curative) actions to take are:

- Locate and get rid of possible contamination sources
- Drain water bottoms
- Treat tank with a broad spectrum biocide



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Treatment directions

Preventive treatment

Drain water bottoms as frequently as you can. Use biocide twice a year, preferably when climate is hot and rainy (rain season, monsoon...).

1. Drain or pump water and slime from the bottom of your fuel tank until clean diesel fuel appears. Dispose of drained fluids according to local legislation.
2. Add **TOTAL fuel Biocide** on top of the tank. **TOTAL fuel Biocide must correspond to the full tank capacity for treatment to be effective (even if tank is not full)**. Treat rates are given below.
3. Fill the tank with diesel fuel to its maximal capacity. This will ensure biocide dispersion in the fuel. It is also important to fill the tank so that bacteria fixed on tank walls are treated.

Turn fuel recirculation on for 6 hours. This ensures further dispersion of biocide, and also treatment of recirculation lines.

Curative treatment

1. Drain or pump water and slime from the bottom of your fuel tank until clean diesel fuel appears. Dispose of drained fluids according to local legislation.
2. Add **TOTAL fuel Biocide** on top of the tank (treat rates are given below). For treatment to be effective, **TOTAL fuel Biocide** quantities must correspond to the full tank volume, even if tank is not full.
3. Fill the tank with diesel fuel to its maximal capacity. This will ensure biocide dispersion in the fuel. It is also important to fill the tank so that bacteria fixed on tank walls are treated.
4. Turn fuel recirculation on for 6 hours. This ensures further dispersion of biocide, and also treatment of recirculation lines.
5. Check filters after 48h to avoid plugging by dead organic matter (killed bacteria)
6. It is recommended to repeat treatment after a while (two/three weeks), to ensure complete elimination of microbes/bacteria. Remaining biocide at disposal may be used for this purpose.

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Treat rates

Treat rates to consider are given in the following table:

Threat rates		
Product	Shock Curative	Preventive
Total fuel Biocide	1L/m ³	150 to 300 ml for 1m ³

Most of the effect is obtained within the first six hours. However, thirty six hours are needed to obtain full effect, as show data below:

Time	Bacteria / mL	
	Reference	Total fuel Biocide
6 hours	10 ⁶	10 ³
36 hours	10 ⁶	10
10 days	10 ⁶	<10
20 days	10 ⁷	<10
50 days	10 ⁷	<10

Bacteria count by ATP bioluminescence)

Rapid inhibition of microbial growth: TOTAL fuel Biocide at the suggested dosage

TOTAL fuel Biocide works rapidly against bacteria and fungi providing complete kill in only a few hours.

Long-term preservation: Fuel treated with TOTAL fuel Biocide will remain protected from contamination over extended periods. It will also resist further growth if the system becomes re-contaminated.

Treatment effectiveness

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Complete system protection: The partitioning characteristics of **TOTAL fuel Biocide** ensure that it is present to some extent in both the fuel and water phases. This enables:

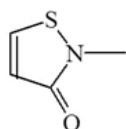
- Eradication of contamination in the water bottom.
- Protection of the fuel as it is transferred through the distribution system.

TOTAL fuel Biocide partitions between the fuel and water phases, is varying according to the fuel/water ratio.

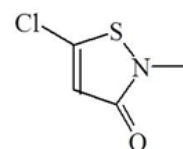
TOTAL fuel Biocide has a very broad activity spectrum against bacteria, yeasts and moulds. Typical MIC (Minimum Inhibitory Concentration) values against relevant spoilage organisms are as follows.

MIC Values For Typical Spoilage Organisms (as ppm active CIT/MIT)					
Bacteria	MIC	Moulds	MIC	Yeasts	Mic
Corynebacterium sp.	2,5	Aspergillus niger	5.0	Saccharomyces cerevisiae	5.0
Escherichia coli	2,5	Penicillium funiculosum	1.0		
Klebsiella sp.	2,5				
Proteus penneri	2,5				
Pseudomonas aeruginosa	2,5				

TOTAL Fuel Biocide active material structure



2-Méthyl-2H-isothiazole-3-one



5-Chloro-2-methyl-2H-isothiazol-3-one

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Disposal of storage tank effluent

As with most biocides at certain concentrations **TOTAL fuel Biocide** is toxic to aquatic species. Therefore water bottoms or effluents must be diluted and/or deactivated prior to discharge into sewerage systems.

Dilution: **TOTAL fuel Biocide** is biodegradable and is non-persistent in the environment.

Dilution to below effect levels will ensure its degradation - the greater the dilution factor the more rapid is the degradation. It is suggested however, since accurate monitoring of biocide is not always feasible, that the product is deactivated prior to disposal.

Deactivation: The active ingredients of **TOTAL fuel Biocide** are readily degraded to nontoxic components by the addition of slightly acidic 10% solution of sodium metabisulphite (NaS_2O_5) or sodium bisulphite (NaHSO_3) in the ratio of 4:1 deactivation solution:

TOTAL fuel Biocide Deactivation should not take place in the storage tank.

TOTAL fuel Biocide Storage

It is recommended to have stocks in advance to proceed to preventive treatment, or to be able to treat an emergency. Although expensive, tank cleaning and biocide treatment cost only a fraction of draining the entire tank and wasting fuel.

Unopened product can be stored **up to 18 month without opening** (for longer times, product efficiency may be reduced). It is best to avoid direct exposure to sun. **Opened product must be used within three months.**

CONTACT :

For further information please contact :

TOTAL ADDITIFS ET CARBURANTS SPECIAUX
3 PLACE DU BASSIN
69700 GIVORS
FRANCE
TEL : +33 (0)4 72 49 27 00

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