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Innovative Products for Saving Fuel & Oil

micfil Ultrafine Filter

micfil Fuel Optimizer

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Objectives

- Improved lubrication and wear without oil changes
- Less fuel consumption and smoke through clean and electrostaticly charged fuel
- Trouble-free operation with prolonged engine lifespan and less service costs

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Products:

micfil Ultrafine filter

- Suitable for engine oil, hydraulic and gear oil, and fuel
- Produced in high grade aluminuim or stainless steel
- Complies with IACS regulations
- Filtration performance down to 0,5 micron
- Absorbs water

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Products:

micfil Fuel Optimizer

- Improves engine performance
- Reduces fuel consumption
- Reduces soot and smoke formation
- Protects valves and injection nozzles
- Prevents tank sludge

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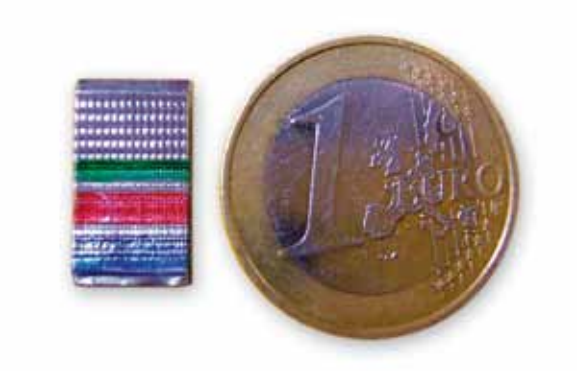
Products:

VRChips

- Increases the charge air flow rate
- Improves combustion
- Together with micfil fuel optimizer reduces fuel consumption and carbon emissions
- Reduces high frequency vibrations



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Oil Filtration

Ultra-fine Filter for Lubrication Oil

- Removes solid contaminants down to 0.5 micron
- Up to 20 times finer filtration than standard filters
- Prolongs engine life by reducing wear
- Eliminates routine oil changes
- Less maintenance and repair costs
- Protection of environment
- Does not void engine warranty

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Oil Filtration

Standard Filtering is Not Sufficient

- Lubricating gaps in engines are between 1.5 and 10 microns
- Standard Filtration is only down to > 10 microns
- Most abrasion to your engine occurs from particles between 1 micron and 10 microns
- About 15% of used oil remains in the engine after an oil change
- Engines run continuously in dirty oil
- Standard filters cannot absorb water – water is responsible for the formation of acid

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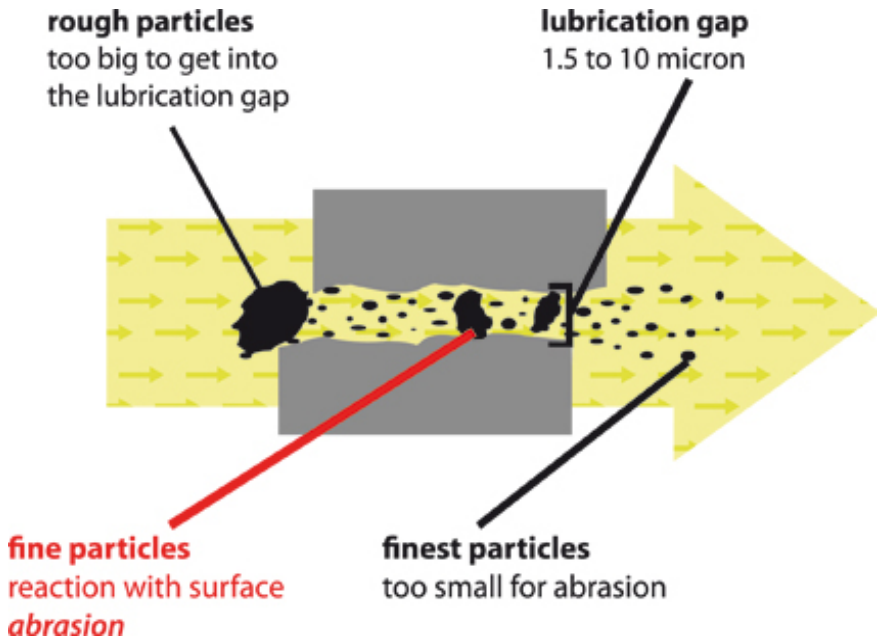
Oil Filtration

Micfil Filters provide 20 times Higher Filtration Performance Than Standard Filters

- Dirt, combustion, oxidation and abrasion particles down to 0,5 microns are filtered out
- micfil ultra-fine filter inserts bind water and counteracts the formation of acid



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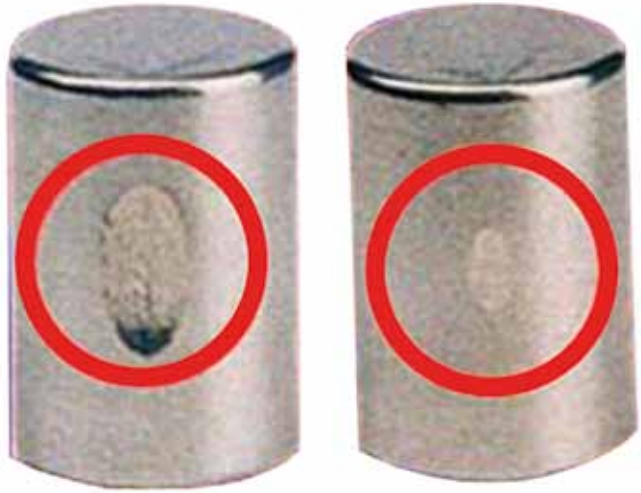
Oil Filtration

Improvement in the Lubricity of the Oil

- The lubrictiy and thermal resistance of the micfil ultra-fine filtered and unchanged oil are markendly increased by the enrichment of the oil with hydrocarbon and other particles of less than 1 micron
- These properties continue to improve the longer oil is used



Reichert Abrasion Wear Test

Left:
Abrasion with Unused oil

right:
Abrasion after 350,000 km with micfil-filtered used oil

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Oil Filtration

micfil Ultra-fine Filters Absorb Water

- Corrosive acid is formed from sulfur blow-by in the combustion process when sulfur particles combine with moisture
- Since the micfil ulftra-fine filter inserts remove moisture excessive acid formation cannot take place
- The alkaline reserve (TBN level) is protected

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Oil Filtration

Additives Are Not Affected or Filtered Out

- Additives are added to the base oil and perform three jobs:
  - CLEANING by reducing particles and holding them in suspension
  - ANTI-CORRISIVES to neutralize acids
  - ANTI-WEAR to coat metal surfaces to reduce wear
- Additives are primarily used up due to excessive contamination within the oil
- micfil ultra-fine filters minimizes the consumption of additives

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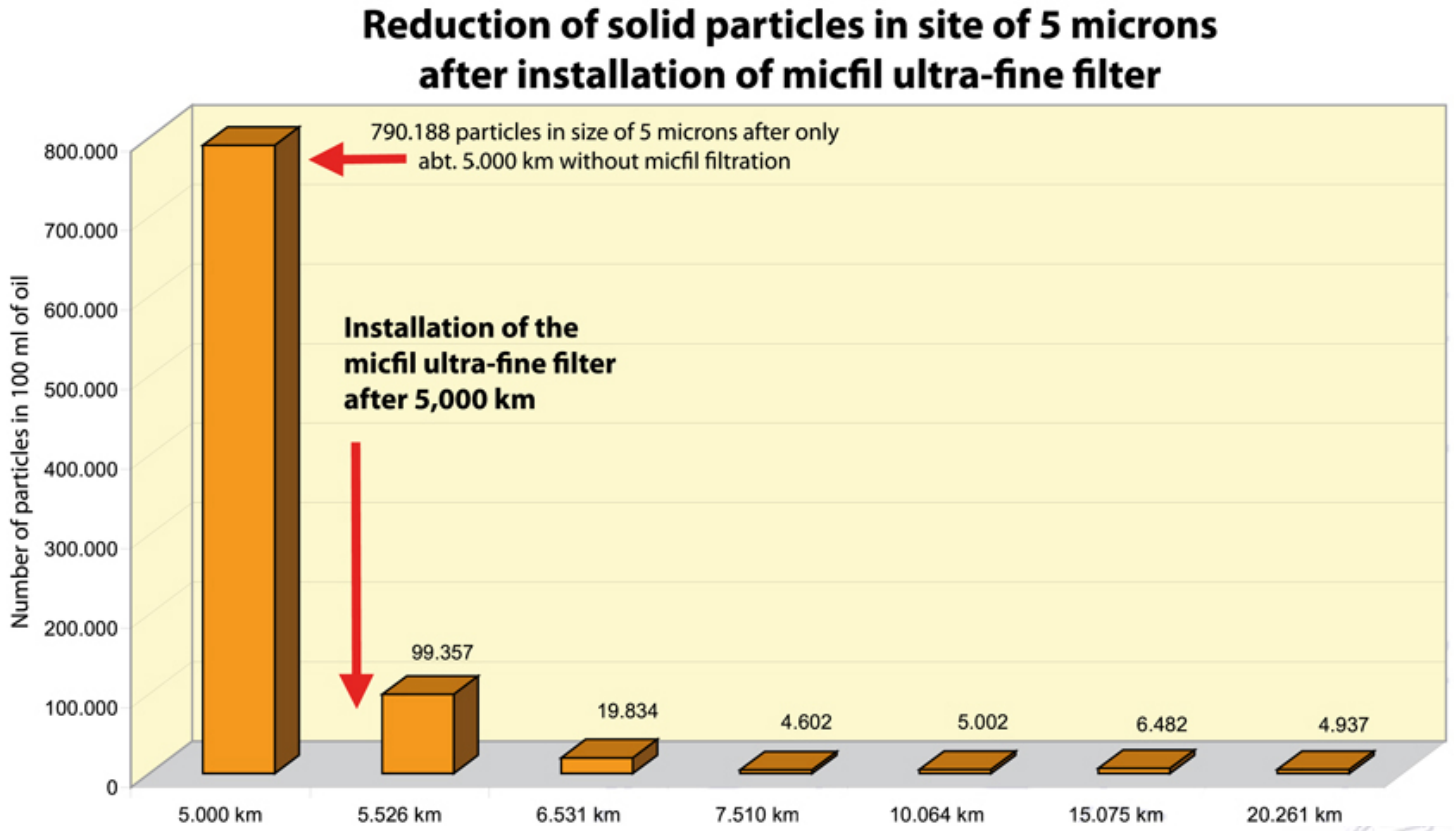
Oil Filtration

micfil Ultra-Fine Filters Keep the Oil Clean



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Oil Filtration

Elimination of Conventional Oil Changes through micfil Filters

- Oil is a mineral like copper or gold and so does not age or wear out
- Through micfil ultra-fine filtration:
  - Solid particles down to 0,5 micron in size are filtered out
  - The lubricity and thermal resistance of the oil is improved
  - Removal of moisture prevents formation of corrosive acids
  - The consumrtion of additives is minimized
  - The conventional oil change is not necessary
- Defective engines must be repaired

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Oil Filtration

micfil Ultra-Fine filters for Hydraulic and Gear Oil

- The care of hydraulic and gear oil is often neglected
- Trouble-free operation requires clean oil
- The oil film between hydraulic components is less than 10 microns
- The human eye can not see smaller then 40 microns
- micfil ultra-fine filters remove solid particles of down to 0.5 micron in size and absorb moisture
- When moisture and harmful particles are removed then no hydraulic oil change is necessary

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Installations

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Fuel Filtration and Optimization

Fuel Contamination I

- Diesel fuel is an organic fluid and naturally unstable. Its quality is continuously degrading.
- Hydrocarbon molecule chains clump together and form particles of increasing size. This causes the formation of sludge in the tank and poor combustion results as the individual molecules do not receive enough oxygen during ignition.
- This organic debris represents more than 90% of all the contamination in fuel

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Fuel Filtration and Optimization

Fuel Contamination II

- The barrier layer between water and fuel in the tank is an ideal breeding ground for bacteria, fungi, yeast and algae. These micro-organisms and their waste products produce dark, slimy deposits and acids.
- Bacteria reproduce under ideal conditions extremely quickly: They double in number every 20 minutes.
- Micro-organisms and their slimy waste products block filters and form tank sludge. It can lead to a total blockage of the entire fuel system.

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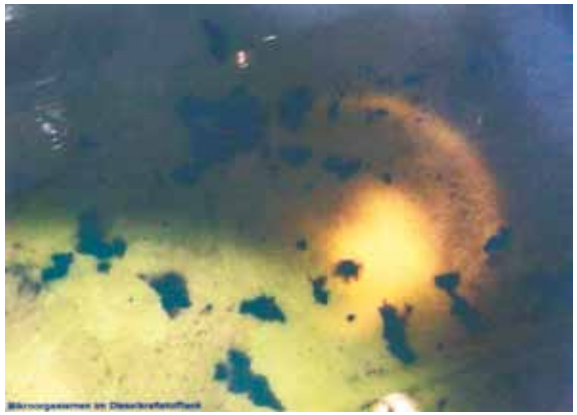
Fuel Filtration and Optimization

Negative Consequences of Fuel Contamination

- Poor combustion
- Higher fuel consumption
- Higher emissions – especially carbon (soot)
- Combustion residue
- Damages to valves and injectors
- Increased carbon content in the lube-oil
- Deposits (sludge) in the tank
- Reduced service life of filters



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Fuel Filtration and Optimization

Combustion residue

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Fuel Filtration

Cleaner Fuel Through micfil Ultra-fine Filter

- Filtration performance down to 0.5 micron
- Less damage to injector pumps and injectors
- Flow rate per filter approx. 500 l/h
- Installation:
  - Between fuel pump and standard fuel filters
  - Between main tank and service tank
  - As a separate fuel care system (ideally with complete fuel optimization system)

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Fuel Optimization

micfil Fuel Optimization

- Electrostatic charging of the hydrocarbon molecules by high- energy fields dissolves most clumping of the fuel molecules and therefore improves their fine distribution
- The individual fuel molecules receive more oxygen during ignition, leading to improved combustion with the following advantages:
  - Reduction in fuel consumption by approx. 5%
  - Less formation of soot and smoke
  - Removal and prevention of carbon deposits in the combustion chamber
  - Protection of valves and injectors
  - Less soot content in the lubricating oil
  - Prevention of sludge in the tanks

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Fuel Optimization

micfil Fuel Optimization

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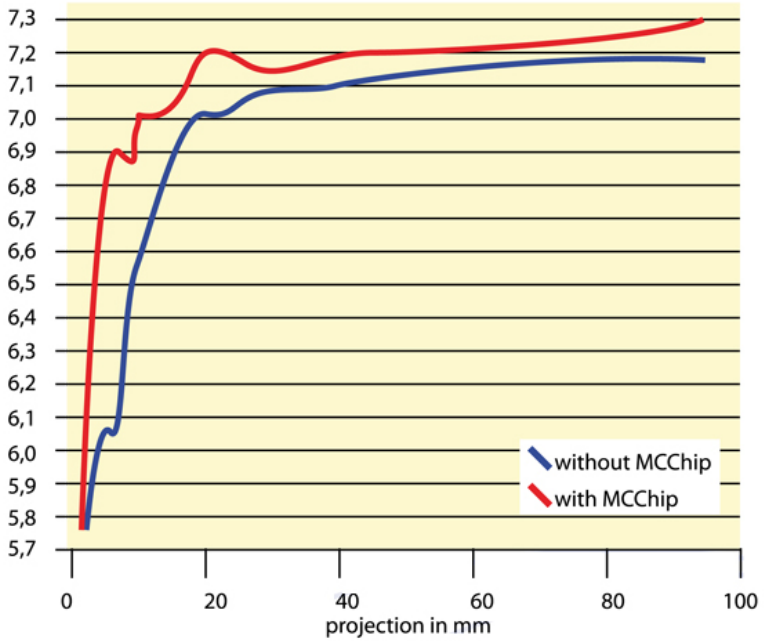
micfil VRChips

Increase in the Charge Air Flow Rate

- Applying VRChips on high pressure injection lines and injectors reduces electromagnetic radiation
- VRChips increase the air speed in the peripheral zones of the air supply channels and produces an even airflow
- The cylinder charging is improved resulting in better combustion. This leads to:
  - lower fuel consumption
  - fewer combustion residues
  - reduction in emissions



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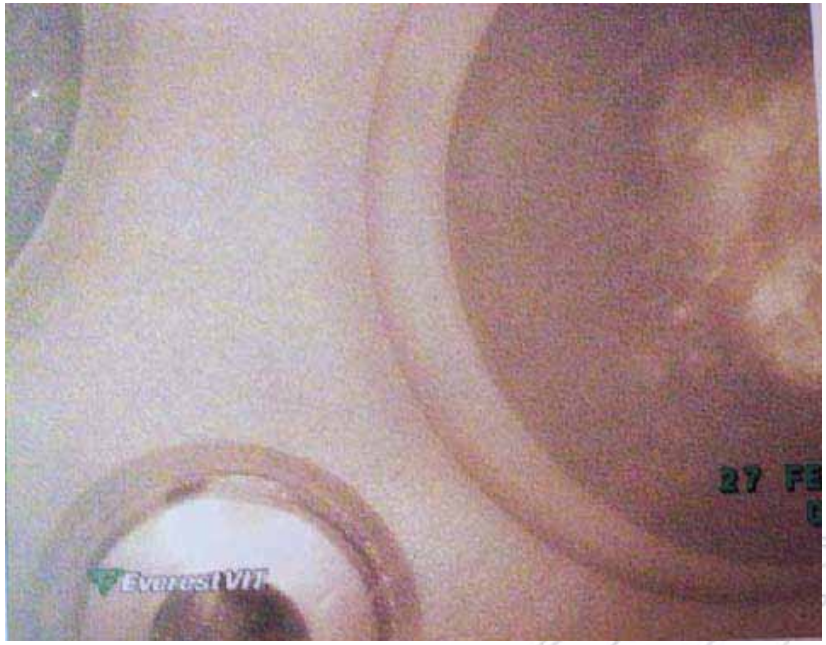
Fuel Filtration and Optimizing

Negative Consequences of Fuel Contamination

Positive Consequences of micfil Ultra-fine Filters and Fuel Optimizer about 100 hrs after installation



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Fuel Filter Installations

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Fuel Filter Installations

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micfil Filters for Yachts, Ships and River Barges

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Fuel Filtration and Optimization

Small Investment with Great Improvement

- Comprehensive system for oil, hydraulic and fuel care
- Trouble-free operation
- Less repair and maintenance cost
- Longer service life of components
- Longer life of engines
- Protection of environment

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Thank you
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