

# Fuel oil Alkaline-Bioprocess

## Bioremediation of Fuel Oil Contaminated Sand and Gravel

### Problem description

As a result of spills and leaking storage tanks, large quantities of alkaline (pH 9.2) sand and gravel are contaminated with fuel oil.

### MADEP solution

By the enrichment culture technique, MADEP s.a. has isolated micro-organisms that degrade fuel oil at high rates and with specificity.

A consortium of fuel oil degrading bacteria isolated by MADEP s.a. is cultivated on-site and used to inoculate the contaminated sand and gravel.

Biodegradation is further stimulated by addition of inorganic nutrients.

The highest degradation rates are obtained when the sand and gravel are aerated and mechanically agitated.



### Laboratory-scale biodegradation of fuel oil in sand and gravel

#### Materials and Methods

Soil was placed in a 15 l rotating drum bioreactor. The CO<sub>2</sub> concentration measured in the exhaust gas is an indicator of biological activity. The initial CO<sub>2</sub> concentration in the exhaust gas was zero. Biological activity increased rapidly following addition of a single carbon source, fuel oil, and inoculation with a suspension of live bacteria isolated by MADEP. The fuel oil degradation rate was calculated from the CO<sub>2</sub> concentration measured in the exhaust gas.

#### **Experimental conditions**

<b>Experimental conditions</b>	<b>Value</b>
Soil mass	2.7 kg
Moisture	6% water
Initial fuel oil concentration	1000 ppm
Temperature	15°C
Soil pH	9.2
Agitation	2 Rotations per minute for 30 minutes at the start of the experiment. Static thereafter.
Aeration	1.8 bed volumes/hour using a perforated tube placed in the sand and gravel

#### Results

Average fuel oil degradation rate (during 4 days): 8 ppm/day

Maximum fuel oil degradation rate (sustained for >8 hours): 15 ppm/day

