

PILOT-SCALE EXPERIMENTS ON BIODEGRADATION OF ENGINE OIL BY COMPOSTING AND BIOAUGMENTATION

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ABSTRACT

Biological treatment technologies are among the most practical and cost-effective methods for managing oil-contaminated soils. Biological treatment methods depend on the ability of micro-organisms to degrade oily waste into carbon dioxide, water and biomass through biochemical reactions.

The most common bioremediation technology applied in Estonia is windrow composting. Composting is very effective, but relatively slow process which is usually used to treat large quantities of wastes. In-situ biotreatment methods are so far very little studied in Estonia, although they offer considerable advantages: they often disturb the site less, as excavation is not required, and pump-and-treat technology can be used instead of costly excavation and earthworks. Micro-organisms and nutrients may be added to the water (bioaugmentation and biostimulation) to enhance degradation of oil on site.

In Estonian Agricultural University, two pilot-scale tests were performed in 2001/02. Objective of the studies was to compare composting and bioaugmentation in degradation of spent engine oil in contaminated sand. In both tests, the oily mixture was placed into a box of 1 m³. Compost mixture was made out of contaminated sand, bark and horse manure, whereas the other test contained only oily sand. In case of the bioaugmentation test, water was enriched with commercial bacterial mass, pumped on top of the oily sand and percolated through it. After 221 days of composting, the concentration of hydrocarbons was reduced by 92%. By bioaugmentation the concentration of oil was

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rapidly reduced to about 50%, but then it “slowed to a standstill”. The arrangements to re-activate degradation did not result in further reduction of the concentration of oil.