

MONITORING OF THE IN-SITU BIOREMEDIATION OF PETROLEUM WASTE SLUDGE IN LANDFARMING SITES

E. KATSIVELA^{1,3}, E. R. B. MOORE² and N. KALOGERAKIS¹

¹Laboratory of Biochemical Engineering & Environmental Biotechnology,
Department of Environmental Engineering, Technical University of Crete,
Polytechnioupolis, GR-73100 Chania, Greece

² Macaulay Institute, Craigiebuckler, Aberdeen AB15 8QH, Scotland, U.K.

³Technological Educational Institute of Crete,
Department of Natural Resources and Environment,
Romanou 3, Halepa, 73133 Chania, Crete, Greece

E-mail: katsivela@chania.teicrete.gr

EXTENDED ABSTRACT

In-situ bioremediation of petroleum waste sludge in landfarming sites of Motor Oil Hellas (petroleum refinery) was studied by monitoring the changes of the petroleum composition of the waste sludge, as well as the changes in the structure of the microbial community, for a time period of 14 months. The changes in the composition of the petroleum hydrocarbons of the landfarming soil were measured by Soxhlet extraction and analysed by gas chromatography coupled with mass spectrometry. In parallel, the analysis of the structure of the bacterial community of the polluted soil was performed, using terminal restriction fragment length polymorphism (T-RFLP) of PCR-amplified 16S rRNA genes. The analyses indicated an enhanced biodegradation of the petroleum hydrocarbons in the landfarming areas. A depletion of n-alkanes of approximately 70 to 90% was obtained. Marked changes of the microbial communities of the landfarms occurred with the degradation of the petroleum hydrocarbons. The results obtained from T-RFLP fingerprinting demonstrated that the diversity of the microbial community was decreased.

Key words: biodegradation, petroleum hydrocarbons, refinery waste sludge, bacterial community, 16S rDNA T-RFLP fingerprinting