Using NPK Fertilizer in Oil Spill Bioremediation in Brazilian Marine Environment – Laboratory Simulation

E. S. de Souza*, J. A. Trigüis and M. F. Coelho

Universidade Estadual do Norte Fluminense, Laboratório de Engenharia e Exploração de Petróleo
Rodovia Amaral Peixoto Km 163, Avenida Brennand s/n, Imboacica, Macaé, Rio de Janeiro, Brazil CEP: 27925-310
eiane@lenep.uenf.br, triguis@lenep.uenf.br

Abstract

The petroleum exploration, production and transportation activities along the Brazilian coast may impact the environment by releasing oil. The best response is to minimize the amount of oil that reaches the shoreline. This can be done using containment booms associated to a removal of the oil, by enhancing the naturally occurring biodegradation process just below the water line. Bioremediation is a technology that accelerates biodegradation in order to reduce the concentration and/or toxicity of various chemical substances, including petroleum (Rowland et al. 1986; Atlas, 1995). Bioremediation is accomplished by the addition of microorganisms to the environment or, by promoting better conditions for their metabolic activities, such as incorporation of oxygen or nutrients (Prince 1993; Rosenberg et al., 1996; Foght et al. 1998). Biodegradation is influenced by environmental parameters, mainly temperature, making tropical habitats, potential candidates for bioremediation (Lee, 1999).

This research includes a laboratory simulation of an oil spill bioremediation in a tropical marine environment, using seawater, a light crude oil and an immobilized NPK fertilizer, over a period of 28 days. The extent of oil biodegradation was determined by whole oil gas chromatography and gas chromatography – mass spectrometry analyses (Wang and Fingas, 1997). The results showed that: a) The oil natural degradation, mostly due to evaporation process, of the light end n-alkanes had occurred in the first 4 days of the experiment; b) Biodegradation of the n-alkanes was most effective after 7 days, as a result of bioremediation; c) According to GC/MS results, no changes were observed in the relative abundance of steranes and triterpanes during the oil spill bioremediation; and d) The addition of NPK increased the preferential biodegradation of 4 methyl – Dibenzothiophene after 28 days of the experiment.

Keywords: Oil bioremediation, oil spill simulations, alkanes biodegradation, marine environment, Brazil.

References