

## **ABSTRACT**

### **Assessment of Compositional Changes and Development of Biodegradability Predictive Models For Representative Crudes From Trinidad and Tobago**

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This study assessed the technique of bioremediation for remediation of oil contaminated soils in the oil fields of Trinidad and Tobago.

An initial assessment was done to determine the optimum nutrient concentration required for bioremediation of total petroleum hydrocarbons (TPH) and sixteen priority poly aromatic hydrocarbons (ppPAHs) using indigenous microorganisms. A detailed laboratory study assessed compositional changes of representative crude oils and effects of bagasse on bioremediation. Field studies entailed bioremediation of seven oil polluted sites. Models were developed and validated to predict the extent of TPH and ppPAH biodegradability.

Laboratory studies indicated that bioremediation was greatly enhanced at a C:N:P ratio of 100:5:1. Although TPH degradation was found to be relatively low in lower API crudes (29.57 - 30.90 %) and higher in high API crudes (45.09 - 54.98 %), reductions in total ppPAHs (69.54 - 85.32 %) for the crudes studied were more substantial.

Bagasse generally enhanced the rate and extent of TPH degradation with incrementals ranging from 10.77 to 23.94 % however, this was not the case with the total ppPAHs (1.37 to 5.19 %). Notwithstanding, bagasse significantly improved the rates and extent of degradation of individual ppPAHs.

Field studies confirmed that bioremediation of TPH and ppPAHs is feasible under local conditions using indigenous microorganisms; and that the proposed regulatory limit (< 3% w/w) for TPH can be attained.

This study developed and successfully field validated mathematical models to predict the extent of TPH and ppPAH degradation. It was found that accurate predictions are possible when the basic chemical characteristics are considered without the need for costly and complex extensive chemical characterization as in previous models.

**Keywords:** bioremediation; TPH; ppPAHs; crude; microorganisms and bagasse.