

**UNIVERSITI TEKNOLOGI MARA**

**BIOREMEDIATION OF PETROLEUM SLUDGE  
FROM THE EXXON MOBIL PETROLEUM  
REFINING PLANT AT KERTEH, MALAYSIA**

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## ABSTRACT

Petroleum refineries generate huge volumes of petroleum sludge during the process of refining crude oil. It is well known that petroleum sludge contains toxic, mutagenic and carcinogenic compounds that constitute hazard to human and the environment. Applications of bioremediation is not a new method for treatment of petroleum hydrocarbons contaminations. With advances in biotechnology, bioremediation has become one of the most rapidly developing fields of environmental restoration. Petroleum hydrocarbons can be degraded by microorganisms such as bacteria, fungi and yeast. However, bacteria play the central role in hydrocarbon degradation. The driving force for petroleum biodegradation is the ability of microorganisms to utilize hydrocarbons to satisfy their cell growth and energy needs. Studies on the microbial processes to degrade hydrocarbon from several countries in arid region to date have established information on the best consortium of microorganisms to be used. However, very few reports are available on studies in tropical countries like Malaysia. Thus, this study investigates microbial species present in petroleum sludge that are capable of degrading hydrocarbon. Hydrocarbons used in this study include low chain hydrocarbon; n-decane, tetradecane, pentadecane and do-decane and also PAH namely; phenanthrene, anthracene and dibenzothiophene. A series of experiments were conducted to enrich and isolates bacteria strains that are capable of degrading the hydrocarbons. These were followed by hydrocarbon degradation test and identification of bacteria strains that are capable of degrading hydrocarbon. Hydrocarbon degradation tests were done by using microtiter plate technique with INT as the indicator. A total of 53 strains capable of degrading hydrocarbon were successfully isolated. Three of best strains were selected to be identified by using biochemical test. The best active strains were selected base on their ability to degrade PAH compound namely; phenanthrene, anthracene and dibenzothiophene. These three strains were identified as *Clavibacter michiganensis* ss *insidiosus*, *Brevibacterium oitidis* and *Rhodococcus rhodochrus*.

Keywords: Bioremediation, biodegradation hydrocarbon degrading bacteria, microtiter plate technique, petroleum sludge, poly aromatic hydrocarbons (PAHs).

## **Candidate's Declaration**

I declare that the work in this dissertation was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This topic has not been submitted to any other academic institution or non-academic institution for any other degree or qualification.

In the event my thesis be found to violate the conditions mentioned above, I voluntarily waive the right of conferment of my degree and agree be subjected to the disciplinary rules and regulations of Universiti Teknologi MARA.

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