Bioremediation Techniques for Oil-Sludge Treatment at the Arun Field

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Abstract

lurry sludge that contains hydrocarbons and heavy metals compounds were generated rom drilling activities and production processes in the Arun Field in North Aceh. The ludge was categorized as a hazardous and toxic waste, and it required special handling nd treatment. As a part of the overall waste management program, the sludge was eated by applying bioremediation technology to reduce the concentration of nvironmental pollutants to levels considered acceptable by the Indonesian Regulatory gencies. The pre-treatment sampling result showed that the Total Petroleum ydrocarbon (TPH) concentration of the sludge was in the range of 2-4% and heavy etal compounds such as lead, zinc and mercury were above the government limits.
hree biological methods applied to treat the waste such as water lagoon, slurry and iopile. Cultured indigenous microbial consortions were introduced to remove and ansform targeted pollutants. The water lagoon approach reduced oil & grease, pH, OD, H_2S, NH_3, and total Phenol to below the produced water threshold. Meanwhile lurry and biopile techniques showed a reduction of TPH, BTEX and heavy metal oncentrations. Combination of those methods resulted in an effective and efficient way o reduce petroleum waste and petroleum contaminated soil pollutants to unharm to uman health and environment. An acute toxicity test (LD50) to *Mus Musculus* was emonstated that showed a significantly improved sludge quality.
he biotreated soil was spreading *in-situ* and applying vegetation such sun flower, gume cover crops, Jatropha, and wild plants that grows healthy and fruity well. Series onitoring programs were conducted on quarterly basis, after one year, the average of PH of bioremediated soil was 2150 ppm versus 10,000 ppm regulation, the water ality of two monitoring wells were also below regulation limit.

eywords : biodegradation, toxicity, *in situ*, microbial consortia

NTRODUCTION

l and Gas Industries in Indonesia have significant contribution as a leading sector to the untry growth. These industries have multiplier effect for national economic such as eating job opportunity and generating new economic activities that strengthen local mmunity around concession area. However, Oil and gas production processes done by