Effectiveness of Single and Microbial Consortium of Locally Isolated Beneficial Microorganisms (LIBeM) in Bioaugmentation of Oil Sludge Contaminated Soil at Different Concentration Levels: A Laboratory Scale

surface. soils used in the study were mixed thoroughly before being put in the treatment plot.

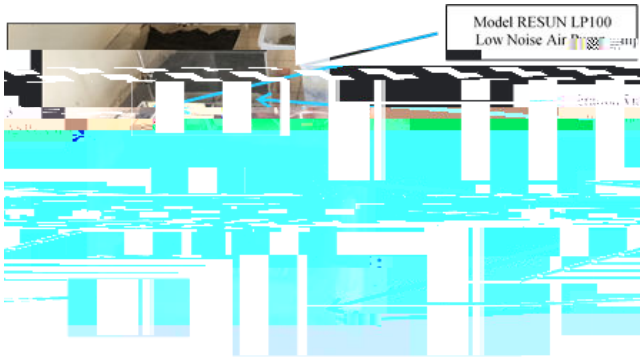

Figure 1: Bioreactor supplied with aerated static pile for bioaugmentation of oil sludge contaminated soil.

LIBeM strains used in this study were from Environmental Microbiology Laboratory, Faculty of Science and Natural Resources at Universiti Malaysia Sabah. microbes (LIBeM) were previously isolated from contaminated area and had already undergone screening. All of these microorganisms have been proven to degrade oil and phenol based on the previous research done by Piakong and Nurul Huda [6,7]. carbon source of these strains is oil sludge and $MgSO_4.7H_2O$ (Figure 2).

Figure 2:

81%, 80%, 79% and 34% for 10% oil sludge studied. results that single strain *P. aeruginosa*

as compared to control plot. highest CFU can be observed in T1 treated using *P. aeruginosa*-BAS-Cr1 proven that these strains have highest adaptation to the oil sludge and thus can reproduce highest population of CFU. indigenous microorganism in the control plot showed to 1.0×10^5 CFU g^{-1} at T5 (5%) during week 6 incubation periods. Natural attenuation typically depends on the adaptation of available microorganisms for growth and reproduction without human disturbance. Low microbial population in natural attenuation was probably because of less available microorganisms to degrade the contaminant. It is important to note that the increase and of the CFU g^{-1} per week in all set treatment studied are explained by the impact on the bacteria caused by the oil sludge addition to the medium and the adaptability period or the competition among the augmented strains and indigenous microorganism in the soil [16]. these indicated that the viable cell counts in the inoculated soil with single and microbial consortium of LIBeM are higher than natural attenuation condition.

study highlighted that the inoculations of LIBeM in the treatment plot were done every 2 weeks along the treatment period. is to ensure that the soil is adequate with mineral nutrient and to avoid the microbial population in the soil drop below 10^3 CFU g^{-1} during the

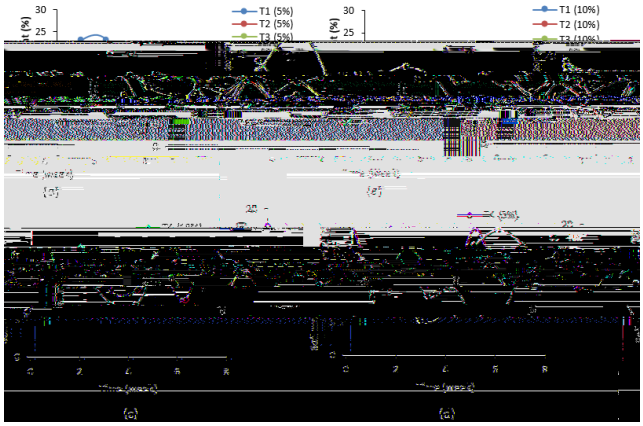

Figure 7: Variation of soil moisture content with single strain (a-b)

9. Sharma A, Rehman MB (2009) Laboratory scale bioremediation of diesel