

**KAJIAN PERBANDINGAN EFEKTIVITAS SURFAKTAN *BIOSOLVE*
PINKWATER DENGAN *DIETANOLAMIDA* (DEA) DALAM BIOREMEDIASI
LUMPUR DARI KEGIATAN PEMELIHARAAN ALAT BERAT
DI PT KALTIM PRIMA COAL**

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INTISARI

Lumpur yang dihasilkan dari kegiatan pemeliharaan alat berat di PT Kaltim Prima Coal berwarna kehitaman, berminyak, dan berbau oli menyengat sehingga dapat mengindikasikan tingginya kandungan *Total Petroleum Hydrocarbon* (TPH). Senyawa hidrokarbon bersifat beracun, mutagenik, dan karsinogenik sehingga dapat mematikan organisme-organisme yang terdapat di wilayah tersebut. Tujuan dari penelitian ini adalah menganalisis kandungan TPH pada lumpur dari kegiatan pemeliharaan alat berat, menganalisis perbandingan efektivitas surfaktan *biosolve pinkwater* dengan *dietanolamida* (DEA) untuk menurunkan TPH, serta memberikan arahan pengelolaan lumpur yang sesuai.

Penelitian ini merupakan penelitian kuantitatif dan kualitatif. Metode pengumpulan data dilakukan dengan survei dan pengamatan kondisi eksisting, pengambilan sampel dilakukan dengan teknik *grab sampling*. Uji laboratorium terhadap lumpur dilakukan dengan 7 parameter, yaitu suhu, kadar air, pH, TPH, Total P, Total N, dan TPC. Pengolahan lumpur dilakukan dengan metode bioremediasi menggunakan tambahan surfaktan *biosolve pinkwater*, *dietanolamida* (DEA), pupuk NPK, dan urea selama 56 hari. Sampel yang digunakan berjumlah 7 sampel dengan konsentrasi masing-masing surfaktan 0%, 4%, 8%, dan 12%. Hasil uji TPH setelah percobaan selanjutnya dianalisis menggunakan metode analisis matematis dan deskriptif.

Hasil penelitian menunjukkan bahwa lumpur dari kegiatan pemeliharaan alat berat memiliki konsentrasi TPH sebesar 95350 mg/kg. Konsentrasi tersebut berada di atas baku mutu TK-A, yaitu sebesar 40000 mg/kg sehingga termasuk limbah B3 kategori 1 yang akan berdampak akut serta langsung pada manusia dan tentunya berdampak negatif pada lingkungan hidup. Bioremediasi berjalan optimum dengan penambahan surfaktan *biosolve pinkwater* pada konsentrasi 12% dengan nilai efektivitas sebesar 57,944%. Sementara, bioremediasi dengan penambahan surfaktan *dietanolamida* (DEA) berjalan optimum pada konsentrasi 12% dengan nilai efektivitas sebesar 55,218%. Rekomendasi arahan pengelolaan diawali dengan *soil washing* dilanjutkan dengan *landfarming* seluas 29 meter x 25 meter, volume surfaktan *dietanolamida* (DEA) yang dibutuhkan adalah 368 liter.

Kata Kunci: Lumpur, *Total Petroleum Hydrocarbon* (TPH), Bioremediasi, *Biosolve Pinkwater*, *Dietanolamida* (DEA)

**COMPARATIVE STUDY OF THE EFFECTIVENESS OF BIOSOLVE
PINKWATER AND DIETHANOLAMIDE (DEA) SURFACTANT IN
BIOREMEDIATION OF SLUDGE FROM HEAVY EQUIPMENT
MAINTENANCE ACTIVITIES AT PT KALTIM PRIMA COAL**

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ABSTRACT

The sludge produced from heavy equipment maintenance activities at PT Kaltim Prima Coal is blackish, oily, and smells of strong oil, which can indicate a high content of Total Petroleum Hydrocarbon (TPH). Hydrocarbon compounds are toxic, mutagenic, and carcinogenic so they can kill organisms in the area. The aim of this research are to analyze the TPH content in sludge from heavy equipment maintenance activities, analyze the comparative effectiveness of biosolve pinkwater and diethanolamide (DEA) surfactants to reduce TPH, and provide direction for appropriate sludge management.

This research is quantitative and qualitative research. Data collection methods were carried out by surveys and observations of existing conditions, sampling was carried out using grab sampling techniques. Laboratory tests on sludge are carried out with 7 parameters, namely temperature, water content, pH, TPH, Total P, Total N, and TPC. Sludge processing was carried out using the bioremediation method by adding biosolve pinkwater, diethanolamide (DEA) surfactants, NPK fertilizer, and urea for 56 days. The samples used were 7 samples with each surfactant concentration of 0%, 4%, 8%, and 12%. The results of the TPH test after the experiment were then analyzed using mathematical and descriptive analysis methods.

The research results showed that sludge from heavy equipment maintenance activities had a TPH concentration of 95350 mg/kg. This concentration is above the TK-A quality standard, which is 40,000 mg/kg so it is categorized as B3 waste category 1 which will have an acute and direct impact on humans and of course have a negative impact on the environment. Bioremediation runs optimally with the addition of pinkwater biosolve surfactant at a concentration of 12% with an effectiveness value of 57.944%. Meanwhile, bioremediation with the addition of diethanolamide (DEA) surfactant runs optimally at a concentration of 12% with an effectiveness value of 55.218%. Recommendations for management directions begin with soil washing followed by landfarming of 29 meters x 25 meters, the volume of diethanolimide (DEA) surfactant needed is 368 liters.

Keyword: *Sludge, Total Petroleum Hydrocarbon (TPH), Bioremediation, Biosolve Pinkwater, Diethanolamide (DEA)*