

OPTIMALISASI INSTALASI PENGOLAHAN AIR LIMBAH MAINTENANCE DI AREA *SHOP* PT X PROVINSI PAPUA, INDONESIA

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INTISARI

Penelitian dilakukan di PT X Papua, Indonesia yang merupakan perusahaan tambang dua metode pertambangan yaitu *underground mining* dan *surface mining*. Masing-masing area penambangan tersebut terdapat fasilitas *workshop* yang digunakan untuk kegiatan perawatan dan perbaikan kendaraan dan alat berat. Instalasi Pengolahan Air Limbah (IPAL) di area *workshop* yang memiliki air limbah yang kandungan minyak dan lemak dan pH melebihi ambang batas baku mutu yang diizinkan pada area *inlet*. Penelitian bertujuan untuk mengevaluasi air limbah area *workshop*, mengevaluasi unit pengolahan limbah cair dan menganalisis karakteristik limbah cair *maintenance* area *workshop* PT X, dan membuat rekomendasi dan membuat desain Instalasi Pengolahan Air Limbah (IPAL) yang sesuai untuk mengoptimalkan instalasi pengolahan air limbah area *workshop* daerah penelitian.

Penelitian yang dilakukan menggunakan metode kuantitatif dengan tahapan perolehan data, pengolahan data dan analisis data. Metode perolehan data meliputi data sekunder berupa dokumen yang digunakan dan hasil laboratorium dan data primer berupa hasil survei lapangan, pengambilan air sampel dan pemetaan. Data pengambilan sampel yang digunakan yaitu dengan metode *purposive sampling*. Pengolahan data yang dilakukan yaitu dengan menghitung evaluasi air limbah hasil kegiatan *workshop*, evaluasi unit pengolahan yang diterapkan, dan efektivitas unit pengolahan. Analisis data menggunakan analisis deskriptif dan matematis.

Hasil pengujian menunjukkan bahwa air limbah di area *surface* sudah memenuhi baku mutu, sedangkan di area *underground* pada *inlet*, parameter minyak dan lemak sebesar 26,66 mg/L masih melebihi baku mutu. Setelah melalui proses pengolahan, seluruh parameter di *outlet* turun dan sesuai standar. Evaluasi menunjukkan bak pengumpul di area *surface* sesuai kriteria desain, sementara di area *underground* perlu redesain agar waktu detensi optimal. Efisiensi *removal* unit pengolahan tercatat cukup tinggi, yaitu TOC 61,63–97,85%, pH 0,12–9,25%, serta minyak dan lemak 57,14%–88,89%. Untuk peningkatan kinerja, direkomendasikan penambahan bak *oil trap/grease trap* dengan target penyisihan minyak dan lemak 90% serta penerapan *anaerobic filter* untuk menurunkan kandungan organik hingga 97,82%.

Kata Kunci : Air Limbah, IPAL, minyak dan lemak, TOC, pH, efektivitas removal unit.

**OPTIMIZATION OF WASTEWATER TREATMENT INSTALLATIONS
MAINTENANCE IN THE SHOP AREA OF PT X PAPUA PROVINCE,
INDONESIA**

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ABSTRACT

The research was conducted at PT X Papua, Indonesia, a mining company that uses two mining methods, namely underground mining and surface mining. Each mining area has a workshop facility used for the maintenance and repair of vehicles and heavy equipment. The Wastewater Treatment Plant (WWTP) in the workshop area has wastewater with oil and fat content and pH levels exceeding the permissible quality standards at the inlet area. The study aims to evaluate the workshop area wastewater, evaluate the liquid waste treatment unit, analyze the characteristics of the PT X workshop maintenance area liquid waste, and make recommendations and designs for a Wastewater Treatment Plant (WWTP) that is suitable for optimizing the wastewater treatment plant in the workshop area of the study site.

The research was conducted using quantitative methods with stages of data acquisition, data processing, and data analysis. The data acquisition method included secondary data in the form of documents used and laboratory results and primary data in the form of field survey results, water sampling, and mapping. The sampling data used was obtained using the purposive sampling method. Data processing was carried out by calculating the evaluation of wastewater from workshop activities, the evaluation of the treatment units applied, and the removal efficiency of the treatment units. Data analysis used descriptive and mathematical analysis.

Test results show that liquid waste in the surface area meets quality standards, while in the underground area at the inlet, the oil and grease parameter of 26.66 mg/L still exceeds quality standards. After undergoing the treatment process, all parameters in the outlet area decreased and met standards. The evaluation shows that the storage tanks in the surface area meet the design criteria, while in the underground area, they need to be redesigned to achieve optimal retention time. The removal efficiency of the treatment unit is quite high, namely TOC 61.63–97.85%, pH 0.12–9.25%, and oil and grease 57.14%–88.89%. To improve performance, it is recommended to add an oil trap tank with a target oil and fat separation of 90% and to implement an anaerobic filter to reduce organic content by 97,82%.

Keywords: *Workshop Wastewater, IPAL, oil and grease, TOC, pH, removal unit efficiency.*