

**PERANCANGAN INSTALASI PENGOLAHAN AIR LIMBAH (IPAL)
SKALA USAHA MIKRO KECIL (UMK) PADA INDUSTRI BATIK
DI PADUKUHAN CENGKEHAN, KABUPATEN BANTUL**

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INTISARI

Industri batik skala rumahan di Kalurahan Wukirsari, Kabupaten Bantul, berpotensi menghasilkan limbah cair dengan kandungan pencemar tinggi yang berasal dari proses pewarnaan dan pelorodan malam. Penelitian ini berfokus pada perancangan dan uji kinerja bak multiproses sebagai sistem pengolahan air limbah batik skala laboratorium yang mengintegrasikan tahapan koagulasi–flokulasi, sedimentasi, dan aerasi dalam satu unit reaktor. Tujuan penelitian ini adalah untuk menilai efektivitas sistem tersebut dalam menurunkan konsentrasi parameter pencemar pada air limbah batik.

Rancangan percobaan dilakukan dengan sistem batch menggunakan variasi dosis koagulan tawas sebesar 1000 mg, 1500 mg, dan 2000 mg. Hasil uji menunjukkan bahwa dosis optimum sebesar 2000 mg menghasilkan flok paling stabil dan endapan terbanyak. Proses sedimentasi dilakukan selama 1 jam, diikuti aerasi selama 1 jam dengan laju udara 1,5 L/menit. Parameter yang dianalisis meliputi COD, BOD, TSS, TDS, amonia, sulfida, krom, fenol, minyak dan lemak, serta pH. Hasil pengolahan menunjukkan penurunan kadar COD sebesar 54,17 %, BOD 67,56 %, TSS 69 %, TDS 33,94 %, amonia 82,23 %, krom 98,23 %, fenol 76 %, dan minyak serta lemak 32,26 %, dengan pH akhir sebesar 12,5 %.

Meskipun sebagian besar parameter mengalami penurunan signifikan, beberapa di antaranya masih melebihi baku mutu. Oleh karena itu, rancangan IPAL dilengkapi dengan bak ekualisasi untuk menstabilkan fluktuasi beban limbah, *grease trap* untuk menyisihkan minyak dan lemak sebelum proses kimia berlangsung, serta *constructed wetland* sebagai tahap akhir berbasis proses biologis alami. Proses IPAL memiliki dimensi dari ekualisasi hingga *constructed wetland* sebesar 3 m x 0,5 m atau luas 1,5 m²

Kata Kunci : Air Limbah Batik, Bak Multiproses, IPAL, Koagulasi, Flokulasi, Sedimentasi, Aerasi

**DESIGN OF A SMALL AND MICRO-SCALE WASTEWATER TREATMENT
INSTALLATION (IPAL) IN THE BATIK INDUSTRY
IN PADUKUHAN CENGKEHAN, BANTUL REGENCY**

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ABSTRACT

The small-scale batik industry in Wukirsari Village, Bantul Regency, generates wastewater with high pollutant concentrations originating from the dyeing and wax removal processes. This study focuses on the design and performance evaluation of a multiprocess treatment tank as a laboratory-scale wastewater treatment system that integrates coagulation–flocculation, sedimentation, and aeration within a single reactor unit. The objective of this research is to assess the effectiveness of the system in reducing the main pollutant parameters of batik wastewater.

The experimental design was conducted in a batch system using alum (aluminum sulfate) as a coagulant with dosage variations of 1000 mg, 1500 mg, and 2000 mg. The results indicated that the optimum dosage of 2000 mg produced the most stable flocs and the greatest sedimentation. The sedimentation process was carried out for 1 hour, followed by aeration for 1 hour with an air flow rate of 1.5 L/min. The analyzed parameters included COD, BOD, TSS, TDS, ammonia, sulfide, chromium, phenol, oil and grease, and pH. The treatment achieved reductions of 54.17% COD, 67.56% BOD, 69% TSS, 33.94% TDS, 82.23% ammonia, 98.23% chromium, 76% phenol, and 32.26% oil and grease, with a final pH of 12.5%.

Although most parameters experienced a significant decrease, several still exceeded quality standards. Therefore, the WWTP design is equipped with an equalization tank to stabilize fluctuations in waste load, a grease trap to remove oil and grease before the chemical process, and a constructed wetland as a final stage based on natural biological processes. The WWTP process has dimensions from equalization to constructed wetland of 3 m x 0.5 m, or an area of 1.5 m².

Keywords: *Batik Wastewater, Multiprocess Tank, Wastewater Treatment, Coagulation, Flocculation, Sedimentation, Aeration*