

ABSTRAK

Pengaruh Variasi Plat Elektroda dan Kuat Arus terhadap Konsumsi Energi dan Kualitas Air Baku PDAM pada Proses Elektrokoagulasi

(M. Arya Bocran, 2026: 50 Halaman, 10 Tabel, 10 Gambar)

Air baku PDAM masih memerlukan pengolahan agar memenuhi standar kualitas air bersih. Salah satu metode yang dapat diterapkan adalah elektrokoagulasi, yaitu proses yang memanfaatkan arus listrik dan elektroda logam untuk menghasilkan koagulan secara langsung sehingga mampu mengurangi kandungan pencemar dalam air. Penelitian ini bertujuan menganalisis pengaruh variasi elektroda Al-Al dan Al-Fe serta kuat arus 0,01; 0,04; 0,07; 0,10; dan 0,13 A terhadap kualitas air baku PDAM berdasarkan parameter turbiditas, pH, Total Dissolved Solids (TDS), konduktivitas, konsumsi energi spesifik (Specific Energy Consumption/SEC), dan biaya operasi (Operating Cost). Proses elektrokoagulasi dilakukan selama 30 menit menggunakan reaktor batch, kemudian hasilnya dibandingkan dengan kualitas air keluaran IPA 3 Ilir PDAM. Hasil penelitian menunjukkan bahwa elektrokoagulasi efektif meningkatkan kualitas air baku. Kondisi terbaik diperoleh pada elektroda Al-Al dengan arus 0,07 A, yang menghasilkan turbiditas 1,91 NTU, pH 7,14, TDS 29,3 ppm, dan konduktivitas 72 $\mu\text{S}/\text{cm}$. Peningkatan kuat arus menyebabkan konsumsi energi spesifik dan biaya operasi ikut meningkat, dengan nilai SEC sebesar 0,000105–0,002685 kWh/m³ dan biaya operasi Rp26,99–Rp1.087,31/m³. Dengan demikian, penggunaan elektroda Al-Al pada arus 0,07 A memberikan keseimbangan terbaik antara efektivitas pengolahan, konsumsi energi, dan biaya operasi sehingga berpotensi menjadi alternatif pengolahan air baku PDAM.

Kata Kunci: 1.Elektrokoagulasi, 2.Air Baku PDAM, 3.Kuat Arus, 4.Plat Elektroda, 5. Konsumsi Energi, 6. Cost Operation

ABSTRACT

Effect of Electrode Plate Variation and Current Intensity on Energy Consumption and PDAM Raw Water Quality during the Electrocoagulation Process

(M. Arya Bocran, 2026: 50 Pages, 10 Tables, 10 Figures)

Raw water supplied to the regional water utility (PDAM) requires further treatment to meet clean water quality standards. One of the applicable methods is electrocoagulation, which utilizes an electric current and metal electrodes to generate coagulants in situ, thereby reducing contaminants in water. This study aimed to analyze the effect of Al-Al and Al-Fe electrode configurations and electric current variations of 0.01, 0.04, 0.07, 0.10, and 0.13 A on the quality of PDAM raw water based on turbidity, pH, Total Dissolved Solids (TDS), conductivity, Specific Energy Consumption (SEC), and Operating Cost. The electrocoagulation process was conducted for 30 minutes using a batch reactor, and the treated water quality was compared with the water produced by the IPA 3 Ilir PDAM treatment plant. The results showed that electrocoagulation effectively improved the quality of PDAM raw water. The optimum condition was achieved using Al-Al electrodes at a current of 0.07 A, resulting in a turbidity of 1.91 NTU, pH of 7.14, TDS of 29.3 ppm, and conductivity of 72 $\mu\text{S}/\text{cm}$. Higher current intensity increased both the Specific Energy Consumption, ranging from 0.000105 to 0.002685 kWh/m^3 , and the Operating Cost, ranging from IDR 26.99/ m^3 to IDR 1,087.31/ m^3 . Therefore, the Al-Al electrode configuration at 0.07 A provided the best balance between treatment efficiency, energy consumption, and operating cost, indicating its potential as an alternative technology for PDAM raw water treatment.

Keyword: 1. Electrocoagulation, 2. PDAM Raw Water, 3. Electric Current, 4. Electrode Configuration, 5. Specific Energy Consumption, Operating Cost.