ABSTRAK

EFEKTIFITAS KONSUMSI ENERGI DAN SEPARASI RENDEMEN AIR BAKU MENGGUNAKAN METODE ELEKTROKOAGULASI DENGAN PENGARUH VARIASI ELEKTRODA DAN WAKTU PROSES

(M. Tio Kurniawan, 2026, Skripsi, 54 Halaman, 12 Tabel, 21 Gambar, 4 Lampiran)

Pengolahan air baku secara konvensional menggunakan koagulan kimia seperti tawas dan PAC masih menghadapi kendala berupa produksi lumpur yang besar dan potensi residu kimia pada air hasil olahan. Penelitian ini mengkaji metode elektrokoagulasi sebagai alternatif pengolahan air baku yang lebih ramah lingkungan dengan menganalisis pengaruh variasi jenis elektroda (Al–Al dan Al–Fe) serta variasi waktu proses (20, 30, 40, 50, dan 60 menit) terhadap kualitas air dan konsumsi energi. Air baku yang digunakan berasal dari IPA 3 Ilir PDAM Tirta Musi Palembang dengan karakteristik awal kekeruhan 57 NTU, pH 7,01, TDS 28,7 mg/L, dan konduktivitas 56,6 µS/cm. Proses dijalankan dengan kuat arus tetap 0,1 A, tegangan 38 V, dan densitas arus 3,57 mA/cm². Hasil penelitian menunjukkan bahwa kedua jenis elektroda mampu menurunkan kekeruhan secara signifikan. Kondisi operasi optimum dicapai pada elektroda Al–Al dengan waktu 40 menit, menghasilkan kekeruhan terendah 0,68 NTU (efisiensi 98,8%), pH 7,44, TDS 26,3 mg/L, dan konduktivitas 55,3 µS/cm. Nilai *Specific Electrical Energy Consumption* (SEEC) pada kondisi optimum tersebut sebesar 0,00253 kWh/L dengan konsumsi elektroda 0,0224 kg/m³. Elektroda Al–Fe mencapai kekeruhan terendah 0,71 NTU pada menit ke-60, namun dengan konsumsi elektroda yang lebih tinggi (0,0694 kg/m³) sehingga berimplikasi pada biaya operasional yang lebih besar.

Kata kunci: elektrokoagulasi, air baku, elektroda Al–Al, elektroda Al–Fe, SEEC, kekeruhan

ABSTACT

ENERGY CONSUMPTION EFFICIENCY AND RAW AIR YIELD SEPARATION USING THE ELECTROCOAGULATION METHOD THE THE EFFECT OF ELECTRODE VARIATIONS AND PROCESS TIME

(M. Tio Kurniawan, *2026, Thesis, 54 pages, 12 tables, 21 figures, 4 appendices)*

Conventional raw water treatment using chemical coagulants such as alum and PAC faces persistent challenges, including excessive sludge production and the risk of chemical residues in treated water. This study investigates electrocoagulation as an environmentally friendly alternative for raw water treatment by analyzing the effect of electrode type variations (Al–Al and Al–Fe) and process time variations (20, 30, 40, 50, and 60 minutes) on water quality and energy consumption. Raw water samples were obtained from the Water Treatment Plant (WTP) 3 Ilir of PDAM Tirta Musi Palembang, with initial characteristics of turbidity 57 NTU, pH 7.01, TDS 28.7 mg/L, and conductivity 56.6 µS/cm. The process was operated at a constant current of 0.1 A, voltage of 38 V, and current density of 3.57 mA/cm². Results demonstrated that both electrode configurations effectively reduced turbidity. Optimum operating conditions were achieved using Al–Al electrodes at 40 minutes, yielding the lowest turbidity of 0.68 NTU (98.8% removal efficiency), pH 7.44, TDS 26.3 mg/L, and conductivity 55.3 µS/cm. The Specific Electrical Energy Consumption (SEEC) at this optimum condition was 0.00253 kWh/L with an electrode consumption of 0.0224 kg/m³. The Al–Fe electrode configuration achieved a minimum turbidity of 0.71 NTU at 60 minutes; however, its higher electrode consumption (0.0694 kg/m³) resulted in greater operational costs.

Keywords: *electrocoagulation, raw water treatment, Al–Al electrode, Al–Fe electrode, SEEC, turbidity*