

ABSTRAK

Proses elektroplating barrel merupakan metode pelapisan logam yang digunakan untuk melapisi komponen berukuran kecil secara massal, seperti mur, baut, ring, dan sekrup. Keberhasilan proses tersebut dipengaruhi oleh kestabilan putaran barrel sehingga diperlukan sistem penggerak yang mampu menghasilkan putaran rendah dan stabil. Penelitian ini bertujuan untuk merancang, membangun, dan menguji sistem penggerak elektroplating barrel berbasis motor DC power window dengan transmisi roda gigi lurus dan pengaturan kecepatan menggunakan Pulse Width Modulation (PWM). Metode penelitian yang digunakan adalah metode rancang bangun yang meliputi tahap perancangan, fabrikasi, serta pengujian kinerja sistem. Hasil perancangan menunjukkan bahwa sistem menggunakan motor DC 12 V dengan rasio transmisi roda gigi sebesar 8,875 : 1, sehingga putaran motor 100 rpm dapat direduksi menjadi putaran barrel teoritis sebesar 11,27 rpm, sesuai dengan target putaran proses elektroplating, yaitu 5–15 rpm. Hasil pengujian menunjukkan bahwa putaran barrel meningkat seiring kenaikan duty cycle PWM dan mencapai 11,3 rpm pada duty cycle 100%. Pada pengujian berbeban hingga 5 kg, perubahan putaran maksimum hanya sekitar 2,65%, sehingga sistem mampu mempertahankan putaran barrel dengan baik. Pengujian arus dan suhu motor menunjukkan konsumsi arus berada pada kisaran 2,00–2,90 A, sedangkan suhu motor meningkat secara bertahap namun masih berada dalam batas kerja yang aman. Berdasarkan hasil tersebut, dapat disimpulkan bahwa sistem penggerak elektroplating barrel yang dirancang mampu bekerja secara stabil, memenuhi kebutuhan putaran proses elektroplating, serta layak digunakan sebagai mesin elektroplating barrel skala laboratorium.

Kata kunci : elektroplating barrel, motor DC power window, transmisi roda gigi lurus, PWM, putaran barrel.

ABSTRACT

Barrel electroplating is a metal coating process used to plate small components in large quantities, such as nuts, bolts, washers, and screws. The quality of the electroplating process is highly influenced by the stability of the barrel rotation; therefore, a drive system capable of producing a low and stable rotational speed is required. This study aimed to design, fabricate, and evaluate a barrel electroplating drive system using a 12 V DC power window motor, a spur gear transmission, and Pulse Width Modulation (PWM) for speed control. The research employed a design and build method consisting of design, fabrication, and performance testing stages. The design results showed that the drive system utilized a gear reduction ratio of 8.875:1, reducing the motor speed of 100 rpm to a theoretical barrel speed of 11.27 rpm, which met the required electroplating operating range of 5–15 rpm. Performance testing demonstrated that the barrel speed increased with the PWM duty cycle and reached 11.3 rpm at a 100% duty cycle. Under loading conditions of up to 5 kg, the maximum decrease in barrel speed was only 2.65%, indicating that the drive system was able to maintain a stable rotational speed. Current and motor temperature tests showed that the motor consumed 2.00–2.90 A, while the motor temperature increased gradually but remained within a safe operating range throughout the tests. The results indicate that the proposed barrel electroplating drive system operates reliably, meets the required rotational speed for the electroplating process, and is suitable for laboratory-scale barrel electroplating applications.

Keywords: barrel electroplating, DC power window motor, spur gear transmission, pulse width modulation (PWM), barrel rotational speed.