

ABSTRAK

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Mesin CNC TU-3A merupakan salah satu sarana praktikum yang digunakan dalam proses pembelajaran dan pelatihan pemesinan berbasis Computer Numerical Control (CNC) di Politeknik Negeri Sriwijaya. Seiring dengan usia pemakaian yang cukup lama, mesin mengalami kerusakan pada beberapa komponen sistem kontrol sehingga tidak dapat beroperasi secara normal. Kerusakan tersebut menyebabkan terganggunya kegiatan praktikum mahasiswa dan menurunkan efektivitas pemanfaatan peralatan laboratorium. Untuk mengatasi permasalahan tersebut, dilakukan rekondisi mesin CNC TU-3A dengan mengganti sistem kontrol lama menjadi sistem kontrol berbasis perangkat lunak Mach3 yang lebih mudah dioperasikan, dikonfigurasi, dan dipelihara. meningkatkan keandalan sistem kontrol, pembelajaran di lingkungan Politeknik Negeri Sriwijaya. Tahapan rekondisi meliputi identifikasi kerusakan, perencanaan perbaikan, penggantian komponen yang rusak, pemasangan motor stepper dan driver, perakitan panel kontrol, pengkabelan sistem, instalasi perangkat lunak Mach3, konfigurasi parameter mesin, serta pengujian kinerja mesin. Metode pengujian yang digunakan terdiri dari uji visual, uji fungsional, dan uji operasional melalui pelaksanaan program pemesinan pada benda kerja. Hasil rekondisi menunjukkan bahwa seluruh sistem pada mesin CNC TU-3A dapat berfungsi dengan baik. Sistem kontrol Mach3 mampu mengendalikan pergerakan sumbu mesin sesuai perintah program yang diberikan. Motor stepper, motor spindle, serta komponen pendukung lainnya bekerja secara normal tanpa mengalami gangguan yang signifikan. Hasil pengujian operasional menunjukkan bahwa mesin mampu melakukan proses pemakanan dan menghasilkan dimensi benda kerja yang sesuai dengan program yang dijalankan. Berdasarkan hasil tersebut, dapat disimpulkan bahwa rekondisi mesin CNC TU-3A menggunakan sistem kontrol Mach3 berhasil mengembalikan fungsi mesin dan meningkatkan kesiapan mesin untuk digunakan sebagai media praktikum dan pembelajaran pemesinan CNC.

Kata Kunci: Rekondisi, CNC TU-3A, Mach3, Sistem Kontrol, Pengujian Mesin.

ABSTRACT

Reconditioning of the TU-3A CNC Machine Based on Mach3 Control at Sriwijaya State Polytechnic

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The CNC TU-3A machine is one of the practical training facilities used in Computer Numerical Control (CNC) machining education at Politeknik Negeri Sriwijaya. Due to prolonged use and aging components, the machine experienced failures in its control system, rendering it unable to operate properly. This condition disrupted laboratory activities and reduced the effectiveness of practical learning sessions. To overcome these problems, a reconditioning process was carried out by replacing the original control system with a Mach3-based control system, which offers greater flexibility, easier configuration, and improved maintenance capabilities. The objective of this reconditioning project was to restore the operational functionality of the CNC TU-3A machine, improve the reliability of its control system, and support machining practice activities in the laboratory. The reconditioning process included fault identification, repair planning, replacement of damaged components, installation of stepper motors and drivers, assembly of the control panel, rewiring of the electrical system, installation of Mach3 software, machine parameter configuration, and performance testing. The results of the reconditioning process showed that the CNC TU-3A machine was successfully restored to operational condition. The Mach3 control system was able to control all machine axes accurately according to programmed commands. The stepper motors, spindle motor, and supporting components functioned properly without significant operational issues. Operational testing demonstrated that the machine was capable of performing machining operations and producing workpieces with dimensions corresponding to the programmed specifications. Furthermore, the machine exhibited stable performance throughout the testing process. Based on the results obtained, it can be concluded that the reconditioning of the CNC TU-3A machine using the Mach3 control system successfully restored the machine's functionality and improved its readiness for educational and practical machining applications at Politeknik Negeri Sriwijaya.

Keywords : Reconditioning, CNC TU-3A Machine, Mach3, Control System, Operational Testing.