

ABSTRAK

**RANCANG BANGUN INTEGRASI MESIN PENGOLAHAN SAMPAH
PLASTIK DAN MESIN CNC MINI BERBASIS MIKROKONTROLER
(2026 : 57 Halaman + 47 Gambar + 3 Tabel + Daftar Pustaka + Lampiran)**

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TEKNIK ELEKTRO

PROGRAM STUDI DIII TEKNIK ELEKTRONIKA

POLITEKNIK NEGERI SRIWIJAYA

Permasalahan sampah plastik merupakan isu lingkungan yang terus meningkat seiring bertambahnya populasi manusia. Penelitian ini bertujuan merancang dan mengintegrasikan mesin pengolahan sampah plastik terpadu dengan mesin *Computer Numerical Control* (CNC) mini berbasis mikrokontroler. Sistem pengolahan sampah plastik terdiri dari atas dua unit utama, yaitu mesin pencacah (shredder) untuk memperkecil ukuran sampah plastik dan mesin pelelehan (injection) menggunakan elemen pemanas (heater). Pengaturan suhu proses pelelehan dikendalikan secara akurat menggunakan *Temperature Controller* Rex-C100 dan sensor Thermocouple. Hasil lelehan plastik dibentuk melalui cetakan menjadi produk kreatif yang kemudian diintegrasikan langsung ke mesin CNC mini berbasis laser 450Nm 3.5W untuk proses gravir otomatis berpresisi tinggi. Pusat kendali utama mesin CNC mini menggunakan arduino mega 2560 yang memproses file g-code untuk menggerakkan motor stepper sumbu X dan sumbu Y berbasis mekanik DVD-ROM. Hasil pengujian menunjukkan kedua sistem mampu beroperasi secara otomatis dan sistematis sesuai intruksi program.

Kata Kunci : Sampah Plastik, Shredder, Injection, CNC Mini, Laser, Arduino Mega 2560, Mikrokontroler.

ABSTRACT

DESIGN AND DEVELOPMENT OF AN INTEGRATED PLASTIC WASTER PROCESSING MACHINE AND MINI CNC MACHINE BASED ON A MICROCONTROLLER

(2026 : 57 Pages + 47 Picture + 3 Tables + Bibliography + Appendix)

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ELECTRICAL ENGINEERING

DIPI STUDY PROGRAM IN ELEKTRONIC ENGINEERING

SRIWIJAYA STATE POLYTECHNIC

Plastic waste accumulation is an environmental issue that continuously increases alongside human population growth. This study aims to design and integrate a unified plastic waste processing system with a microcontroller-based mini Computer Numerical Control (CNC) machine. The plastic waste processing system consists of two primary units : a shredder machine to minimize plastic size and an injection machine utilizing heating elements. The temperature configuration during the melting process is accurately controlled using a Rex-C100 Temperature Controller and a Thermocouple sensor. The molten plastic is shaped through a mold into creative products, which are then integrated directly into a 450Nm 3.5W laser-based mini CNC machine for high-precision automated engraving. The primary control center of the mini CNC machine utilizes an Arduino Mega 2560, which processes g-code file to actuate X and Y axes stepper motor utilizing DVD-ROM mechanisms. Testing results show that both systems operate automatically and systematically according to the programmed instructions.

Keywords : Plastic Waste, Shredder, Injection, Mini CNC, Laser, Arduino Mega 2560, Microcontroller.