

ABSTRAK

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Judul Laporan Akhir : Rancang Bangun Alat Oven *Heat Treatment*
(Pengujian)

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Laporan akhir ini membahas proses rancang bangun dan pengujian alat oven heat treatment sebagai sarana praktikum di lingkungan pendidikan vokasi, khususnya bagi mahasiswa Teknik Mesin di Politeknik Negeri Sriwijaya. Tujuan utama dari perancangan alat ini adalah untuk menyediakan alternatif oven laboratorium yang lebih ramah lingkungan, ekonomis, dan mudah digunakan dibandingkan metode konvensional yang masih menggunakan bahan bakar padat seperti arang. Oven ini dirancang dengan sistem pemanas listrik menggunakan elemen kawat nikelin serta dilengkapi dengan sistem kontrol suhu berbasis thermocouple dan thermocontrol. Struktur oven terdiri dari beberapa lapisan insulasi termal, yakni plat baja, kalsiboard, glasswool, dan batu tahan api tipe C-1, untuk menjaga kestabilan suhu dan efisiensi panas. Proses pengujian dilakukan di Bengkel Produksi Jurusan Teknik Mesin Polsri untuk mengevaluasi kinerja alat dalam aspek fungsionalitas, kestabilan suhu, dan efektivitas proses heat treatment terhadap benda kerja berbahan baja karbon tinggi. Hasil pengujian menunjukkan bahwa oven mampu mencapai suhu kerja hingga 750°C dalam waktu yang relatif singkat dan stabil, serta mampu memberikan hasil perlakuan panas yang baik terhadap benda kerja. Pengamatan terhadap komponen-komponen utama seperti heater, thermocouple, thermocontrol, dan isolasi termal juga menunjukkan bahwa alat bekerja sesuai dengan rancangan tanpa mengalami kerusakan berarti. Dengan demikian, alat ini dinilai layak sebagai media pembelajaran praktikum proses perlakuan panas dan dapat dijadikan sebagai alternatif edukatif dalam mendukung kurikulum vokasi bidang teknik mesin.

Kata Kunci: *Heat Treatment*, Oven Listrik, *Thermocouple*, Baja Karbon Tinggi

ABSTRACT

Design and Construction of a Heat Treatment (Testing Process)

(2025: xii + 65 pp. + 21 Figures + 6 Tables + 12 Attachments)

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This final report discusses the design, construction, and testing of a heat treatment oven developed as a practical learning tool for vocational education, particularly for Mechanical Engineering students at the State Polytechnic of Sriwijaya. The primary goal of this project is to provide a cost-effective, environmentally friendly, and user-friendly alternative to conventional ovens, which commonly rely on solid fuels such as charcoal. The designed oven utilizes electric heating elements made from nichrome wire, along with a temperature control system based on a thermocouple sensor and a digital thermocontrol module. The oven's construction consists of several thermal insulation layers, including steel plates, calcium silicate board (kalsiboard), glasswool, and C-1 type fire bricks, to ensure temperature stability and heat efficiency. Testing was conducted at the Production Workshop of the Mechanical Engineering Department to evaluate the oven's performance in terms of functionality, temperature stability, and the effectiveness of the heat treatment process on high-carbon steel specimens. The test results confirmed that the oven is capable of reaching and maintaining a stable operating temperature of up to 750°C within a relatively short time. Additionally, the treated specimens exhibited expected changes in physical properties, consistent with successful heat treatment outcomes. Observations of key components such as the heater, thermocouple, thermocontrol system, and thermal insulation indicated that the oven operated reliably without significant damage or malfunction. In conclusion, the heat treatment oven developed in this project fulfills its basic functional requirements as a hands-on learning medium and serves as a practical and educational alternative for supporting heat treatment learning activities in mechanical engineering vocational education.

Keywords : Heat Treatment, Electric Oven, Thermocouple, High Carbon Steel