

ABSTRAK

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Judul Laporan : Rancang Bangun Alat Pembersih *Filter* Udara
Berbasis Arduino Untuk Mobil Diesel (Proses
Perawatan)

(2025: xiv + 74 Halaman, 46 Gambar, 18 Tabel, + 15 Lampiran)

Filter udara memiliki fungsi penting dalam sistem pembakaran mesin, yaitu menyaring kotoran, debu, serta partikel kecil lainnya sebelum udara masuk ke ruang bakar. Keberadaan filter udara yang bersih sangat berpengaruh terhadap kualitas proses pembakaran, efisiensi bahan bakar, dan performa mesin secara keseluruhan. Namun, metode pembersihan filter yang dilakukan secara manual sering kali dinilai kurang efektif karena hanya menghilangkan sebagian kotoran, bahkan berisiko merusak elemen filter akibat perlakuan yang tidak tepat. Selain itu, proses manual juga dapat menyebabkan penyebaran debu ke lingkungan sekitar sehingga menimbulkan potensi pencemaran udara dan gangguan kesehatan bagi operator maupun lingkungan sekitar. Untuk mengatasi permasalahan tersebut, penelitian ini merancang dan membuat sebuah ruang pembersih filter udara mobil diesel yang dilengkapi sistem kontrol berbasis Arduino. Tujuan utama dari penelitian ini adalah meningkatkan efektivitas pembersihan filter, menjaga keawetan elemen filter, serta mengurangi dampak polusi udara selama proses berlangsung. Metode yang digunakan adalah rancang bangun yang meliputi tahap perencanaan desain, pembuatan prototipe, pengujian performa, serta evaluasi perawatan untuk memastikan alat berfungsi sesuai rancangan. Berdasarkan hasil perhitungan, motor DC yang digunakan memerlukan daya minimum sebesar 65,58 Watt dan torsi sebesar 1,392 Nm untuk memutar pipa pembersih dengan kecepatan 150 rpm. Komponen rangka mampu menopang total massa beban sebesar 18,373 kg, dan telah dilakukan analisis kekuatan struktur rangka serta roda untuk memastikan kestabilan alat saat dioperasikan. Perawatan berkala pada mesin pembersih ini diharapkan dapat menjaga performa alat agar tetap optimal, memperpanjang usia pakainya, serta memberikan kontribusi nyata sebagai solusi yang lebih praktis, aman, ramah lingkungan, dan efisien dalam perawatan filter udara pada mesin diesel.

Kata kunci: filter udara, pembersihan, motor dc, arduino, rancang bangun, perawatan

ABSTRACT

Arduino-Based Air Filter Cleaning Tool Design for Diesel Cars (Maintenance Process)

(2025: xiv + 74 pp + 46 Figures + 18 Tables + 15 Attachments)

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The air filter plays an important role in the engine combustion system by filtering dirt, dust, and other small particles before the air enters the combustion chamber. A clean air filter greatly affects the quality of combustion, fuel efficiency, and overall engine performance. However, the cleaning process carried out manually is often considered less effective because it only removes part of the dirt and may damage the filter element due to improper handling. In addition, the manual process can also cause the spread of dust into the surrounding environment, which may lead to air pollution and health problems for both the operator and the environment. To overcome these problems, this study designed and developed an air filter cleaning chamber for diesel engines equipped with an Arduino-based control system. The main objective of this research is to improve the effectiveness of filter cleaning, maintain the durability of the filter element, and reduce air pollution during the cleaning process. The method applied is an engineering design approach that includes design planning, prototype manufacturing, performance testing, and maintenance evaluation to ensure the tool works according to the intended function. Based on the calculation results, the DC motor requires a minimum power of 65.58 Watts and a torque of 1.392 Nm to rotate the cleaning pipe at 150 rpm. The frame components are capable of supporting a total load mass of 18.373 kg, and a structural strength analysis of the frame and wheels has been carried out to guarantee stability during operation. Regular maintenance of this cleaning machine is expected to maintain optimal performance, extend its service life, and provide a practical, safe, environmentally friendly, and efficient solution for air filter maintenance in diesel engines.

Keywords: air filter, cleaning, dc motor, arduino, design and fabrication, maintenance