

ABSTRAK

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Judul Laporan Akhir : Rancang Bangun Alat Pembersih Air Cleaner Pada
Unit Hino 500 Euro 4

(2026: xiv + 41 Halaman, 20 Gambar, 7 Tabel + 6 Lampiran)

Air cleaner merupakan komponen vital pada unit Hino 500 Euro 4 yang berfungsi menyaring debu dan partikel halus agar tidak masuk ke sistem induksi udara mesin. Selama ini proses pembersihan air cleaner masih dilakukan secara manual menggunakan selang kompresor yang diarahkan langsung oleh operator, sehingga hasil pembersihan tidak konsisten, memerlukan waktu lama, serta menimbulkan risiko paparan debu bagi operator. Berdasarkan permasalahan tersebut, dirancang sebuah alat pembersih air cleaner otomatis yang mampu bekerja secara konsisten, cepat, dan aman.

Alat dirancang menggunakan rangka besi hollow ST32 ukuran $30 \times 30 \times 2$ mm dengan dimensi keseluruhan $1500 \text{ mm} \times 550 \text{ mm} \times 1550 \text{ mm}$, dilengkapi panel akrilik transparan setebal 5 mm sebagai ruang pembersihan tertutup. Sistem pembersihan menggunakan udara bertekanan dari kompresor yang disalurkan melalui nozzle, dengan nozzle digerakkan secara otomatis maju-mundur oleh linear stepping motor yang dikendalikan motor stepper NEMA 23. Seluruh proses dikendalikan oleh controller ZK SMC-01 yang terintegrasi dengan driver motor TB6600. Debu hasil pembersihan dihisap oleh vacuum blower berdaya 750 Watt agar tidak menyebar ke lingkungan kerja.

Hasil perhitungan menunjukkan tekanan kerja kompresor sebesar 500.000 Pa, debit udara nozzle sebesar $0,002826 \text{ m}^3/\text{s}$, daya vacuum blower 750 Watt, beban rangka sebesar 441,45 N, dan torsi motor stepper sebesar 1,18 N.m dengan faktor keamanan, yang masih berada di bawah kapasitas torsi motor NEMA 23 sebesar 2 N.m. Hasil tersebut menunjukkan bahwa seluruh komponen yang dipilih telah memenuhi kebutuhan sistem. Dengan demikian, alat pembersih air cleaner otomatis ini layak direalisasikan ke tahap fabrikasi dan pengujian lapangan untuk mengurangi ketergantungan pada metode manual serta meningkatkan keselamatan kerja operator.

Kata Kunci: air cleaner, alat otomatis, vacuum blower, motor stepper, Hino 500

ABSTRACT
Desain of Apar Pin seal production Equipment
(Making Process)

(2026: xiv + 41 pp. + 20 Figures + 7 Tables + 6 Attachments)

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The air cleaner is a vital component in the Hino 500 Euro 4 unit, functioning to filter dust and fine particles from entering the engine's air induction system. The cleaning process has so far been carried out manually using a compressor hose directed by the operator, resulting in inconsistent cleaning, long processing time, and dust exposure risk to the operator. Based on these problems, an automatic air cleaner cleaning device was designed to work consistently, quickly, and safely.

The device frame uses ST32 hollow steel measuring 30×30×2 mm with overall dimensions of 1500 mm × 550 mm × 1550 mm, equipped with a 5 mm transparent acrylic panel forming an enclosed cleaning chamber. The cleaning system uses pressurized air from a compressor channeled through a nozzle, which is moved automatically back and forth by a linear stepping motor driven by a NEMA 23 stepper motor. The entire process is controlled by a ZK SMC-01 controller integrated with a TB6600 motor driver. Dust released during cleaning is extracted by a 750 Watt vacuum blower to prevent it from spreading into the work environment.

Calculation results show a compressor working pressure of 500,000 Pa, nozzle air flow rate of 0.002826 m³/s, vacuum blower power of 750 Watts, frame load of 441.45 N, and stepper motor torque of 1.18 N.m including a safety factor, which remains below the NEMA 23 motor's torque capacity of 2 N.m. These results indicate that all selected components meet the system requirements. Therefore, this automatic air cleaner cleaning device is ready to proceed to the fabrication and field testing stages to reduce reliance on manual methods and improve operator work safety.

Keywords : air cleaner, automatic device, vacuum blower, stepper motor, Hino 500