

RANCANG BANGUN ALAT DETEKSI KERUSAKAN MOTOR 3 PHASE BERBASIS ARDUINO MEGA 2560

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ABSTRAK

Motor AC 3 phase banyak digunakan dalam industri karena efisiensi dan keandalannya, namun tetap berpotensi mengalami kerusakan akibat suhu berlebih, getaran, maupun gangguan kelistrikan sehingga diperlukan sistem deteksi dini yang mampu memantau kondisi motor secara real-time. Penelitian ini merancang alat deteksi kerusakan motor 3 fasa berbasis Arduino Mega 2560 dengan dukungan sensor PZEM-004T untuk mengukur tegangan, arus, daya, faktor daya, dan frekuensi, sensor SW-420 untuk mendeteksi getaran, serta sensor DS18B20 untuk suhu. Data hasil pengukuran ditampilkan melalui aplikasi Delphi, disimpan pada SD card, dan direkam ke database lokal. Hasil pengujian menunjukkan bahwa pengukuran tegangan, arus, dan frekuensi memiliki error rendah ($<2\%$), sedangkan daya dan faktor daya mengalami deviasi lebih tinggi sekitar 3–5%. Sensor SW-420 berhasil mendeteksi peningkatan getaran saat dilakukan simulasi kerusakan menggunakan metode DOL dan star-delta berdasarkan interval waktu dengan validasi terhadap standar ISO 10816, sementara sensor DS18B20 memiliki selisih rata-rata 0,5 °C dibanding thermometer inframerah. Sistem monitoring berbasis Delphi mampu menampilkan data secara real-time sekaligus menyimpan hasil pengujian. Secara keseluruhan, alat ini dapat digunakan untuk mendeteksi indikasi kerusakan motor 3 fasa serta berfungsi sebagai media pembelajaran praktikum di bidang teknik elektro.

Kata Kunci : Motor AC 3 fasa, Arduino Mega 2560, Deteksi Kerusakan, Simulasi DOL, Simulasi Star-Delta, PZEM-004T, SW-420, DS18B20

**DESIGN OF A 3-PHASE MOTOR DAMAGE DETECTION DEVICE BASED ON
ARDUINO MEGA 2560**

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ABSTRACT

Three-phase AC motors are widely used in industry due to their efficiency and reliability, but they are still susceptible to damage due to excessive temperatures, vibrations, and electrical disturbances, requiring an early detection system capable of monitoring motor conditions in real time. This study designed a 3-phase motor damage detection device based on Arduino Mega 2560 with the support of a PZEM-004T sensor to measure voltage, current, power, power factor, and frequency, an SW-420 sensor to detect vibration, and a DS18B20 sensor for temperature. The measurement data is displayed through the Delphi application, stored on an SD card, and recorded in a local database. The test results show that the voltage, current, and frequency measurements have low errors (<2%), while the power and power factor have higher deviations of around 3–5%. The SW-420 sensor successfully detected increased vibration during damage simulation using the DOL and star-delta methods based on time intervals with validation against the ISO 10816 standard, while the DS18B20 sensor had an average difference of 0.5 °C compared to an infrared thermometer. The Delphi-based monitoring system is capable of displaying data in real-time while storing test results. Overall, this tool can be used to detect indications of damage to 3-phase motors and serve as a practical learning medium in the field of electrical engineering.

Keywords: *3-phase AC motor, Arduino Mega 2560, Fault Detection, DOL Simulation, Star-Delta Simulation, PZEM-004T, SW-420, DS18B20.*