

RANCANG BANGUN SISTEM *LIVE MONITORING* OPERASIONAL KOMPRESOR INDUSTRI BERBASIS *INTERNET OF THINGS* DI PT. TMMIN

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ABSTRAK

Penelitian ini bertujuan untuk merancang dan mengimplementasikan sistem *live monitoring* berbasis *Internet of Things (IoT)* pada mesin kompresor industri Kaeser ES300 di PT Toyota Motor Manufacturing Indonesia (TMMIN). Sistem ini menggunakan mikrokontroler ESP32 yang terintegrasi dengan sensor DHT22 untuk mengukur suhu dan kelembapan, sensor DSM501A untuk mengukur konsentrasi partikel debu, dan sensor INA219 untuk memantau tegangan serta konsumsi arus. Pengambilan data dilakukan sebanyak 100 kali untuk setiap parameter, dan hasilnya dianalisis dengan membandingkan terhadap alat ukur industri seperti *Thermal imager* dan multimeter digital. Hasil pengukuran menunjukkan bahwa sensor DHT22 memiliki nilai rata-rata suhu sebesar 41,36°C dengan akurasi 99,71% dan presisi 96,8%, serta kelembapan rata-rata sebesar 32,53% dengan kestabilan pembacaan tinggi. Sensor DSM501A menghasilkan konsentrasi debu rata-rata 240,78 $\mu\text{g}/\text{m}^3$ dengan *fluktuasi* minimal dan performa stabil. Sensor INA219 mencatatkan tegangan konstan sebesar 4,78 V (akurat terhadap pembacaan multimeter dengan akurasi 98% dan presisi 100%) serta konsumsi arus rata-rata 3,67 mA (akurasi 99,76%, presisi 98,3%). Seluruh data dikirim secara *real-time* ke *platform Thingspeak* dan divisualisasikan melalui antarmuka *website online*, serta didukung fitur notifikasi otomatis via *WhatsApp* untuk meningkatkan respon teknisi terhadap kondisi kritis. Dengan demikian, sistem yang dikembangkan terbukti akurat, andal, dan efisien dalam melakukan pemantauan operasional kompresor secara jarak jauh, terutama di luar jam kerja teknisi, serta dapat menjadi solusi efektif dalam mendukung sistem pemeliharaan prediktif industri.

Kata kunci: *Internet of things, ESP32, Sensor DHT22, DSM501A, INA219, Live monitoring, Akurasi, Presisi, Kompresor Industri*

***DESIGN AND DEVELOPMENT OF A LIVE MONITORING
SISTEM FOR INDUSTRIAL COMPRESSOR OPERATIONS
BASED ON THE INTERNET OF THINGS AT PT. TMMIN***

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ABSTRACT

This research aims to design and implement a live monitoring system based on the Internet of Things (IoT) for the Kaeser ES300 industrial air compressor at PT Toyota Motor Manufacturing Indonesia (TMMIN). The system uses an ESP32 microcontroller integrated with the DHT22 sensor for measuring temperature and humidity, DSM501A for detecting dust particle concentration, and INA219 for monitoring voltage and current consumption. Data was collected 100 times per parameter and analyzed by comparing the results against industrial-grade measuring tools such as a Thermal imager and digital multimeter. The results show that the DHT22 sensor measured an average temperature of 41.36°C with 99.71% accuracy and 96.8% precision, and an average humidity of 32.53% with high reading stability. The DSM501A sensor recorded an average dust concentration of 240.78 $\mu\text{g}/\text{m}^3$ with minimal fluctuation and consistent performance. The INA219 sensor reported a stable voltage of 4.78 V (with 98% accuracy and 100% precision) and an average current consumption of 3.67 mA (99.76% accuracy and 98.3% precision). All data was transmitted in real time to the Thingspeak platform and visualized through a dedicated web interface. Additionally, the system features an automatic WhatsApp notification alert to enhance technician responsiveness in critical conditions. In conclusion, the developed system is proven to be accurate, reliable, and efficient for remote industrial compressor monitoring, especially outside technicians' working hours, and offers an effective solution to support predictive maintenance systems.

Keywords: Internet of things, ESP32, DHT22 Sensor, DSM501A, INA219, Live monitoring, Accuracy, Precision, Industrial Compressor.