ABSTRAK

Karbon monoksida (CO) merupakan polutan udara berbahaya yang sulit dideteksi tanpa alat khusus. Penelitian ini bertujuan untuk merancang sistem pemantauan CO berbasis sensor MQ-135 dan teknologi *Internet of Things* (IoT) guna melakukan pengukuran secara real-time serta memprediksi konsentrasinya menggunakan algoritma regresi linier. Sistem ini diterapkan di salah satu PT yang ada di Kawasan Industri MM2100, Bekasi, dengan data dikumpulkan menggunakan mikrokontroler ESP32 dan dikirim ke platform ThingSpeak, sementara faktor meteorologi seperti suhu, kelembapan, kecepatan angin, dan kondisi cuaca diperoleh dari Open Meteo sebagai variabel independen. Proses penelitian meliputi perancangan sistem, pengumpulan data, pemodelan regresi linier, serta evaluasi performa menggunakan RMSE, MSE, MAE, dan R-squared (R^2). Hasil penelitian menunjukkan bahwa sensor MQ-135 memiliki standar deviasi sebesar 19,89 ppm akibat keterbatasan rentang deteksi maksimum 450 ppm, yang memengaruhi akurasi pengukuran. Selain itu, model prediksi berbasis regresi linier menghasilkan nilai R-*squared* sebesar 0,079 atau 7,9%, menunjukkan bahwa hubungan antara faktor meteorologi dan konsentrasi CO masih lemah, sebagian besar disebabkan oleh keterbatasan jumlah dan variasi data yang digunakan. Meskipun demikian, sistem ini tetap menunjukkan potensi dalam pemantauan polutan CO secara real-time. Peningkatan akurasi dapat dicapai melalui optimalisasi sensor, perluasan cakupan data, serta penerapan algoritma *machine learning* yang lebih kompleks agar sistem dapat memberikan prediksi yang lebih akurat dan andal dalam mendukung pemantauan konsentrasi CO.

Kata Kunci: Karbon Monoksida (CO), Sensor MQ-135, Polutan Udara, IoT, Prediksi CO, *Machine Learning*, Regresi Linier

ABSTRACT

Carbon monoxide (CO) is a hazardous air pollutant that is difficult to detect without specialized equipment. This study aims to design a CO monitoring system based on the MQ-135 sensor and Internet of Things (IoT) technology to perform real-time measurements and predict its concentration using a linear regression algorithm. The system is implemented in one of the companies located in the MM2100 Industrial Area, Bekasi, with data collected using an ESP32 microcontroller and transmitted to the ThingSpeak platform, while meteorological factors such as temperature, humidity, wind speed, and weather conditions are obtained from Open Meteo as independent variables. The research process includes system design, data collection, linear regression modeling, and performance evaluation using RMSE, MSE, MAE, and R-squared (R^2) metrics. The results show that the MQ-135 sensor has a standard deviation of 19.89 ppm due to its maximum detection range limitation of 450 ppm, affecting measurement accuracy. Additionally, the linear regression-based prediction model yields an R-squared value of 0.079 or 7.9%, indicating a weak relationship between meteorological factors and CO concentration, primarily due to the limited amount and variation of data used. Nevertheless, this system demonstrates potential for real-time CO pollutant monitoring. Accuracy improvements can be achieved through sensor optimization, expanded data coverage, and the application of more advanced machine learning algorithms to enhance the reliability of CO concentration predictions.

***Keywords**: Carbon Monoxide (CO), MQ-135 Sensor, Air Pollutants, IoT, CO Prediction, Machine Learning, Linier Regression*