

## ABSTARCT

*Fuel efficiency is one of the key indicators in assessing the performance of internal combustion engines, both in industrial and educational environments. Manual testing processes often encounter issues such as data inaccuracies, delayed recording, and difficulties in analyzing parameter changes in real time. These limitations highlight the need for a digital system capable of automating data acquisition and analysis. Therefore, this research aims to design and develop the EMSys desktop application, which functions to perform integrated acquisition, visualization, and analysis of fuel efficiency data for internal combustion engines.*

*The methodology includes system design, software implementation, sensor integration, and functional testing. The system utilizes load cell, proximity, and thermocouple sensors connected through the Modbus RTU RS-485 protocol to obtain engine operational data. The desktop application is developed using C# and the .NET Framework, equipped with real-time graph displays, measurement tables, automatic data storage, and Excel export features for further analysis.*

*The application testing was conducted by directly connecting the system to an internal combustion engine and evaluating its performance in reading and displaying sensor data in real time. The testing covered sensor accuracy assessment, Modbus RTU communication stability, graph performance, data logging reliability, and Excel export functionality. The results showed that the EMSys application successfully presented real-time sensor data without noticeable delay, achieved more than 95% accuracy, and operated stably throughout the testing process. Based on these findings, it can be concluded that the EMSys application is effective and reliable for supporting fuel efficiency monitoring and analysis, enhancing the overall reliability of research processes in both academic and industrial settings.*

*Keywords: desktop application, fuel efficiency, internal combustion engine, real-time sensor, data acquisition*