

ABSTRACT

Performance testing of internal combustion engines requires a data acquisition system capable of recording key parameters simultaneously and in real time. The use of separate conventional measuring instruments often results in inefficient data collection and poor synchronization between parameters. This study aims to design and implement a microcontroller-based ICE Logger system to measure torque, engine speed (RPM), fuel consumption, coolant temperature, and air flow rate in an integrated manner on an engine test bench.

The research method consists of multisensor hardware design and firmware development using a hybrid interrupt-polling approach with a fixed 200 ms sampling window. Pulse-based sensors such as RPM and Air Flow Meter are processed using interrupt and hardware counter mechanisms to prevent pulse loss, while torque, fuel consumption, and temperature sensors are read through digital conversion modules with averaging techniques. Sensor calibration parameters are stored in EEPROM, and processed data are formatted in CSV structure for serial communication and displayed on LCD.

The implementation results show that the system performs stable data acquisition with an update interval of approximately 200 ms and synchronized parameter output. The application of averaging and dead-zone logic improves measurement stability under both steady and transient engine conditions. The developed ICE Logger system can be utilized as a real-time monitoring and data logging tool for engine performance testing on a test bench.

Keywords: *data acquisition, engine test bench, microcontroller, multisensor system, ICE Logger.*