# Empowering industrial automation labs with IoT: A case study on real-time monitoring and control of induction motors using Siemens PLC and Node-RED



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**Abstract** - This initiative discusses the utilization of the Internet of Things (IoT) to enable smart control and monitoring of multiple devices in an industrial automation lab. The traditional manual approach of overseeing device performance in the industrial sector is prone to errors and lacks scalability and efficiency. The investigation compares Node -RED and Labview and proposes a design for remote control and monitoring. The process involves Node -RED, Siemens S7-1200 PLC, Sinamics V20 and an induction motor. Key steps include configuring frequency data exchange between Node -RED and the PLC, allocating frequencies based on an ID communication protocol, and using PLC data to power the induction motor via the Variable Frequency Drive. An

experimental setup aims to validate the system's applicability and functionality by comparing theoretical data with experimental results. The study included a no-load test to observe motor shaft operation and a variable load setup where the motor was subjected to varying loads. Real-time monitoring of speed and torque adjustments was facilitated by the control unit. The no-load test revealed an average slip of 0.06 for the motor, with a direct voltage-frequency relationship. In the variable load test, the motor maintained a consistent voltage-to-frequency ratio, while current behaviour varied across different load ranges. By leveraging IoT connectivity using Siemens PLC S7-1200, this project demonstrates real-time data collection and analysis using Node -RED, Google Firebase, Google Sheets, and remote-control capabilities, leading to improved operational efficiency, reduced downtime, and increased productivity. The article emphasizes the significance of IoT in industrial automation labs and highlights its potential to revolutionize device control and monitoring, particularly focusing on the analysis of induction motors. The main challenge was to interface the devices to create an interconnected robust system, which was successfully overcome by implementing various IoT protocols. The system generated promising results, confirming IoT 's potential in industrial automation.

**Keywords**

**Author Keywords:** Node-RED; Induction motor; Internet of things; Variable frequency drive

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