

DESIGNING AND DEVELOPING AN AUTOMATIC BOTTLE SORTING SYSTEM BASED ON PLC AND HMI (Human-Machine Interface)

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ABSTRACT

The bottling and packaging industry in Indonesia still heavily relies on manual processes, which pose risks of inaccuracies in sorting and impact production efficiency. To address this issue, this study designs and develops an automatic bottle sorting system based on a Programmable Logic Controller (PLC) and Human-Machine Interface (HMI). The system is designed to sort 600 ml and 330 ml bottles based on weight, using a load cell sensor for weight detection and pneumatic actuators for sorting. The research method involves hardware and software design, component integration, and functional and accurate testing. The main components of the system include Arduino for managing data from the load cell sensor, PLC as the control center for sorting logic, and HMI as the interface to display weight data and system status in real time. A proximity sensor is used to detect the presence of bottles on the conveyor, while pneumatic actuators sort bottles based on PLC commands. Test results show that the system performs stable and accurate classification, with an average system reading error of 7.1525 grams. All sorting decisions matched actual conditions, resulting in a 100% success rate across all test scenarios. With a classification success rate of 100% and reading errors within tolerance limits, the system offers an efficient and reliable solution for implementation in industrial packaging production lines.

Keywords: Industrial Automation, Sorting System, Programmable Logic Controller (PLC), Human-Machine Interface (HMI), Load Cell Sensor.