

PLC-Based Metal and Non-Metal Sorting System as a Laboratory Practice Module

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ABSTRACT

The manual sorting of metal and non-metal materials has limitations in terms of sorting consistency and accuracy. This research proposes an automatic sorting system based on a *Programmable Logic Controller* (PLC) as a *prototype* and industrial automation training module by integrating an inductive *proximity* sensor, capacitive *proximity* sensor, conveyors, and pneumatic actuator. The objectives of this research are to integrate the control devices and actuators into an automatic sorting system, design the control logic using a *Ladder Diagram*, and determine the system performance in detecting and separating metal and non-metal materials. The research method consisted of literature study and technical data collection, hardware and system layout design, control program development using Zelio Soft 2 software, component assembly and wiring, and functional testing of the sensors, pneumatic actuator, and overall sorting system. The Schneider Zelio Logic SR2B121BD PLC was used as the main signal processing controller. The inductive *proximity* sensor was used to detect metallic materials, while the capacitive *proximity* sensor was used to detect the presence of objects. Metallic materials were directed to the second conveyor, while non-metallic materials were separated using a pneumatic cylinder. The test results involving five metal objects and five non-metal objects showed a sorting success rate of 100% for each material type. These results indicate that the developed *prototype* was able to perform the sorting process according to the designed control logic and can be used as a learning medium for industrial automation.

Keywords: sorting system, *Programmable Logic Controller*, *proximity* sensor, pneumatic actuator, training module.