

IMPLEMENTATION OF AN AUTOMATIC CONTROL SYSTEM ON A PLC CPM2A-BASED LIQUID PROCESSING TRAINER

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ABSTRACT

The development of industrial automation technology has increased the demand for learning media capable of simulating real industrial control processes. A multi-tank Liquid Process Trainer is one of the learning platforms used to represent liquid processing operations, including material filling, heating and mixing, and product transfer. This study aims to design and implement a ladder diagram program on an Omron CPM2A PLC as an automatic control system, integrate all sensors and actuators into a functional PLC program, and verify the system performance in accordance with the designed sequential control logic. The research employed the Research and Development (R&D) method, which consisted of needs analysis, system design, hardware and software implementation, as well as testing and verification stages. The control program was developed using CX-Programmer software with the ladder diagram programming language. The testing process included input/output (I/O) verification, step-by-step sequence verification, full-cycle testing, and protection function testing. The results showed that the ladder diagram program was successfully implemented on the Omron CPM2A PLC and was capable of controlling all processing stages of the Liquid Process Trainer according to the designed operational sequence. All sensors and actuators were successfully integrated into the control system, with the I/O verification achieving a success rate of 100%. Furthermore, the results of the step-by-step sequence verification, full-cycle testing, and protection function testing demonstrated that the system operated automatically, sequentially, stably, and reliably without any logical errors or functional failures during the testing process. Based on these findings, the automatic control system based on the Omron CPM2A PLC was successfully implemented and is suitable for use as a learning medium for industrial automation systems.

Keywords: PLC Omron CPM2A, CX-Programmer, Sensor, Actuator