Control and Monitoring of an Instant-Coffee Production Line Using an S7-1200 PLC

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***Abstract*—This thesis designs control and monitoring for a simulated instant-coffee production line using a Siemens S7-1200 programmable logic controller. The report reviews the production process, selects control components, develops PLC logic, and presents a monitoring interface. It distinguishes manual and automatic operation and shows simulated system behaviour through diagrams and interface images. The thesis conclusion states that the simulation met the project requirements and that operation followed the intended process sequence. The source does not document installation in an operating factory or a measured comparison of production speed, accuracy, or reliability. The reported result is therefore a design and simulation of the production-line control system. The student also notes limits of experience and knowledge, leaving further refinement of the design and its evaluation for later work.**

***Index Terms*—PLC S7-1200, coffee powder production, control system, monitoring system, HMI, SCADA**

I. Introduction

The thesis provides an overview of the production process of soluble coffee, including the selection of the topic, objectives, and the role of PLC S7-1200 in the control and monitoring of the production line. It details the various stages of production, from grinding to packaging. The research aims to design and implement a control system that can effectively manage the production line, ensuring efficient and accurate operations. The study focuses on the practical application of PLC S7-1200 in the coffee powder production process, addressing the need for precise control and monitoring of the production line [1]. Related earlier ICTU undergraduate theses provide context for this English summary [3], [4]. Published articles on the methods and subject of this project provide context for this English summary [5], [6], [7].

II. Methods

The project begins with a description of instant-coffee processing and derives a control sequence for the proposed production line. The student uses a Siemens S7-1200 PLC, identifies relevant input and output devices, and prepares control logic for manual and automatic operation. The report presents process diagrams, controller-related material, and a supervisory interface. Simulation is used to show how the designed sequence responds to operator commands and process states. The methodology is an engineering design and software simulation; the source does not describe a field deployment or a controlled performance experiment on an industrial production line [1].

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III. Results

The source presents a simulated control system with manual and automatic operating modes and a visual monitoring interface. Its diagrams and screens show the intended sequence of the instant-coffee line and the status of controlled devices. In the conclusion, the author reports that the simulation was built according to the project requirements and that the designed sequence operated as intended. These are project-level observations about the model and simulation. The report does not give numerical throughput, product-quality, uptime, or reliability measurements from a factory. Accordingly, the summary does not attribute industrial production gains to the proposed control system [1].

IV. Discussion

The design illustrates how a programmable controller and a supervisory interface can represent an instant-coffee production process. Separating manual from automatic operation helps explain the control logic and operator interaction. The evidence in the manuscript is primarily a simulation and the accompanying design documents, so conclusions about real production performance would require a later installation and measured tests. The author explicitly acknowledges limitations arising from experience and knowledge. The useful outcome of this undergraduate project is a documented control model that could inform further development, rather than a verified improvement in an operating production plant [1].

V. Conclusion

The thesis provides a design and simulation for controlling and monitoring an instant-coffee production line with an S7-1200 PLC. It describes the production sequence, control logic, operating modes, and monitoring display. The source conclusion reports that the simulation met the stated project requirements. This English summary preserves that limited conclusion and does not present the simulation as a deployed factory system. No comparative production or reliability statistics are claimed. Further work would need to implement and evaluate the design in a physical setting before statements about industrial performance could be supported [1].

References

[1] Nguyễn Anh Đức, ”Control and Monitoring of an Instant-Coffee Production Line Using an S7-1200 PLC,” internal undergraduate thesis (original in Vietnamese), Thai Nguyen University of Information and Communication Technology, 2021.

[2] Trần Văn Hiếu, Thiết kế hệ thống HMI/SCADA với TIA Portal, NXB Khoa học và kỹ thuật, 2019
[3] Phạm Công Lưu, ”Design of a 5m3 Concrete Mixing Plant Control and Monitoring System Using S7-300 PLC,” internal undergraduate thesis, Thai Nguyen University of Information and Communication Technology, 2013.
[4] ICTU Student 69, ”Application of S7-200 PLC in Industrial Control Model,” internal undergraduate thesis, Thai Nguyen University of Information and Communication Technology, 2008.
[5] Nur Alif Mardiyah, Akhmad Hakam Sudrajat, Amrul Faruq, ”PLC Human Machine-Interfaces Based System for Vietnam Drip Coffee Maker Application,” Kinetik: Game Technology, Information System, Computer Network, Computing, Electronics, and Control, pp. 35-44, 2017. DOI: 10.22219/kinetik.v3i1.272.
[6] Sheng Yong Lei, ”Servo-Control System Design of Automatic Production Line Based on PLC and HMI,” Applied Mechanics and Materials, vol. 457-458, pp. 1381-1385, 2013. DOI: 10.4028/www.scientific.net/amm.457-458.1381.
[7] Tan Thanh Nguyen, ”CONTROLLING AND SUPERVISING THE MIXING SYSTEM USING PLC S7-1200 AND WEBSERVER,” Scientific Journal of Tra Vinh University, vol. 1, no. 1, pp. 104-108, 2019. DOI: 10.35382/18594816.1.1.2019.95.