Design of a Grid-to-Generator Automatic Transfer Switch Using a PLC

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***Abstract*—This undergraduate thesis focuses on the design and implementation of an Automatic Transfer Switch (ATS) system for generator sets using a Siemens S7-1200 PLC. The author describes the hardware design, control algorithms, and the implementation of the WinCC Advanced interface. The work contributes to the understanding of ATS and PLC principles, and provides practical experience in automation and control systems. The thesis details the design and implementation of an ATS system for generator sets, covering hardware design, control algorithms, and the WinCC Advanced interface for monitoring and control. The system can handle both manual and automatic control modes, and includes a monitoring and control interface using WinCC Advanced. The author suggests potential future developments, such as integrating the system with industrial communication protocols and utilizing the Web server feature of the S7-1200 PLC.**

***Index Terms*—ATS, PLC, S7-1200, WinCC, Control System, Generator Set**

I. Introduction

The thesis introduces the need for an ATS system to ensure continuous power supply to critical facilities such as hospitals and government buildings. It details the design and implementation of an ATS system using a Siemens S7-1200 PLC, covering hardware design, control algorithms, and the WinCC Advanced interface. The author explains the importance of ATS systems in maintaining uninterrupted power supply and the role of PLCs in implementing such systems. The work provides practical experience in designing and implementing an ATS system, which is essential for ensuring the reliability of power supply in critical infrastructure [1]. Published articles on the methods and subject of this project provide context for this English summary [9], [10].

II. Methods

The author designed and implemented the ATS system using a Siemens S7-1200 PLC. The system includes hardware design for manual and automatic control modes, control algorithms, and the implementation of the WinCC Advanced interface for monitoring and control. The hardware design involves the selection of appropriate components and the configuration of the PLC to handle both modes of operation. The control algorithms were developed to manage the switching between the main power source and the generator set. The WinCC Advanced interface was implemented to provide a user-friendly monitoring and control environment. The implementation process involved programming the PLC, configuring the interface, and testing the system under various conditions to ensure its reliability and functionality [1].

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III. Results

The thesis demonstrates the successful design and implementation of an ATS system for generator sets using a Siemens S7-1200 PLC. The system can handle both manual and automatic control modes and includes a monitoring and control interface using WinCC Advanced. The author describes the implementation of the control algorithms and the configuration of the WinCC Advanced interface. The system was tested under various conditions, including power outages and generator start-up scenarios, to ensure its reliability and functionality. The results show that the system operates as intended, providing a seamless transition between the main power source and the generator set [1].

IV. Discussion

The system design and implementation provide practical experience in ATS and PLC principles. The author suggests potential future developments, such as integrating the system with industrial communication protocols and utilizing the Web server feature of the S7-1200 PLC. The integration of these features would enhance the system's capabilities and provide additional monitoring and control options. The author also notes that the current implementation does not include any measured evaluation or test results, and further testing and validation would be necessary to fully assess the system's performance and reliability [1].

V. Conclusion

The thesis concludes that the designed ATS system for generator sets using a Siemens S7-1200 PLC meets the basic requirements and provides valuable experience in automation and control systems. The author acknowledges the limitations of the current implementation and suggests that further research and development could lead to more advanced and integrated systems. The work contributes to the understanding of ATS and PLC principles and provides a foundation for future advancements in power supply systems [1].

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