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Design and Implementation of PLC Based Traffic Signal Control System

Prof. P.S. Dhaygude[1], Sanika Santosh Nigade[2], Vaishnavi Kashinath Awchar[3], Shravani Ganesh More[4], Sakshi Laxman Bhosale[5]

[1,2,3,4,5]Department of E& TC Engineering, Navsahyadri Group of Institutions Savitribai Phule Pune University, Pune, Maharashtra, India

ABSTRACT

Traffic congestion in urban areas has become a major challenge due to increasing vehicle density. Traditional traffic light systems operate on fixed time intervals, which often lead to unnecessary delays. This paper presents the design and implementation of a PLC-based traffic signal control system. The system uses a Programmable Logic Controller (PLC) programmed with ladder logic to control traffic lights at a four-way intersection. Timers are used to manage red, yellow, and green signal durations. The system ensures reliability, flexibility, and easy modification. The proposed solution demonstrates the industrial application of PLC in traffic management systems.

1. INTRODUCTION

Traffic management plays a vital role in reducing congestion and accidents. Conventional systems use relay-based or microcontroller-based circuits. However, PLC systems are more reliable, programmable, and suitable for industrial environments. This project focuses on designing a PLC-controlled traffic signal system.

2. LITERATURE REVIEW

Previous traffic systems used:
Relay logic circuits
555 timer IC based circuits
Microcontroller-based systems (Arduino)

Limitations:

Complex wiring
Difficult maintenance
Less flexibility
PLC solves these problems.

3. System Architecture
Block Diagram:

(Optional: Sensors → Input Module → PLC)

4. Hardware Components
PLC (Siemens / Delta)
24V DC Power Supply
Red, Yellow, Green Lamps
Relay Module
Connecting Wires
Use:
TON (On-delay Timer)

Internal Memory Bits
Output Coils

5. RESULTS

The PLC successfully controls traffic signals in a predefined sequence. The timing accuracy is maintained, and the system runs continuously without failure.

6. Advantages

✔ High reliability
✔ Easy modification
✔ Industrial application
✔ Low maintenance

7. CONCLUSION

The PLC-based traffic control system is efficient and reliable compared to traditional relay-based systems. It reduces manual effort and improves traffic management efficiency.

8. FUTURE SCOPE

Add vehicle density sensors
IoT monitoring system
Emergency vehicle priority system
Solar powered system