Review Paper on Tunnel Automation using PLC

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Abstract - Fire is one of the main causes of trouble in long tunnels and its effects are often severe also because of the produced smoke and toxic gases. Although great care has been posed to develop reliable fire extinguishing systems and safe paths for people escaping form fire, prevention is still considered one of the most effective ways to face the problem. The system is equipped with sensing devices all around the vehicle. An issue of concern is the safety of these tunnels especially during the incidences of fire or suffocation. Such incidences need to be detected and controlled in a timely manner. An intelligent system to control the operation of tunnels and subways is the ideal way for mitigating most tunnels problems such as faster response time in case of fire incidents within the tunnel or controlling the high power consumption for the ventilation fans inside the tunnels.

I. INTRODUCTION

The increasing demands of the modern transport systems have created the need to have more efficient transport infrastructure. Subways, traffic or pedestrian tunnels have increasingly become a common sight in the major cities around the world. It is of paramount importance because it helps to meet the varying demands of transport needs. Many commuters frequently use the subways and tunnel stations on a daily basis, and thus, safety is an issue of concern. It is noteworthy to acknowledge the existence of numerous hazards that affect the safety of commuters in these tunnels. Fire and suffocation are two of the most frequent and perhaps. The growing need for people and goods transportation leads to constant increase of road and railway traffic both within the countries and among them. This fact, in turn, has pulled towards a careful revision of safety systems. Fire incidents and suffocation in underground tunnels constitute a significant portion of casualties and destruction of property. The principal hazards associated with subway fires include excessive smoke, high temperatures, and depleted oxygen levels. If the cases of fire incidents or suffocation factors are recorded early enough, then the majority of the resulting casualties can be avoided. To this end, we propose an appropriate solution for the implementation of an intelligent ventilation system of detecting smoke within the underground tunnel. The intelligent control system is to be equipped with a monitoring and control mechanism that detects the oxygen concentration and the temperature levels within the tunnel area. description of an intelligent system to control the operation of tunnels and subways with the aim of controlling fire and suffocation accidents.

II.WORKING PRINCIPLE

In this project we are working with PLC. PLC programming is used for the automation purpose in tunnel. PLC is supplied with switching mode power supply.

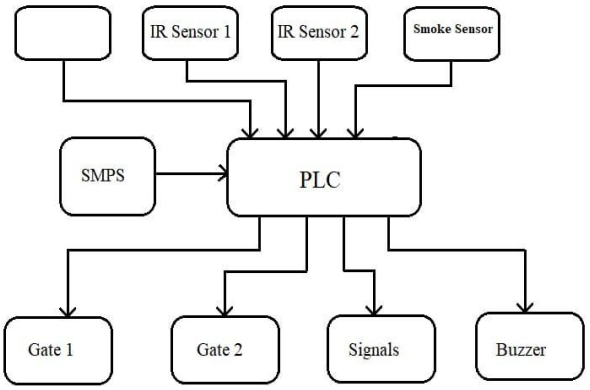

Fig. 1 Block diag. For implementing tunnel automation.

Then two gates are placed at the starting and ending of the tunnel, when the train comes from track then distance and motion will sensed by the IR sensors and the gate will be opened automatically and when the train passed through tunnel gate will close automatically.

Smoke sensors are programmed with PLC in this process for sensing the smoke in case of fire. When the smoke is sensed then the buzzer will sound and send command to the nearest control room.

Signal are provided to avoid accidents of two trains which are crossing to each other on the same track. When signals are given one of the train will stop and another train can pass from track. In this way the whole system of automation will work.

III. HARDWARE

1. PLC Schneider SR2B201FU
2. SMPS
3. IR Sensor
4. A Cubic, Power Relay
5. Transformer (0-12v/1a)
6. Buzzer
7. LED
8. L7800 Series
9. L7812 Series
10. DC Motor

IV. SOFTWARE

1. Compiler: PLC program
2. Programming languages: Ladder language

i. In this ladder diagram logic Normally Open and Normally Close (NO) and (NC) are used for input to various functions.

ii. Firstly, memory bit is provided along with NO's and NC's combination.

iii. NO logic operation is given for signal which operates the gates.

iv. 1 NO and 1NC used together gives the output function of gate opening along with some time delay.

v. Now second memory bit is introduced in the logic using NO and NC inputs.

vi. Again NO and NC connected together for gate close operation along with time delay.

vii. Single NO is used in ladder logic for Buzzer and Exhaust fan operation.

V. ADVANTAGES

There are various major advantages when tunnel automation is provided:-

- It will save human lives.
- It will minimise damages of railway.
- Due to this system accidents of another train will be avoided.
- When gate is closed animals and thieves cannot enter the tunnel which will reduce accidents of animals and theft will also be avoided.
- It will reduce the railway accidents.
- It is easy in operation due to use of PLC

VI. CONCLUSIONS

After implementing this automation technique in tunnel, accidents will be reduced in tunnel which were occur due to various reasons. In case of fire hazards smoke will be detected by using smoke sensors and buzzer will sound hence affected person will get help early and human lives will be saved. Also due to gate application lives of animals will be saved and train accidents will be avoided hence it will again save human lives.

Accidents due to train crossing on same track will be avoided by use of signaling.

In this way this system is useful railway tunnel automation in respect to the safety.

VII. REFERENCES

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