RAILWAY TUNNEL AUTOMATION USING PLC

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ABSTRACT

There are certain control systems that cannot be disabled or shut down, even momentarily, because of the threat to people lives. In these applications, a redundant control system must be in place to take over instantaneously if the primary system fails. This paper aims to replace the manual work in railway protection system by automatically controlling and monitoring the train movements using PLC& SCADA.

In our project controlling of various parameter are done. Like signals for incoming train, alert signal to human beings and animal, fire safety for train inside the tunnel, also it save the electricity because of automatic controlling of light inside the tunnel.

Nowadays even though automation plays a vital role in almost all areas but still railway system is not completely automated. Currently the railway network protection parameters like gate control, identifying track cracks, track collision, track changing and traffic light (indication) are controlled individually by their respective process either manually or semi-automatically, Even then the simultaneous control of all parameters does not exists to ensure safety operation. And at the same time the entire control is given only from control room using embedded technology which is tedious in monitoring and providing the required control under critical situations. To overcome those problems the proposed idea provides both monitoring and control of all the above said parameters with the provision of issuing automatic control in the locomotive itself using PLC. Programmable Logic Controller (Keyence) senses the input from its respective sensors and according to the ladder program it issues the necessary control automatically.

Keyword: *PLC[1] SCADA[2], IR Sensor[3]*

1. Introduction

The main objectives of our project is that to provide safety for railways and also alert signals to animals as well as human beings whose present on the railway track in tunnel.

In Indian Railways has the world's fourth largest railway network in the world. Railway safety is a crucial aspect of rail operation. Railways being the cheapest mode of transportation are preferred overall the other means. To avoid such accidents the project proposed will analyze few vulnerable areas of accidents and help to find out the possible way to reduce the number of accidents. The accidents occurring are mainly due to the carelessness in manual operations or lack of workers. It will describing few major features namely anti-collision, automatic gate control, accident detection and tunnel power saving. Anti-collision will avoid the collision between two trains or train hitting a heavy mechanical object. Automatic gate control will help the accidents reduce occurring at railway crossing. The feature accident detection will enable the immediate help needed after the accidents taking place without human interference. Tunnel power saving will help efficient use of power in tunnel.

A smoke detector is a device that senses smoke, typically as an indicator of fire. Commercial security devices issue a signal to a fire alarm control panel as part of a fire alarm system, while household smoke detectors, also known as smoke alarms. Sensitive alarms can be used to detect, and thus deter, smoking in areas where it is

banned. Smoke detectors in large commercial, industrial, and residential buildings are usually powered by a central fire alarm system, which is powered by the building power with a battery backup. Domestic smoke detectors range from individual battery-powered units, to several interlinked mains-powered units with battery backup; if any unit detects smoke, all trigger even in the absence of electricity.

       In this project we are trying to make tunnel system more safe and secure by using Automation. Here we are designing a system in which automatically signals will indicate that some train is inside the tunnel or not so that another train will not enter in the tunnel. When the train will enter in tunnel all the lights will get on automatically and a buzzer will on before the train enters in the tunnel so that if any person or animal is present in the tunnel they will be alert about the train.

       If in any case fire catches in the tunnel than some buzzers outside of tunnel will get on and exhaust fans will get on to exhaust smoke out from tunnel and buzzers will indicate danger in tunnel so that persons outside of tunnel will come to help them.

1.2 Necessity-

- To aware the people and animal from train in the tunnel.
- To prevent the accidents due to anti-collision.
- To provide signals in case of accidents.

1.3 Objective-

- To make railway tunnel more safe and secure by using automation.
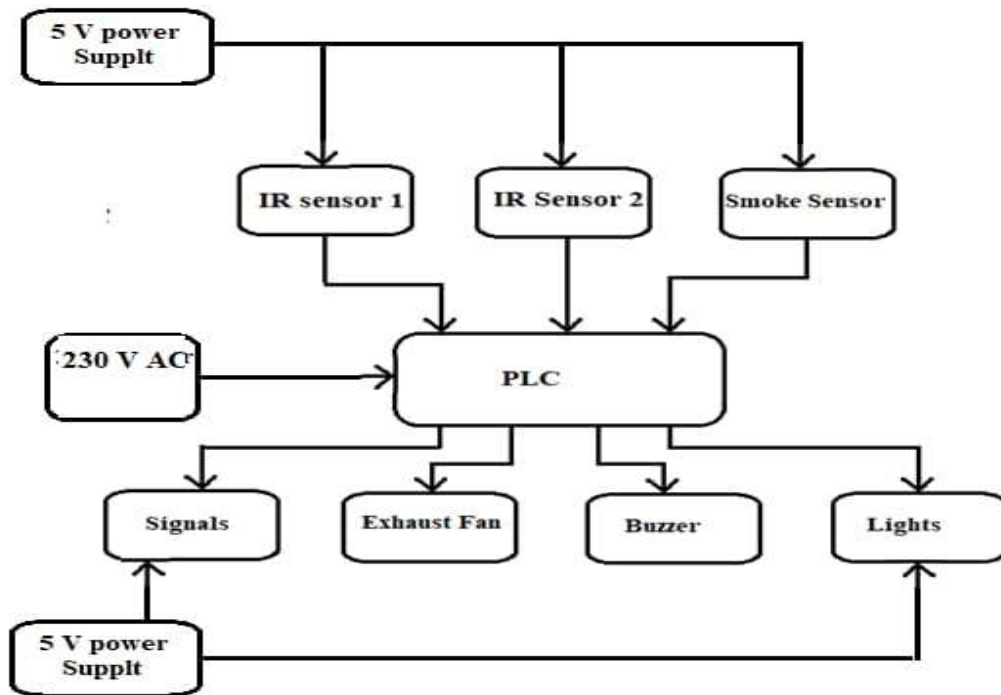
2. Block Diagram-

Fig 1:- block diagram of railway tunnel automation by using PLC.

2.2 Experiment Setup-

2.3 Component required-

- PLC
- Rectifier Unit
- IR Sensor
- Smoke Sensor
- Buzzer
- Relay
- LED
- Exhaust Fan
- Transformer
- Voltage regulator

3. Working-

In this project we are trying to make tunnel system more safe and secure by using Automation. Here we are designing a system in which automatically signals will indicate that some train is inside the tunnel or not so that another train will not enter in the tunnel. When the train will enter in tunnel all the lights will get on automatically and a buzzer will on before the train enters in the tunnel so that if any person or animal is present in the tunnel they will be alert about the train. If in any case fire catches in the tunnel than some buzzers outside of tunnel will get on and exhaust fans will get on to exhaust smoke out from tunnel and buzzers will indicate danger in tunnel so that persons outside of tunnel will come to help them. In our project controlling of various parameter are done. In The railway tunnel automation we are used the PLC Schneider zelio logic SR2B121FU. This PLC is brain of our project. SR2B121FU having 8 input and 4 output port. The PLC is operated on 100-230 Volt AC supply. The various parameter are controlled with the help of PLC.

These project is divided into two types A) Input side B) Output side

At the input side different types of sensor like IR1, IR2 and smoke sensor are used. And which is operated on 5V DC power supply. These 5V DC power supply can obtained from bridge rectifier unit. The function of IR1, IR2 sensor is to sense the motion of train. IR1 sensor is used to sense the motion of incoming train and which is place at incoming side of tunnel. These signal is again provide to PLC after that the inside light of the tunnel is get automatically ON. And also signal is red by PLC with the help of relay. Before entering the train inside the tunnel the buzzer will ON for 3 sec. for alert to human being and animal present on the track. When the train is going outside of the tunnel, the IR2 sense the train motion and which is place at outgoing side of the railway tunnel. These IR2 sensor send the signal to PLC and operate the light inside the tunnel and signal i.e. light gets OFF and signal glows green. Due to this IR1, IR2 sensor when any abnormal condition occurs in the tunnel or train fails in the tunnel another train will not entered in the same tunnel because of signal shows RED alert. In case of fire catches inside the tunnel due to the short circuit or colliding the train in the tunnel at this condition smoke sensor sense the fire or smoke and which is sends the signal to PLC and PLC operates the buzzer and exhaust fan with the help of relay. This buzzer provide the signal to outside of tunnel and exhaust fan removed the smoke and Gas present in the tunnel.

4. Conclusions-

The system is able to perform all the operations without involvement of any human. This system is able to detect trains coming on same track and avoids collision also system is able to save power in tunnels. In this project we are trying to make tunnel system more safe and secure by using Automation. If in any case fire catches in the tunnel than some buzzers outside of tunnel will get on and exhaust fans will get on to exhaust smoke out from tunnel and buzzers will indicate danger in tunnel so that persons outside of tunnel will come to help them.

5. Future Scope-

This system can be interfaced with the SCADA of stations so that all the information about the status of tunnel will be given to the station. Also we can interface it with the walky Talky of the employees of the system present there so that they will alert about any accident occur there.

6. Advantages-

- Reduce the risk of accident and system will be more secure
- No chance of collapse in the tunnel also reduce suffocation in the tunnel due to exhaust fan.
- Precaution from fire hazards.
- High accuracy monitoring.

7. Application-

- It is used in railway tunnel and also use in vehicle tunnel.

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