



AUTOMATIC FIRE SENSING AND CONTROLLING INFORMATION SYSTEM IN A TRAIN USING PLC AND SCADA NETWORKS.

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ABSTRACT

The demand for railway service, have consistently increasing in the, control and infrastructure are needed. Same as railway vice, in recent years, wireless technology have also advanced rapidly. Especially in this paper we are implementing a PLC, sensor with network based information and rescuing system in a train to alert the authorities about the fire accident occurred. PLC and sensor network both are effective low cost monitoring system will also help the railway industry for both controlling and communication purpose. Finally presenting a low power embedded system to overcome the fire accidents occurring in railway industry. In this paper a discussion of proposed safety system for railway, using PLC as hardware platform, and combine with SCADA and wireless sensor network as a communication platform of wireless area network. Which can transmit, receive and display warnings and emergency signals and for sensing the temperature in trains

Keywords-PLC, SCADA, Network, Temperature sensor.

I. INTRODUCTION

In present day's railways are very common and well known for transportation. We also know many accident are frequently caused in railways. Serious train accident are caused by a variety of mechanical and/or human factors. The so-called "human error" [6] is the result of any factors. Drivers and the running staff work irregular hours and suffer from a safety risks due to disturbed sleep patterns. Studies have shown that some drivers are less alert and are most likely to commit errors between midnights and dawn. Another problem frequently caused in trains is fire accident. Fire on a running train is more catastrophic than on a stationary one, since fanning by winds help spread the fire to other coaches. Moreover, passenger's sometime jump out of a running train on fire resulting in increased casualties. In case of fire in running train, every railway staff available on the train or at the site shall immediately try and stop the train and plunge into action to save lives and property. All railway staff and passengers should take all possible precaution to avoid any of the above mistakes so

that possibility of fire breaking out can be minimized. In general fire originates in a small level. When it is surrounded by burning materials with adequate supply of air, fire spreads. Some of the main sources for occurrence of fire accidents in train. Carrying stoves, gas cylinders, kerosene oil, petrol, fireworks etc. In passenger compartments. 2. Making fire/using fire near paper, wood, petrol or such other inflammable articles. 3. Lighted match sticks, cigarette ends carelessly thrown. 4. Short circuit in electrical wirings. 5. Using naked light during authority to knock delivery to the driver, shunting of inflammable loads, sealing of inflammable wagons. The goal is to design and implement a cost effective and intelligent full-fledged PLC kit and wireless based system to successfully prevent the fire accidents occurred in a train and also inform the authorities about the incident immediately. The proposed system consists of self-acting PLC, SCADA and network based data communication system which works round the clock to avoid fire accidents in train. This system can be placed

without replacing any existing system. The proposed system gets data from the moving trains, control centers/stations, Signaling Posts. The efficiency of the system is expected to be considerably increased as the proposed system takes inputs from the signal posts and also from the train. As no change is necessary to be made to the infrastructure of the existing system, the cost of implementation of this system is also less. The system has been designed and simulated using PLC. Models of train system have also been made and tested. The rest of the paper deals with above given details only. Section 2 deals with the overview of the proposed system dealing the schematic diagram and detailed explanations for various blocks. Section 3 details the block diagram and PLC simulation details followed [3] with experimental setup of entire prototype, conclusion and reference.



Fig a) Fire accident occurred in a Train

2. OVERVIEW OF THE PROPOSED SYSTEM

The project aims in designing a system which alerts the railway authorities and prevents the passengers from any kind of fire accidents that occur in the train and this system also provides an immediate effect which controls fire using a controlling system. The project mainly helps to avoid accidents which usually occur when a sensor senses the temperature and it activates the PLC. This system has three main sections:

A) Sensing B) Messaging C) Controlling

The train system does not have any kind of protection system. In this project the automatic control system is implemented. The module in the train has a temperature sensor which continuously monitors the temperature. The temperature is read by the sensor. This sensor data is processed and sent the signal to the PLC controller. Then the PLC activates the water spray system. A clock circuit is provided about 3 min if there

any temperature then PLC activates CO₂ extinguisher and send message to guard and the engine driver. Then again sense the temperature it activates the GSM, GPS and hook removing system.

A) Sensing

In a train the fire is occurred due to many criteria the fire is occurred the sensor senses the fire level and send signal to the PLC kit. Here CCTV is provided for continuous monitoring, it is fitted in all compartments.

B) Messaging

Temperature sensed by the sensor at the second the PLC kit sends the message to the control center using the GSM technology. Control center having the SCADA monitoring it would be connected to the networks.

C) Controlling

Temperature sensed at the next second the PLC activates the water spray system and activates the message to the electrical circuit breaker system. After 3 min the temperature exits the CO₂ extinguishing system activates and send the message to the guard and engine driver. After 5 min the temperature exits the PLC activates the GSM, GPS AND HOOK removing system. GPS is used to know the position, GSM is used for the messaging system and the hook removing system is used to separate.

3. HOOK REMOVING SYSTEM

The command is come from the PLC kit the hydraulic system is on then the compartment will separate on both sides.

4. BLOCK DIAGRAM

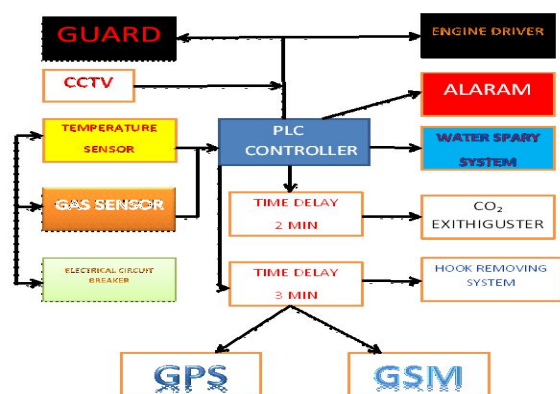


Fig b) Ordinary Hook System



Fig c) Normal Condition

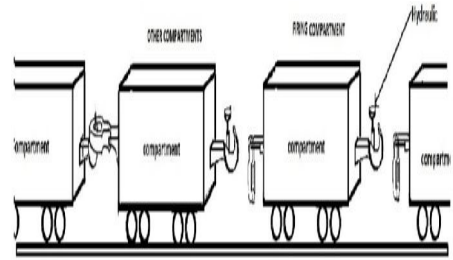


Fig F) fire suppression modal

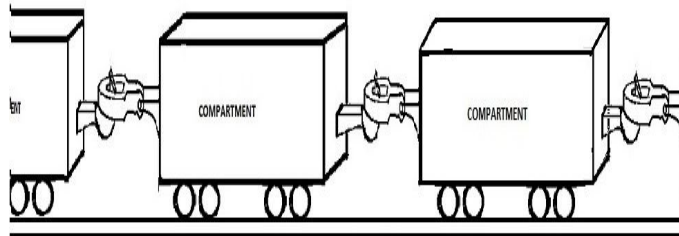


Fig d) During operation

5 .RESULTSANDANALYSIS

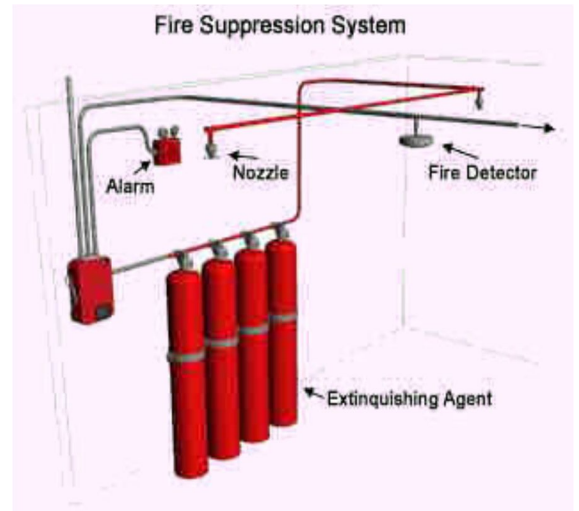


Fig G) PLC Program

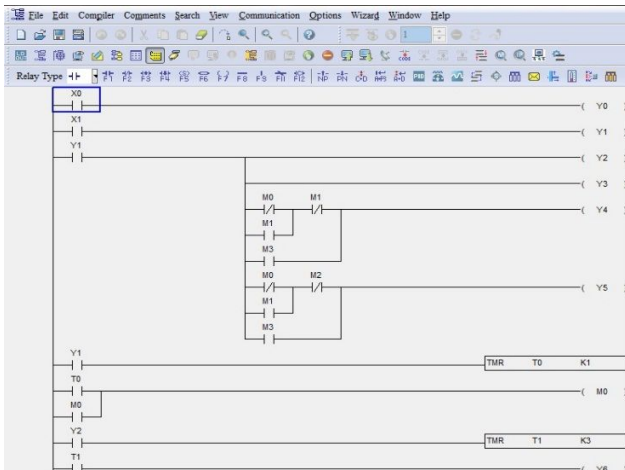


Fig E) Afteroperation

Simulation of the proposed scheme has been carried-out in PLC. The program for the various systems have been simulated and all the necessary conditions verified. Program for various systems have been shown in fig G. various systems are shown in fig a,c, d, e, and f. And the snapshot of the PLC simulation result is shown in Fig.

6. CONCLUSION

In this project an implementation of automatic fire control system for trains have been designed, simulated and tested. This simulation has been done using (WPL) PLC and testing has been carried out using the developed (WPL). It has been estimated that if the system is implemented in railways we can reduce the fire accidents with the help of PLC ,SCADA and networks .Hence it is expected that, major train mishaps can be prevented and human life saved if this system is implemented.

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