Fire Suppression and Alerting System in Railways

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Abstract: - In earlier systems during summer and high-temperature seasons faulty detection of temperature sensors will occur due to high heat, meanwhile, gas/smoke sensor that had been used also considers the external environment smoke in the air as compartment. These wrong signals from the sensors to the controller will cause unwanted enabling of the buzzer, wrong information to the locomotive pilot, unwanted chaos, and delay of trains. This involves confusion to the total railway system. The proposed method provides faster communication using Zigbee and enables the rescuing methodology while fire accidents on the train by utilizing gas/smoke sensors integrated with LM35 along with automated fire suppression systems. In this method there are many suction ducts will be present at each partition of the train compartment along with CO_2 fire extinguisher for fire suppression. If the temperature is greater than 80ºC and the output value of the gas and the smoke sensor senses the smoke, then the Arduino gives the command to enable buzzer, alerting signal to Zigbee network, fire extinguisher. The automatic braking system is enabled which will be utilized to split the fired compartment from the unaffected compartments, else there is no action will be taken.

*Keywords -* Zigbee, Gas/Smoke sensor, railways, arduino, LM35.

I. INTRODUCTION

Railway is lifeline of India and it is being the cheapest mode of transportation is preferred over all other means of transportation. Railway related accidents are more dangerous than other transportation accidents in terms of severity and death rate etc. This paper is aimed at helping the railway administrations concerned to strengthen their safety culture and develop the monitoring tools required by modern safety management. When comparing year by year the fire accidental deaths increased up to 7.7%. A Railway upgrade project has to be developed to increase the number of trains in the city by reducing the fire accidents in trains and providing safety to the passengers. Our project provides solution to fire accidents and ensures safety, reduces the death rate and losses to the government and the public. This project deals about one of the efficient methods to avoid train Fire accidents. The system has been implemented and demonstrated by using Smoke sensor and ZigBee with the help of arduino.

II. PROPOSED FRAMEWORK

The proposed method provides faster communication through ZigBee for alerting the people, by using gas and smoke sensor integrated with LM35 (temperature sensor) which is shown in Fig.1.In this method many suction ducts at each partition of the train compartment will sucks the gas continuously for knowing the present status, and also the system

equipped with CO_2 fire extinguisher for fire suppression. The proposed system continuously monitor the preset value and current value. If the temperature is greater than 80ºC and the output value from the gas and smoke sensor is true then the arduino give control signal to enable the buzzer, ZigBee network and fire extinguisher, then the fired compartment is separated from others by applying electronic braking system, else there is no action will be taken. The proposed system block consists of smoke and gas sensor that are embedded at the sides of the compartment at each seating arrangement is connected with the suction pump kept at one end of the compartment along with the ducts, which detects the presence of smoke with the help of suction pressure given by the pump in the end of the system. Meanwhile the temperature sensor(LM35) which detects the temperature of the compartment.
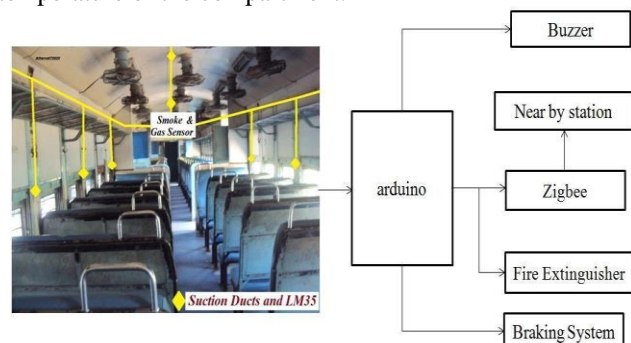
Fig.1 Block diagram of proposed system

When the smoke sensors value exceeds the preset value and the temperature sensor detects the temperature above 80ºC arduino enables the buzzer, gives information to the nearby station using Zigbee. Fire extinguisher also gets enabled for minimizing the spread of fire.

III. TEMPERATURE SENSOR

Table 1. Pin Details of LM35

The proposed system block consists of smoke and gas sensor that are embedded at the sides of the compartment at each seating arrangement is connected with the suction pump kept at one end of the compartment along with the ducts, which detects the presence of smoke with the help of suction pressure given by the pump in the end of the system. Meanwhile the temperature sensor (LM35) which detects the temperature of the compartment.

Pin No	Function	Name
1	Supply voltage 5V (+35V to -2V)	Vcc
2	Output voltage (+6V to -1V)	Output
3	Ground (0V)	Ground

IV. SMOKE AND GAS SENSOR

MQ-2 gas sensor has high sensitivity to LPG, Propane and Hydrogen, also could be used to Methane and other combustible steam, it is with low cost and suitable for different application. The sensor needs minimum input of 2 voltage, heater voltage （VH） and test voltage (VC). When the smoke sensors value exceeds the preset value and the temperature sensor detects the temperature above 80ºC arduino enables the buzzer, gives information to the nearby station using Zigbee. Fire extinguisher also gets enabled for minimizing the spread of fire.
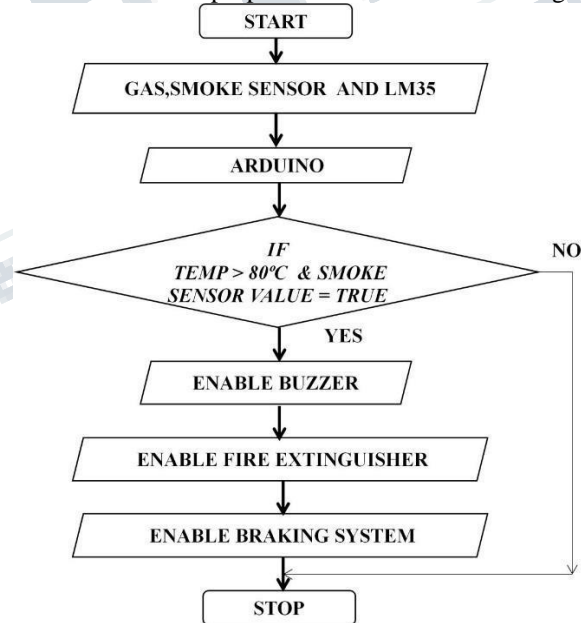
V. FLOW CHART

Suction duct is used to get the gas continuously from the compartment to the smoke and gas sensor through pump. If the sucked gas contains CO_2 and CO then the sensor signal is given to arduino meanwhile LM35 detects the temperature level.

Table.2: Specification of smoke and gas sensor used

Term	Parameter	Min	Typical	Max	Unit
V_{CC}	Working Voltage	4.9	5	5.1	V
P_H	Heating consumption	0.5	-	800	Mw
R_L	Load resistance	Adjustable			
R_H	Heater resistance	-	33	-	Ω
R_S	Sensing Resistance	3	-	30	kΩ

If the temperature is greater than preset value (i.e. greater than 80ºC) and the sensor value is true then the arduino enables the buzzer, fire extinguisher and then the information passed to the loco pilot through ZigBee module. The flow chart of the proposed method is shown in Fig.2.

Fig.2 Flow chart of proposed system

VI. RESULT

This system consists (shown in Fig.3) of smoke and gas sensor that are embedded at the sides of the compartment at each seating arrangement is connected with the pump kept at one end of the compartment along with the suction duct detects the presence of smoke with the help of suction

pressure given by the pump in the end of the system. At the same time the temperature sensor (LM35) which detects the temperature of the compartment. When the smoke sensors value exists the preset value and the temperature sensor detects the temperature above 80 ºC arduino enables the buzzer, gives information to the nearby station using Zigbee. Fire extinguisher also gets enabled for minimizing the spread of fire.

Fig.3 Hardware Interfacing with arduino

VII. CONCLUSION

This system will be very much useful for reducing the accident by detecting fire at initial stage itself, alerting the passengers, passing the message to the loco pilot, immediate actions to avoid spreading of fire. Hence the system is much secured. Fire is a good servant and it's a bad slave, so we should handle carefully and safely. Fire on a running train is more catastrophic, than a stationary one. Since fanning by wind helps spread the fire to other coaches. More over passenger sometime jump out of a running train on fire resulting is increased casualties thus by implementing the above concept we provide a complete solution for fire accident and to those who travel in train and it would be a revolution in railways.

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