Conventional Fire Alarm System

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Abstract— Safety is the main aspect of human life. There are hazardous effects of fire in human life. The Fire Alarm system (FAS) is implemented in building to reduce hazardous causes of fire. This System continuously monitors the space covered by zones. If fire occurs, it gets detected automatically at incipient stage and gives notification. The early detection helps to prevent the spread and increases human safety.

Index Terms— Fire alarm control panel, Detectors, Response indicator,Electronic hooter ,Manual callstation,False isolation module and fire alarm system working.

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1 INTRODUCTION

There are two types of FAS -Addressable and conventional. Addressable or intelligent fire alarm systems are mostly installed at complex building structure. Conventional fire alarm system is often the natural choice for smaller or budget constraints application.

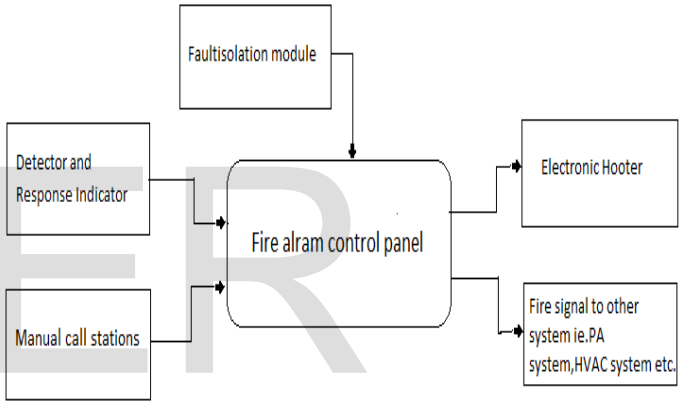
In this work commercial office of one floor having different cabins, rooms and employment working area which is get protected by conventional FAS. Conventional FAS are of two type two wires and four wires .In this work two wire fire alarm system is installed cost-effective and simple. The proposed conventional fire alarm system consists of eight zones. A zone is an area consisting of group devices. Each zone consists of 16 or 17 detectors along with manual call point, response indicator and notification devices. Here electronic hooters are used as notification devices. All zones are connected to the control panel through which whole system gets monitored and controlled.

This fire detection system is linked with public announcement, HVAC system .As the fire gets detected these other building management system gets stopped. It helps to reduce spread of fire.

2 DESIGN OF SYSTEM

2.1 Control Panel

The control panel is heart of the FAS. The main function of monitoring and analyzing the status of each device connected in zone is done by Fire Alarm Control Panel (FACP).To fulfill the requirements of work that are monitoring the eight zone, simple to install, user friendly, simple and reliable solution to the demands of today's fire detection solution. Horizon range FACP design by Morley-IAS is most suitable. It is specially designed for small to medium commercial environments having two, four or eight zones. The front panel of Horizon range consists of different indicators, easy to operate functions and big red key to activate control buttons.



2.2 Detector (Initiating devices)

Detectors are used as input devices in FAS. Smoke and heat type detectors are used in this system.

1. *Photoelectric type smoke detectors*

Photoelectric type smoke detector shall be low voltage, two wire, solid-state devices that provide for integral communication with the control panel regarding individual address, sensor type and analogue signals. The status of the detector will be checked by main control panel e.g. alarm, pre alarm, fault etc..To cover total area of floor 142 system sensor smoke detectors are placed in this system.

2. *Heat Detector*

Heat Detector's are analog addressable, rate of rise type and designed to operate when the ambient temperature rises beyond a fixed temperature or if the rate of rise is faster than the pre-determined rate and allowing the increase/ rise for a specified period. There is one server room on the floor to protect that area from fire one heat detector of system sensor is placed.

2.3 *Response indicators* (Initiating devices)

Response indicators shall be Visual indicating type and shall start flashing when the detector in that particular' area/zone has been activated due to smoke or fire. In this work response indicators are connected with individual detectors which installed at places where they are not easily visible e.g. above false ceiling or below false flooring. Total 35 response indicators are placed on the floor.

2.4 *ELECTRONIC HOOTER (Indication devices)*

Electronic hooters will be used for audio alarm to alert people in case of fire and shall be fully solid state with audio output sufficient to be heard at a distance not less than 50m. The hooters shall have facility for adjustment of volume as per requirement at site. The electronic hooter have rugged construction, weatherproof protection and suitable for outdoor mounting.

3 *MANUAL CALL STATIONS*

Manual call stations will be wall structure mounting break-the-glass/pull-down cover type and located near the exit doors, staircases or lift so that in case of fire being seen by the personnel in the area. They can actuate the alarm. Manual call points for outdoor mounting shall have IP-65 enclosure protection and in explosion hazardous areas shall have explosion proof protection. The explosion proofers shall be certified by either CMRI.

4 *FAULT ISOLATION MODULE*

Fault Isolation Module shall be used in the detector and device loops to detect a wire-to-wire short and electrically isolate that condition from the circuit so that communication is maintained with unaffected devices on the same circuit. Fault Isolation Modules will be provided at an interval of 12 detectors in a loop for isolating the faulty detectors.

5 WORKING OF SYSTEM:

1. *Detection line operation*

Conventional detection systems normally operate on a 24VDC line. In the standby condition, the detectors will draw a low current, typically less than 100µA. When the detector senses a fire, it will switch into the alarm condition with its LED illuminated, and will collapse the line voltage by drawing a larger current dependant on the detectors and control panel, but typically 50-80mA. The control panel can sense this, and activate the appropriate alarms. The detector will remain latched in the alarm state with its LEDs illuminated, even if the smoke or heat is removed until it has been reset from the panel by momentarily removing power from the line.

In this work it is necessary to use a base fitted with a resistor in series with the detector to limit the current draw in alarm. Resistors fitted into the detector base are also used in some cases to distinguish between a short circuit fault and an alarm. The value of the base resistor is dependent on the control panel however a typical value is 470 Ohms. A manual call-point consists of a simple switch with a resistor in series with it, usually 470 Ohms or 680 Ohms. Call point is activated, the resistor is connected across the line and a current of 50-80mA sourced by dependants on the fire alarm control panel is drawn.

2. *Detection line fault monitoring*

This system continuously monitors the zone for short circuit, open circuit and detector removal. When a short circuit occurs on a zone, a high current will be drawn, and the line voltage will be zero volts. The panel detects the low voltage/high current. The device is connected across the end of the zone which detects an open circuit or detector removed by continues monitored. This device can take various forms dependant on the control panel

The simplest end of line device is a resistor, which will draw a current distinct from the quiescent and
alarm currents drawn by the detectors. Installation of detectors into their bases closes a contact in the base supplying the remainder of the zone. Thus if the line is broken, or if a detector head is removed, the current drawn by the zone will fall and a fault will be signaled. Whilst the detector is mounted in the base, the base contact connects directly across the diode, and links it out. There is usually provision for manually linking the diode out to permit continuity testing during commissioning. When the detector head is removed, the diode is connected across the contact, allowing power to continue to be supplied to the remainder of the zone, whilst still permitting the removed detector to be monitored. This is achieved in a number of ways. An active end of line device uses a switched resistor at the end of line and can thus be used with a standard control panel. It sends a periodic signal back along the detection line, which is normally quenched by the control panel. When a head is removed, the base diode is switched into the line, and pulse can be seen. The Active end of line then switches the resistor out of the line, and a fault is signal led.

CONCLUSION

This system will detect fire in early stage. It reduces hazardous effect of fire and increase human safety.

REFERENCES

[1] Indian Standard selection, installation and maintenance of automatic fire detection and alarm system-code of practice (Fourth revision)
[2] Honeywell "Fire Detection System Guide"
[3] Data sheet of Horizon 2,4 & 8 series conventional Fire Alarm Control Panels