

INTEGRATED FIRE ALERT SYSTEM USING H₂O and CO₂

¹Lakhan Meghani, ²Pranav Bairagi, ³Akash Vishwakarma

Pune, India

Abstract: The said paper is using the concepts of hydraulics-Pneumatics and internet of things systems to alert user regarding any kind of smoke or any kind of fire. The said system is equipped with gas accumulator, direction control valve, sprinklers, gas containers, pump, water reservoir, smoke detectors connected all together electronically with the help of microcontroller. The said system, send or receive any kind of message with the help of GSM module to user as a mobile notification. The overloading protection system is been installed to avoid any kind of short circuit. System consist of carbon dioxide and water as a fire extinguishing element switching between these two parameters depends on locking system of the main gate. The aim of this paper is to alert the user and partially control the fire.

Index Terms: Hydraulics Pneumatics, Fire Alert Systems, Carbon dioxide, Water, Microcontroller, Arduino.

I. INTRODUCTION

In the past decades, we have seen fire disasters in shop, homes, industries etc which leads to danger for life and economy. The existing technology uses water as a fire extinguishing source. Let us consider a scenario, there is a shop of clothes: whenever there is a fire disaster inside a shop, they started spraying water on to the fires which results in the damage of clothes. To avoid such condition, we are developing the integrated fire alert system. There is a condition where, during night time, there is no one in the shop and at that time, fire disaster occurs and again they use the water as a primary source of extinguishing. So which also leads the damage of health and wealth. To avoid this, we are developing such a kind of technology where, we are using water as a primary but Carbon dioxide as secondary source. In this way, we will use water in day time as extinguishing source and carbon dioxide in midnights as a extinguishing source. To avoid loss of life, we are avoiding CO₂ in day time to save the human life but generally there is no one inside the shop during night time, we are using CO₂. Though at some cases if someone stays inside the shop, until and unless he/she lock the main door of shop from outside, the switching between CO₂ and HO wont happens. So if there is any fire inside the shop, the system send a message to user as a alert notification in order to take necessary action. In this way, the system works and fire is either prevented the necessary action is taken.

II. FLOWCHART

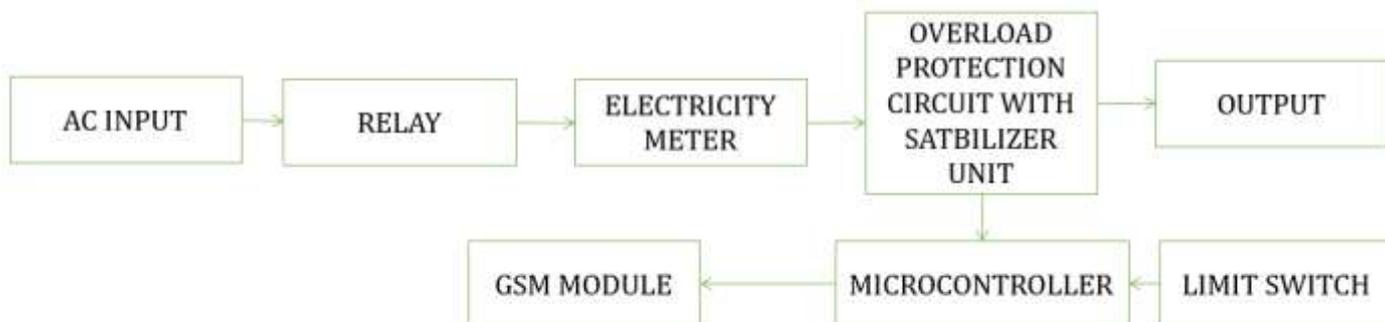


Figure 1: Electronics Systems

III. METHODOLOGY

The AC supply is initially connected with power relay module then to the electricity meter. After the electricity meter, there is an electricity overload protection system which is also known as voltage stabilizer unit whose output the supplied to appliances in the shop. Whenever there is an overloading inside the system, it send an signal to the microcontroller. This microcontroller is connected with GSM module which sends a message to the user that “the system is overloaded at section 1. “Please take necessary action” in this way, section 1 works. At section 2, as an advancement, the system takes and self-decision to cut off the AC supply with the help of relay which is next to AC supply in section 1. In section 2, the limit switch is placed at the main gate, so as soon as the user closes the door externally, the system gets to know the same and hence a notification is also been sent to the user that “The door is been closed and system is switched from water to CO₂.” The whole system is self-power with the help of batteries to avoid any kind of power issue.

As a preventive measure and to detect any kind of smoke, the smoke sensors are installed inside the shop at specific points. This smoke sensor detects the smoke and send a pulse signal to a microcontroller. The controller is connected with multi-channel relays. This relays are connected with different DCVs. One DCV is for water based system and another is for CO₂ system. During the day time and the user is inside the shop or during night time and user is inside the shop, in this scenario, the controller sent an signal to operate the DCV 1 (water DCV). During day and night time, when user is not inside shop and the door closed externally, then DCV 2 (CO₂ DCV) is activated through controller.

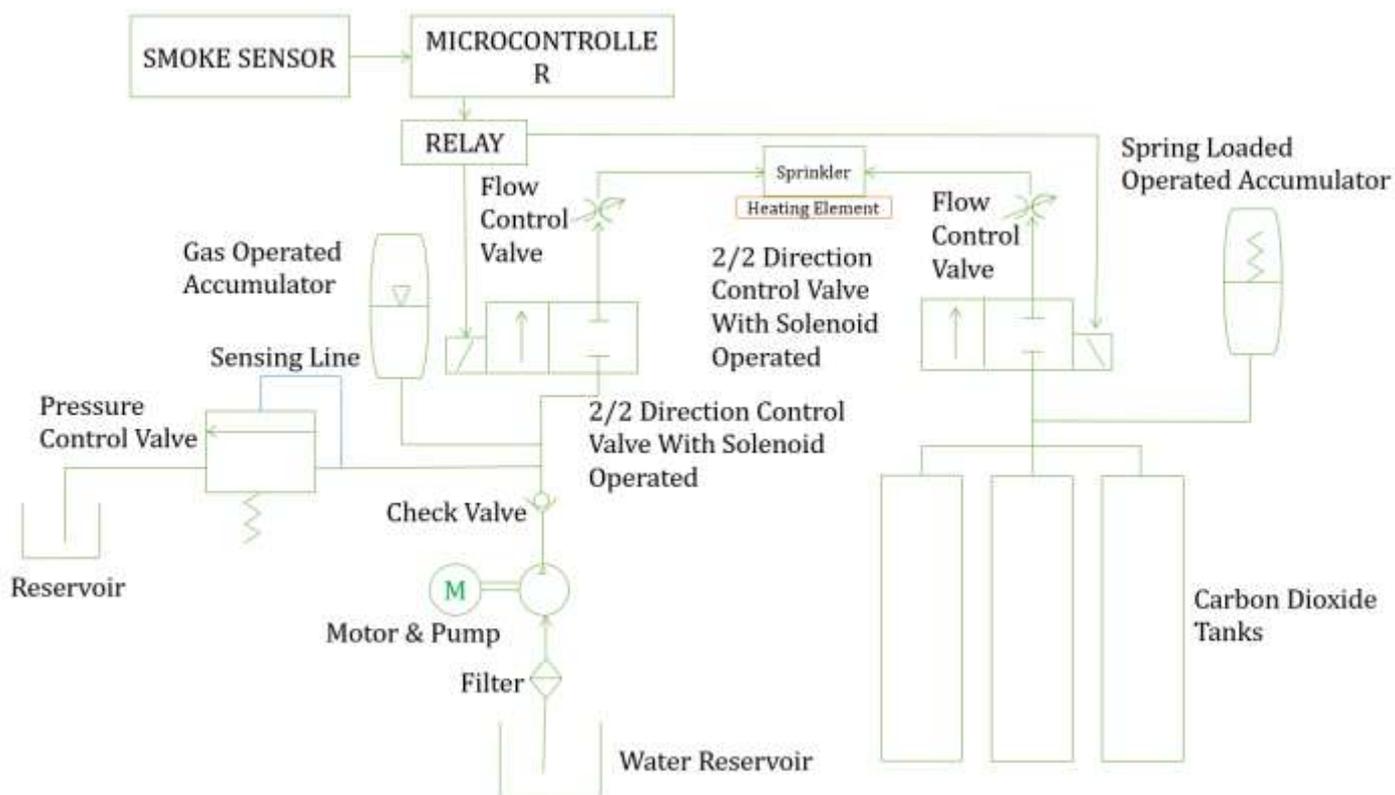


Figure 2: Water and Carbon dioxide Based systems

IV. WATER BASED SYSTEMS

The water based system is equipped with water reservoir from which is been extracted through pipe. Before it enters the pipe, it passes through filter. It filters any foreign particles from water. As soon as it enters the pump, the water is been lifted upward. There is a check valve which is also known as unidirectional valve connected in between DCV and the pump. Which allows only single direction of flow of water. The output of this valve is connected to DCV. This DCV during ON state passes the water forward through flow control valve which controls the flow of water. This flow control valve is then connected to sprinkler which sprinkles the water in all direction. In order to increase the pressure, the gas accumulator is connected to the output of check valve along with a pressure control valve which reduces the excess pressure by bypassing the water to the reservoir.

V. CARBON DIOXIDE BASED SYSTEMS

The construction of the system is very simple as compared to water based system. There are reservoirs of CO₂ in the form of cylinders connected parallel to each other. The output of cylinder is connected directly to DCV followed by flow control valve along with it diaphragm accumulator which increases the pressure of CO₂ stored. The output of the flow control valve is then connected with the sprinkler which releases CO₂ at high pressure inside the shop. There is an heating element placed near the sprinklers in order to avoid any kind of blockage due to freezing of CO₂.

VI. CONCLUSION

The system prevents damage of the objects from water to get damaged by using CO₂ as the extinguisher. With the help of accumulator, the pressure is increased and water and CO₂ is been supplied through the sprinklers is increased. The user gets notification during any kind of fire detection, during any closer and opening of door externally. The system is efficient and simple to implement.

REFERENCES

- 1] Qin Wu, Jiashuo Cao, Chuang Zhou, Ji Huang, Zhuo Li, Shin-Ming Cheng, Jun Cheng, Guanghui Pan, "Intelligent Smoke Alarm System with Wireless Sensor Network Using ZigBee", Wireless Communications and Mobile Computing Volume 2018, Article ID 8235127, 11 pages, 22 March 2018.
- 2] Majid Bahrepour, Nirvana Meratnia, Paul Havinga, "Automatic Fire Detection: A Survey from Wireless Sensor Network Perspective", Pervasive Systems Group, University of Twente {M.Bahrepour, N.Meratnia, P.J.M.Havinga}@Utwente.NI