

Modernization of Fire Detection Systems

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Abstract

Fire detection system play a very important role in detection of fire spreading and extinguishing. Development of various fire detection system was a result of many great fire incidents throughout history which have caused a huge loss of life and property. Fire is also one of the important dangers to ships and industries so special care must be given to that to prevent such kind of fires. The development in the field of semiconductor devices have an important role in accurate detection and extinguishing of fire hazards. Thus, by integration of such devices and new technologies high risk of such hazard can be avoided up to a large extent. New technologies can also help in remote detection of fire and thus, terminate the threat in initial stages.

Keywords: Smoke detector, Smoke alarm, Sprinkler system, Fire, Alarm

INTRODUCTION

Science and engineering play an important role in development accurate and reliable fire detection system. From old times people have realized that early detection of fire has a positive effect in the fire control. The oldest example of fire protection can be tracked back to the Roman Empire and the catastrophic fire that started in Rome. As a result of that, Emperor Neron had adopted such regulations that require fireproof material for wall and building restoration to be used. The second recorded case of fire protection regulations occurred in the year of 1666, after the Great fire of London, which destroyed more than 80 % of the city. From the construction material of a wooden boats, whose material is susceptible to fire hazard to today's fear of onboard fires was always present. Due to these hazards fire alarm system play a very crucial role in save lives as well as property damages and providing the exact location of fire. The detection time is a very crucial factor in fire alarm systems so that fast action can be taken against fire to stop them from becoming a very big deal. Proper selection of a fire alarm system can significantly prevent the spread of fire thus, allowing people with proper evacuation time. Furthermore a fire alarm system will follow a series of actions such as closing fire doors, turning off fire doors, starting fire suppression system and audio and light signaling systems etc.

HISTORY OF FIRE DETECTION SYSTEMS

From the 1980s to the 1990s, with the rapid development of economic construction and the rapid development of science and technology such as semiconductors, microelectronics, optoelectronics, computers, and information, foreign automatic fire alarm technology was market-oriented, guided by high-tech applications, and the fundamental purpose is to reduce the false alarm rate, improve reliability, sensitivity and expand the detection range, and carry out basic theoretical and applied technology research, technical transformation of old products, new product development, standard and specification revision, product quality certification and inspection, and system design. There have been great developments in installation and maintenance, expansion of the scope of application and improvement of application benefits. Many new products and technologies have emerged, enabling the automatic fire detection and alarm system from fire detection, alarm transmission, signal processing, and alarm control display. A series of functions and reliability such as linkage with other systems have been greatly improved and perfected, greatly reducing the rate of false alarms, greatly enhancing people's ability to prevent modern fires, and playing an important role in protecting human lives and property fire safety, becoming a modern fire protection one of the indispensable technologies and a foreword with broad development prospects is the leading fire protection technology and means. The first generation of fire alarm system: The initial stage is a temperature-sensitive fire automatic alarm system composed of some simple discrete components. From the 1840s to the 1940s, temperature-sensing detectors dominated during this period . However, because the sensitivity of the temperature-sensitive fire detector is relatively low and the speed of detecting fire is relatively slow, especially for smoldering fires, it often does not respond. Therefore, it has been unable to achieve the requirements of early fire alarm.

MODERN FIRE DETECTION SYSTEMS

Water Mist Suppression

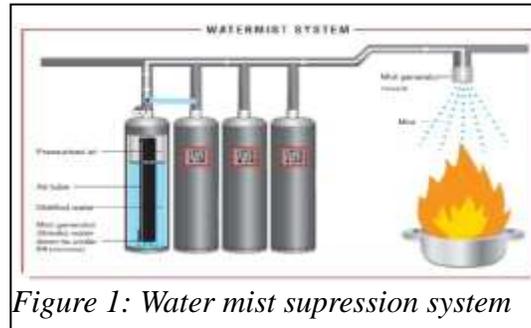


Figure 1: Water mist suppression system

Water sprinklers play an important role as fire sprinklers in residential and commercial establishments, but to water sprinklers has the disadvantage of using large amounts of water and can also be a problem where there are fragile or electronic equipment. In water mist systems, smaller droplets you can make a reduction of the amount of water used at the same time, also increased area flowing water the water vapor, to become the place of oxygen which is a main component of the fire, it can lower the overall temperature more quickly. Also, Reduce the rate of fire spread by creating a water barrier on the surface.

Video Smoke Detector And Video Flame Detector

Smoke and flame detectors play an important role in emergencies, giving early warnings to activate fire protection systems and giving people time to evacuate safely. Smoke detectors that "sense" smoke molecules are commonly used in the home and are, but not always, effective. Smoke / flame detection technology using images is highly efficient and is indispensable in some areas. Video image detection (VID) technology detects fires with two components: a camera and a computer algorithm. The camera scans the area and sends the image to your computer which run "trained" algorithms to identify



Figure 2: Video flame detection

groups of pixels that show the characteristic behavior of smoke and fire. When detected, the computer signals the alarm control system. The VID system also works with common security cameras when connected to a computer with VID software installed. So far, this technology isn't very popular yet, so for

most homes and small businesses, a small ceiling-mounted detector will suffice and may not be the best choice. Installing a VID system is an effective solution in the following cases.

- 1.Covers a large area When the covering space is very large, the ceiling is high and it is outdoors.
- 2.If you have explosives or expensive assets and need a quick response.

Air Sampling Smoke Detector

These systems are always in operation to give the earliest warning of fire hazards. It can detect the fire before it spreads and extinguish it early. The detector actively draws air through a sampling port in the shape of a pipe or tube. The detector then analyses the smoke in the air. These allow the detector to constantly look for a fire in a building that can take in air from multiple locations so that it can respond immediately in the event of a fire.

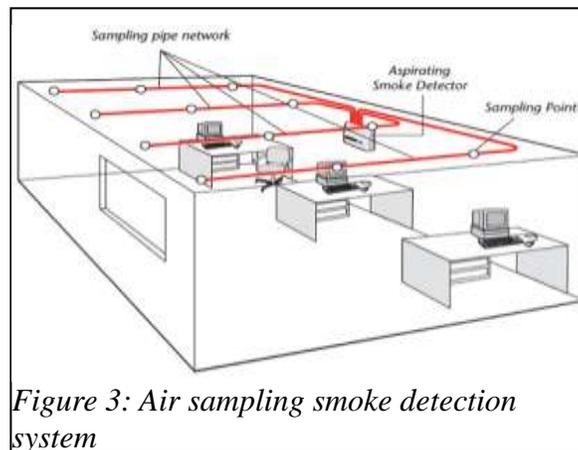


Figure 3: Air sampling smoke detection system

Smoke Alarm

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Figure 4: Smoke detector type alarm

proper operation and proper installation of smoke detectors can have a significant impact on emergency survival. The sooner the alarm is, the sooner you can evacuate.

However, it is also important to consider that some people cannot hear even the most sophisticated alarms. Recently, there are special smoke detectors designed to meet the needs of the hearing impaired, and their effectiveness has been proven. A paper published in 2006 found that "standard residential smoke detectors cannot wake up most children during slow-wave sleep." There, personalized voices that allow

parents and caregivers to wake up their children (proven to be effective in waking up most children) and to direct their children what to do. Development of a smoke detector is underway

About The Internet Of Things (IoT)

The IoT is around us. IoT is a technology that uses the flow of information between devices that differ from the Internet to extend the capabilities of those devices. IoT is used in smart TVs, smart lighting in homes, smart refrigerators, smart cars, and so on. However, the IoT can also revolutionize and modernize fire safety systems. A system centrally managed by IoT has the great advantage that the entire fire protection system is automatically operated by one computer and one software. Many traditional fire protection systems are based on interconnected alarm systems, but they are often installed by different manufacturers, each with different monitoring and maintenance requirements. The IoT establishes faster and more secure data connections between fire detectors and life procedures. In an emergency, it is important that facility managers have access to the entire fire safety system from one room, one device, or a smartphone. In addition, the number of smart buildings has increased recently, and state-of-the-art fire detection systems have been introduced. Sensors that read the temperature of the building in these buildings, so they can detect fires before traditional smoke detectors and instantly begin a series of steps for safety and damage control.

BIM (Building Information Modeling)

Building Information Modeling is a tool used by architects, engineers, and operators, and is as follows. Provides a multidimensional model that contains all relevant data about the building. It also contains the most important fire protection data, such as the fire detector system and the required fire protection of doors and walls. BIM gives all the professionals involved in the project access to the same data and build effective collaboration. For example, if a fire planner wants to change a fire zone, all relevant information can be gathered in one place. After that, all other specialists involved in the building will have immediate access to information about the changes. In short, BIM does everything right, ensuring that the building is best prepared for a fire emergency and that the project is consistent.

CONCLUSION

Fire detection, as an emerging technology closely related to the national economy and the safety of people's lives and properties, has entered a scientific and systematic development track, with broad development prospects and application markets, and it will definitely develop vigorously in the future. and play an increasingly important role in production and life. The future development of fire detection research will be driven by the following issues.

1. Improve the performance of the detection system, and accurately distinguish between fire and non-fire environmental changes based on the existing technology.
2. Use new detection technologies and detectors to expand the capabilities of existing systems.
3. Fire detection technology in special dangerous environments (such as telecommunications buildings, computer network centers, manned space vehicles), and fire detection technology in which the environment is always in irregular changes.

In the basic research of fire detection, the direction of continuous development is how to predict the performance of existing detection and rescue systems under non-ideal actual conditions, how to distinguish background sources, heating and combustion conditions that have the same (similar) products as fire phenomena Material behavior, how to detect low-concentration pyrolysis or combustion products (light, heat, smoke), etc.

1. In terms of detection technology, the following aspects will be further developed.
2. New technologies in other fields lead to new ways of fire detection technology.
3. Multi-element composite detection and multi-criterion detection, especially represented by gas composite detectors.
4. The application of laser technology in fire detection. Laser image particle size clustering will be an effective fire/non-fire identification method, and the application of laser forward/backward scattering will greatly improve the performance of light spot laser smoke detection..
5. The introduction of fuzzy logic, neural network algorithms and other wavelet transform signal processing methods in the detection algorithm.

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