ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 6, Issue 10, October 2020

IMPROVISING ELECTRICAL SAFETY BY MODIFED FIRE EXTINGUISHING SYSTEM IN CEMENT INDUSTRY

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ABSTRACT: Safety is one of the important factors in an industry. Safety performance improvements in an organization can increase its resistance of hazards that possess risk and it also lowers the risk of accident. Safety management practices are the policies, strategies, procedures, and activities implemented or followed by the management of an organization targeting safety of their employees. The organization mainly focuses to improve and maintain the health and safety in a workplace. The workplace is inspected and the electrical hazard is noted in a room which can cause fire explosion where no in-charge worker for that room. Therefore implementing an automatic fire extinguisher will avoid the fire or explosion to reach its maximum state thus maintaining the safety in the workplace. Thus eliminating the risk from that hazard will eliminate the direct and indirect cost thereby improving the organization economically.

KEYWORDS: Safety, Automatic fire extinguisher

I. INTRODUCTION

Health and Safety is one of the important factors in an industry. When a workplace is safe, workers feel more comfortable and confident when they are in that environment. Productivity gets a boost, and profit margins follow suit. Absenteeism also drops when employers take steps to implement an effective safety program. The main focus in occupational health is on three different objectives:

- The maintenance and promotion of workers' health and working capacity.
- The improvement of working environment and work to become conducive to safety and health
- Development of work organizations and working cultures in a direction which supports health and safety at work and in doing so also promotes a positive social climate and smooth operation and may enhance productivity of the undertakings.

The concept of working culture is intended in this context to mean a reflection of the essential value systems adopted by the undertaking concerned. Such a culture is reflected in practice in the managerial systems, personnel policy, principles for participation, training policies and quality management of the undertaking. Investing in a good safety program brings with it other benefits too. When employees feel safe in the workplace and absenteeism rates are kept down, they can focus on serving the company's customers properly. Many companies offer products or services that are similar to those that other companies carry or provide. Customers will decide which companies they want to deal with based on which one they feel provides the best customer service. Increased absenteeism means longer wait times and customers are quite prepared to move on to another company they feel will be able to help them in a more timely manner if they are not getting the level of attention that they deserve. Everyone in the workplace has a duty and a responsibility to do whatever they can to keep the working environment safe. Employers need to know and understand the safety regulations that pertain to their industry and make sure that their premises are up to standard. Workers can do their part by understanding the procedures the company wants them to follow on the job and following them. If they see or encounter something that is out of the ordinary, there should be a procedure in place so that it can be reported to management and deal with promptly. Managers should deal with employee concerns about safety issues in an appropriate manner. There are six main hazards which are in the workplace. They are,

- Biological hazards include viruses, bacteria, insects, animals, etc., that can cause adverse health impacts. For example, mould, blood and other bodily fluids, harmful plants, sewage, dust and vermin.
- Chemical hazards are hazardous substances that can cause harm. These hazards can result in both health and physical impacts, such as skin irritation, respiratory system irritation, blindness, corrosion and explosions.

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- Physical hazards are environmental factors that can harm an employee without necessarily touching them, including heights, noise, radiation and pressure.
- These are hazards that create unsafe working conditions. For example, exposed wires or a damaged carpet might result in a tripping hazard. These are sometimes included under the category of physical hazards.
- Ergonomic hazards are a result of physical factors that can result in musculoskeletal injuries. For example, a poor workstation setup in an office, poor posture and manual handling.
- Psychosocial hazards include those that can have an adverse effect on an employee's mental health or wellbeing. For example, sexual harassment, victimization, stress and workplace violence.

These are the different types of hazards which are present in the workplace. The organization tends to improve and maintain the health and safety of the workplace thereby eliminating the hazards in the workplace. These are the importance of safety in a workplace.

II. LITERATURE SURVEY

O.Raji et al[1] has suggested that a comprehensive review of the development of modern concrete solutions. The development of modern concrete has undergone a long route. Starting with Reactive Powder Concrete (RPC) towards the nano-scaled concrete and green solutions, research on improvement focuses on key ingredients of each of these elements including the durability, availability of the raw resources, economic feasibility and ecological friendliness. Due to the demand for increased sustainability, ecological friendliness and functional reliability of nanomaterials, this study emphasizes on nanomaterial cement and the examples considering the high demand for them. Modern concrete applications need higher durability and mechanical strength. The best way to accomplish this is by integrating nanomaterials to cement-based materials. Recently, nanotechnology has proved to be a salient solution concerning ecological improvements as it reduces dependence on non-renewable energy and contributes to significant energy savings. This technology enhances cement performance using nanomaterials. Some of the nanomaterials come in the form of nanofibers, nano-chemical additives and nano-particles embedded in concrete aggregates. S.Saeidi Rare et al[2] has suggested that suitable sensors are reported till now for the accurate measurement of inner forces at the concrete structures. In this study, a novel sensor is designed and fabricated for the evaluation of inner stress in the concrete structures under dynamical loads. By embedding this sensor in the critical points of the modern concrete structures (e.g. high-rise buildings, large-span bridges, dams, etc.), the heath monitoring of such structures may be easily done. The proposed sensor is a 5 cm × 5 cm × 5 cm cube made of a novel cement-resin-fiber. Haidar Ibrahim et al[3] has promised the attempt to gain benefits from the striking features of nanotechnology and flame-retardants in extinguishing gaseous fires. The fire extinguishing tests indicated that the nanocomposite is considerably more effective in fire extinguishing than other powders in terms of extinction time and agent mass consumed. The fire extinction time of nanocomposite was 45.2% shorter than that of commercial ABC-MAP powder. Furthermore, the consumed amount of nanocomposite was 63.2% less than that of commercial powder. BiheYuan et al[4] has worked in the case with water mist, which means that water mist shows a better suppressive effect than the other two extinguishing agents. The absence of these extinguishing agents was often accompanied with black smoke and violent jet fire. Moreover, the peak average temperatures before the extinguishing agents were depleted were 43, 75 and 133°C lower, respectively, than that in the situation without an extinguishing agent. These results indicate that water mist has the best cooling effect comparing with CO2 and HFC-227ea, which has significant implications for the design of a LIB fire protection system. ZhishingZu et al[5] has shown that the AFFF foam possesses the shortest extinguishing time of 42s and lowest foam liquid consumption of 210 g at a gas-liquid ratio of 16, exhibiting the best fire-extinguishing performance. Chemical analysis of AFFF indicates that a proper gas-liquid ratio is beneficial to enhance the expansion ratio and drainage rate of AFFF that affect the cooling and covering effects of foam, thus achieving the optimum fire-extinguishing efficiency. Infrared thermal imaging analysis indicates that the main fire-extinguishing mechanism of AFFF is mainly ascribed to the superior cooling, covering and suffocating effects of foam against the transfer of heat and oxygen, thus effectively preventing the underlying fuel from further combustion. Zhong Zheng et al[6] have developed for extinguishing sodium fires high efficiently. Laboratory-scale sodium pool fire tests revealed that such graphite powders with stearate sodium coated exhibited much superior performance in comparison to the commonly used raw graphite. The mass ratio (R) of EG@SS composite powders employed over sodium to obtain extinction was 0.7 as opposite to 2.2 of raw EG without surface coating. When applied to sodium fires, the inner expandable graphite would expand rapidly and decrease the flame temperature. Tim Rappilsiber et al[7] have discussed the fire suppressing performance of the four most common extinguishing media under the same reproducible conditions. The tests were performed in bench-scale and used standardized 5A wood cribs as well as a miniature extinguishing system with a liquid

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flow rate 1.4 lmin^{-1}. The tests results present a consistent overview of the fire suppression efficacies of water, water with a foaming agent, nozzle-aspirated foam and compressed air foam. Depending on their jet types, the cooling capabilities of the extinguishing media. Lang ZuQuing et al[8] has shown that designing parameters provided by API are more credible and large foam monitors act as the main fire extinguish facilities. The fire water supplying system is designed according to 'Fire prevention code of petrochemical enterprise design'. The results show that the capability of the present firefighting system should be raised up to at least 6-10 times to meet the need to extinguish full surface fires of large scale floating roof tanks. The reconstructing programs of firefighting system are provided to deal with full surface fires of large scale floating roof tanks in the end. Bihe Yuan et al[9] has shown that the outlet pressures of the fire extinguisher vessel had the same trend basically at different initial temperature; all of them declined rapidly with the jetting time and then tended to be gentle. When the filling pressure was lower, the outlet pressure of the vessel at different initial temperature was quite various, and the sudden slope change could be seen obviously during the discharge process at higher initial temperature. When the initial temperature ranged from -30 ℃ to 30 ℃, the jetting time shortened with the rising of the initial temperature at different filling pressure. In addition, the outlet pressure of the fire extinguisher vessel tended to be flat with the rapid decrease in the injection time. At different filling pressures, the outlet pressure of the vessel declined rapidly with the jetting time and then tended to be gentle. Xiang Chen Fen et al[10] has explores the feasibility of using (CS)-sodium alginate (SA) crosslinking gel to reinforce dry water (DW) composites. The stability and fire extinguishing efficiency of the DW powder are investigated. Compared to ordinary DW material, water loss rate of the modified DW composite is decreased, and its pressure resistance and stability are significantly increased. Moreover, it possesses higher fire extinguishing efficiency than conventional dry powder. Fire extinguishing mechanism and gel formation mechanism are proposed. The improvement in stability has great significance for the storage and transportation of DW materials. These results demonstrate the ability to create a fully green and renewable crosslinking gel capable of endowing high stability to DW material. This work provides a novel solution to improve the stability of DW materials, which will have great application prospect in fire suppression of some flammable hazardous chemicals. Dexu Du et al[11] has demonstrated that the consumption of the three types of fire extinguishing powder decreased with an increase in the driving pressure, and the order of powder dosage was as follows: commercial dry powder > superfine powder > compound superfine powder. Similarly, the order of minimum extinguishing concentration was as follows: commercial dry powder > superfine powder > compound superfine powder. Furthermore, the compound superfine powder exhibited a greater capacity for controlling toxic and harmful gas emissions. F.Kady et al[12] has developed the device shows exceptional charge transfer characteristics, leading to a potential difference up to 80 V and a current density up to 25 μA/m2. When integrated into firefighter shoes, the FRTENG is able to discern the movements of a firefighter in hazardous situation, while providing the high thermal stability missing in conventional TENGs. The fire-retardant and self-extinguishing characteristics offered by the FRTENG makes it a path-breaking device for lifesaving wearable applications. Tunsuna et al[13] has revealed the efficiency of TCP as a flame retardant for PLA foams. Increased TCP levels contributed to a significant enhancement in fire-extinguishing characteristics. Phosphoric acid from thermal decomposition of TCP was a key factor in the proposed mechanism of flame retardation. Flame inhibition and retarded ignition of the PLA foams were achieved at all compositions of TCP and NFR. Due to the presence of compounds such as cellulose, phosphate, and silica, both PK and SB could be used as effective NFRs for PLA foams. All these characteristics promise extended applications for PLA foam in bio, circular, and green economies. ZihanTiwaie et al[14] has shown the KOH was the main product in the high extinguishing performance of potassium salts in flame chemical reactions. Thermodynamics analysis by HSC CHEMISTRY showed the K2CO3 could provide 4.85% KOH in equilibrium substances, which well above other potassium salts, and other active substances good for fire extinguishing benefited from the intermediate product during the process of the KOH reacted with the flame free radicals. Yusihie Koshiba et al[15] has investigated the fire-suppression ability of water mists containing various organic solvents ethanol, 1-propanol, tetrahydrofuran, methyl acetate, and 1,2-dimethyoxyethane which form minimum-boiling azeotropic mixtures with water. The key factors influencing the suppression efficiencies of the solvent-containing water mists were elucidated by measuring the evaporation rates, flash points, extinguishing times, and spray properties (droplet-size distribution, spray mass-flux density, and droplet velocity) of the mists. Suppression trials indicated that heptane pool fires can be extinguished by aqueous solutions of ethanol and 1-propanol at solvent concentrations of 1.0–20.0 vol%, but are not consistently extinguished by the other three solvents, and the extinguishing times of aqueous ethanol and 1-propanol (despite their high flammability) are significantly shorter than those of a wet chemical (conventional fire-extinguishing agent). Rajgokul[16] Plunger valve is an important tool for manufacturing and engineering mainly in cement industry. The compressed air in the reservoir is transmitted through transmission lines such as pipes and hoses. The

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ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 6, Issue 10, October 2020

pneumatic power is controlled by means of a set of valves such as the pressure, flow and directional control valves. This resulted in a conclusion that the samples 2,3,4 and 5 had flat washer seal, which has low frictional force, compact and longer life compared to other seals. Among the above four valves the sample 3 had improved flow characteristics. The equivalent flow area is calculated for the prediction of the response and the flow rate of the valve position. The major dimensional design rules are formulated from the study of different spool valves with seal. Since there is no consistency in the throat gap dimension with respect to the casing, throat opening is not formulated by reverse engineering. This dimension defines the response and the flow rate of the valve. Validation is done by ANSYS CFX software. The operating contact pressure 5bar and 10bar is taken for contact analysis. The frictional force at 0.05mm squeeze and 10bar operating pressure is obtained as 2.40N which is well correlating with the theoretical value as 2.45N. A.D.Adedoyin et al[17] have investigated the dam for structural anomalies that may compromise the purpose and safety of the dam. Field equipment for the study comprised a Super Sting R8/IP Multi-Electrodes Resistivity Meter, 84 metallic electrodes and the accessories, compass clinometer, and portable GPS equipment. Geological data were processed and plotted to obtain a Geological Map and Rosette Diagram that were used for structural interpretations. The structures interpreted include an asymmetric fold and a strike-slip fault. The 2Dresistivity data were processed and tomographically inverted to obtain the resistivity models of the sub-surface around the dam. Interpretations of 2D resistivity models showed that the dam reservoir floor is underlain by competent basement rocks, however, the basement rock is weathered in some places. Patches of low resistivity structures interpreted as seepages, fractures and water-saturated cavity were delineated in different sections of the dam. The surface structural elements from geological study support the subsurface structures interpreted in the 2D resistivity models. Weathered structures, fractures, and seepage in the reservoir floor constitute areas of excessive water loss in the dam. The cavity delineated in the dam foundation is a potential threat to the dam's safety. Mano Sezdi et al[18] has suggested that must be controlled because of the risk of patient electrical shock. The electrical safety measurements must be performed to investigate the leakage currents from medical devices to prevent the damage to both patient and user. For the electrical safety measurements, the electrical safety analyzer is used to test the medical devices. The measurements are performed by applying the measurement procedures generated in according to international standards

III. Constituents of Cement

The primary raw material for cement making is Limestone. This limestone is being quarried in various parts of the world. This limestone is mixed with the slag and the Gypsum and Fly ash are added to increase the quality and setting time of the cement. The setting time of the cement mainly depends upon the mixing ratio of the gypsum and fly ash to the clinker. The main constituents of the cement are,Tri - Calcium Aluminate-$Ca_3Al_2O_6$ Belite or Di - Calcium Silicate-Ca_2SiO_5 Alite or Tri - Calcium Silicate-Ca_3SiO_5

IV. Work Spot Inspection

a) Electrical Control Room

An electrical room is a room or space in a building dedicated to electrical equipment. Its size is usually proportional to the size of the building. Large machineries may have a main electrical room and subsidiary electrical rooms. This electrical control room is mainly for power distribution to the heavy machineries. The electrical control rooms basically contain the following equipment's. They are, Electric Switch Boards, Distribution Boards, Circuit Breakers, Electricity meter, Transformers, Bus bars, Backup Batteries, Fire Alarm Control Panels, Distribution Frames.

Fig. 1 Electrical Control Room

b) Power Distribution from Control room

Control Room is the area from which the power supply is given to the heavy machineries. These heavy machineries consume power in kilo-watt and this high amount of power is being supplied from the control room. Table 1 provides the information of the amount of power being supplied to the machineries from the control room.

Table 1 Power Supply Information

Machinery	Power Supplied (KW)
Coal Mill	1762
Rotary Kiln	1300
Vertical Roller Mill	1900

In control room, the employee and worker enters only at the time of accessing or de-accessing the power for the machineries and also for the maintenance related works in

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International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
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the control room. There will be no workers entering the control room in the remaining hours.

V. Risk Identified

a) Electrical Hazards in Control room

A dangerous condition where a worker could make electrical contact with energized equipment or a conductor, and from which the person may sustain an injury from shock; and/or, There is potential for the worker to receive an arc flash burn, thermal burn, or blast injury. An electric hazard is considered to be removed when protective measures are put in place at the source, or along the path. Where PPE is relied upon for worker protection, an electrical hazard is considered to remain and it is still necessary to address safety requirements for other workers in the area.

Fig. 2 Electrical Hazard

It is the level of voltage the body is exposed to and the resistance to flow of electrical current offered by the body that determines the impact of exposure to electricity. The following factors determine the severity of the effect electric shock has on your body: The level of voltage, The amount of body resistance in the body to the current flow, The path the current takes through the body, The length of time the current flows through the body. If a worker has come into contact with electricity the worker may not be able to remove themselves from the electrical source. The human body is a good conductor of electricity.

b) Effects of Electrical Hazards

There are basically two ways to be injured by electricity. One is by electric shock and the other is by arc flash. Electric shock is the passing of electric current through the body. Electrical contact can cause involuntary physical movements.

Fig. 3 Fire Explosion in electric supply board

The electrical current may Prevents from releasing your grip from a live conductor, Throws into contact with a higher voltage conductor, Causes to lose your balance and fall, Causes severe internal and external burns, Causes death

c) Accidents happened in Workplace

Several accidents happened and affected both the employees and the organization. An employee got injured when he was doing a maintenance work and he was taken to the health care. Both the organization and employee got affected. A fire explosion happened due to the high uncontrollable electric power supply. But it was noted at the earliest and was stopped at its earlier stage.

VI. Fire Sniping System

The electrical – fire hazard which is present in the control room can be overcome by installing the fire sniping system. Fire Sniper System is an automatic fire suppression system which is used to extinguish or suppress the fire automatically without an emergency team or a fire Marshall. This system is mainly proposed to extinguish the fire specifically at the initial stage. Fire sniper system are designed for the protection of larger cabinets, fume hoods, electrical panels, servers rack, UPS Systems, Battery racks etc. This system calls for simultaneous release of extinguishing media at a rapid speed. There are two types of fire sniping system. One is Direct Fire Sniping System and the other is Indirect Fire Sniping System. Direct Fire Sniping System extinguishes directly. There are no specific components needed in the direct fire sniping system. In a direct release system, the suppressant will come through the hole in the tube directly. The Fire extinguisher which consist of mono ammonium phosphate powder which acts as a suppressing agent of fire and also a heat sensing polyimide tube. This heat sensing polyimide tube will melt and releases the mono ammonium phosphate powder when the temperature of fire goes to 80^0C to 110^0C. The disadvantage of direct sniping system is the flow of the suppressing agent cannot be controlled. Direct release systems are recommended for electrical panel and server rack protection. The direct release system works well for protection of electrical hazards, because it does not rely on any metal components installed within an electrical enclosure. Metal components, like nozzles, can cause electrical arc faults which actually increase your fire risk. Because direct release systems rely entirely on the tubing, a plastic material, fire risk is reduced.

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Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
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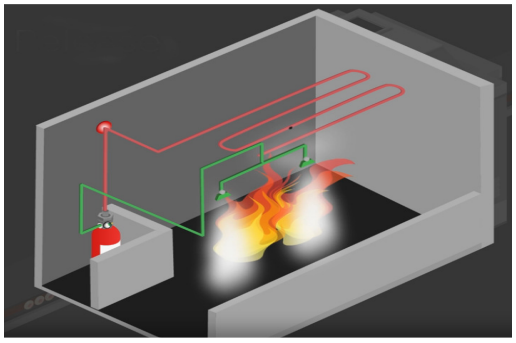

Fig. 4 Fire Sniper Systems

The other type is Indirect Fire Sniping System. Here we are going to install the indirect fire sniping system to suppress the fire as the direct fire sniper system does not have the control in the extinguisher media flow. An indirect release is when the tube acts as a detection device and, through the pressure change, tells the system to discharge the agent through other pipes and nozzles. Indirect release systems are commonly used for vehicles and in CNC Machines. Indirect Release Systems have been independently tested and evaluated by the leading product performance testing agencies. They are UL Listed and FM Approved. Third party testing ensures that products consistently perform as expected and can tolerate environmental challenges like temperature change. Local and national firecodes, including those published by the National Fire Protection Association (NFPA) often recommend UL or FM approved systems. The components of indirect fire sniping system are, Extinguishing Media, Pneumatic indirect actuation valve, Linear heat sensing polyamide tubing, Steel tubing with spray nozzles, Manual release system,

a) Extinguishing Media

The extinguishing media is the source which contains foam concentrates, liquid, powder or gases which are mainly used to obtain a much better fire extinguishing performance than the water. These media can be used in foam sprinkled system, emergency vehicles or portable or mobile fire extinguishers. Here the extinguishing media will be the mono ammonium phosphate powder in a MS cylinder.

b) Pneumatic Indirect Actuation Valve

The pneumatic indirect actuation valve is one of the components in the indirect fire sniper system. If the operating condition during the direct actuation become too unfavourable i.e., excessive pressure or excessive flow rate, indirect actuation method is chosen. Here a valve is used for controlling the process. This indirect actuation valve operates using the air when the pressure of the tube is released.

c) Linear Heat Sensing Polyamide Tubing

The nylon tubing is also known as polyamide tubing. These tubing can withstand higher temperatures and pressures than the normal tubing. It is often used as a substitute for metal because it is lightweight and corrosion resistant. The nylon material from which the tubing is manufactured is a polymer plastic that is constructed by repeating chains of amide groups that are bonded together to form fibers. The unique material structure of the nylon plastic tubing allows it to maintain exceptional chemical, abrasion, impact, and moisture resistance and dimensional stability. This polyamide tubing is used as the material which will be directly in contact with the naked flame.

d) Steel tubing with spray nozzles

Steel tube is strong, tough and durable. It can be round, square or rectangular. Steel tubing often incorporates different alloys such as aluminium, manganese, titanium and tungsten. Its versatility lends it to a range of applications in different industries. Each year millions of tons of steel tubing is produced. Steel tubing can be welded or seamless. Seamless tubes are made by passing the molten steel over a piercing rod to create a hollow tube. Welded tubes are made from curling a rolling plate and welding the seam together. In the past, seamless tubes were stronger than welded tubes. However advances in technology have allowed welded tubes to have sufficient strength to replace welded tubes for many applications. The fire extinguishing media passes through the steel tubing and at the end of the steel tubing there will be a spraying nozzle in which the media can be sprayed on the naked flame.

e) Manual Release System

Manual release system is also present in the indirect fire sniping system. The manual release system is a system which can be operated manually. An individual person is needed to operate the manual release system. Even though the fire sniper system is a automatic system, a manual operation option is also being provided. This can be operated regarding the situation and condition of the place, environment and the fire. [4] presented a brief outline on Electronic Devices and Circuits which forms the basis of the Clampers and Diodes.

VII. WORKING PROCESS

The fire sniper system is the system which operates automatically. It does not need any power source. However the system is also provided with a manual release button which can be used in order to activate the system manually if required. When a fire emerges in a workplace where the indirect fire sniper system is installed, the linear heat sensing polyamide tubes melts when the temperature reaches 80^0C to 110^0C. The linear heat sensing polyamide tubes is being pressurized and if the tube melts at its melting point, the pressure leaks and it burst opens. Due to the pressure leak, the pneumatic actuation valve is operated. Now the fire extinguishing media is being released from the MS cylinder and it

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ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com
International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
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passes through the steel tubing and it gets sprayed on the naked flame using the spray nozzle which is attached to the steel tube. Now the fire can be extinguished and the accident / incident can be avoided. This is the working process of the indirect fire sniper system as shown in Fig.5.

Fig. 5 Working of Fire Sniper System

The quantity mono ammonium phosphate powder which is used as a suppressing agent varies as per the length of the polyamine tube. With these specifications, select the quantity of mono ammonium phosphate powder as shown in Table 2. The length of the tube which is to be installed in the control room in a zigzag way must be considered wholly as the total length to define the need of mono ammonium powder quantity. Select the quantity of mono ammonium phosphate powder by considering the length of the polyamine tube.

Table 2 Specifications of suppressing agent

Length of Polyamine tube (meters)	Quantity of Mono Ammonium Phosphate Powder (kgs)
3	1
4	2
5	4
8	6

VIII. RESULTS AND DISCUSSION

By comparing the existing method and proposed method, the hazard of the control room is eliminated and the accident can be prevented. This can not only improve the organization economically but also improve the reputation of the organization.

Table 3 Comparison of existing and proposed system

Existing method	Proposed method
No Immediate Fire Extinguishing method is provided in the control room.	Immediate Fire Extinguishing method – Fire Sniping System is provided in the control room.
Machineries Damage cost due to fire explosion happens often.	The fire explosion is being eliminated thus saving the machineries damage cost.
Medical costs are spent for the employee injury	Injury is being avoided thus medical expenditure is eliminated.
Enforcement action by government takes place when an accident happens.	Enforcement action is avoided.
Compensation for the employees due to the workplace accident is being provided.	Accident compensation is avoided.

The probable accident rate of the proposed method can be analyzed in the form of a chart. In this below chart the accident rate, injury, compensation and legal actions are being given. This is mainly used to analyze the existing method and the proposed method in the control room. It is given as follows,

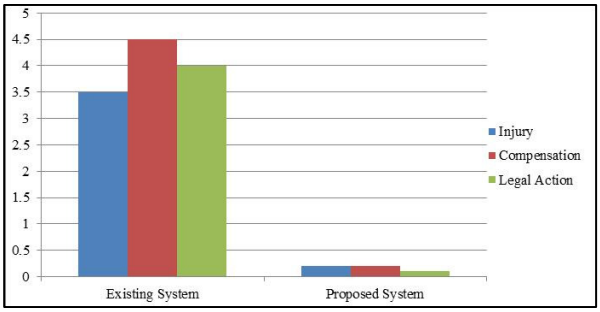

Fig. 6 Bar chart comparisons of existing system and proposed system

ISSN (ONLINE): 2454-9762
ISSN (PRINT): 2454-9762
Available online at www.ijarmate.com

International Journal of Advanced Research in Management, Architecture, Technology and Engineering (IJARMATE)
Vol. 6, Issue 10, October 2020

The chart contains existing system in X axis and the percentage rate of effect in Y axis. By this chart, the accident rate is 3.5 and the compensation is 4.5 and also the legal action is 4 in the existing system. Therefore after implementing the proposed method, the effect of the incident can be estimated. The accident rate is 0.2 and the compensation is 0.2 and also the legal action is 0.1 in the proposed system. In the Fig.6 the proposed method in the workplace can improve and maintain the Health and Safety of the workplace.

IX. CONCLUSION

Thus installing the fire sniper system in the control room improves the safety at the workplace at the higher rate. The electrical hazard causes fire explosion and this fire can be easily suppressed using the fire sniper system. The installation of the proposed system will avoid the unwanted direct and indirect costs for the organization. Eventually this will improve and promote the reputation of the organization and also it promotes the staff morale in the organization. It will also result in the improvement of the industry in economical way. This method can be implemented widely in the future by implementing the fire sniper system in all process industries where the fire hazards are present. This method can not only improve the Safety in the workplace but also results in the growth of the industry.

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