

The Implementation of Fire Emergency Response in the Central Java Oil and Gas Company

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ABSTRACT

Introduction: Oil and gas business activities are one of several sectors that have a high risk of accidents, fires, explosions, and environmental pollution. This makes the company implement preparedness in the face of fire emergencies to be implemented by all workers so that the risk of fire can be minimized and the work environment is in a safe condition. The purpose of this study is to describe the fire emergency response system. **Methods:** This study was analyzed using a descriptive method and used a cross-sectional study design. The research location was in the Central Java Oil and Gas Company from February-April 2017. The data used were primary and secondary data with the researched variables including potential fire hazards, facilities, and fire prevention. **Results:** One of the potential hazards that exist is fire hazard potential. The facilities available as part of the emergency response system are an active protection system consisting of the provision of extinguishers, hydrants, fireboxes, foam chambers, water sprinkles, fire alarm systems, fire pumps, and fire cars. Meanwhile, the passive protection system consists of evacuation routes, muster points, evacuation maps, posters, and warning signs. Fire prevention consists of the formation of a fire-fighting team, training, simulation, and SOP containing technical execution. **Conclusion:** This oil and gas company has implemented an emergency response system especially for fires by facilitating active and passive protection facilities. The company has also established a fire suppression system as part of its fire emergency response system.

Keywords: emergency response, fire, prevention, risk

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INTRODUCTION

Occupational Safety and Health (OSH) is a necessity for every human being because humans will defend their lives from threatening dangers. In line with the development of human civilization, the challenges and potential dangers are increasingly numerous and varied. For this reason, occupational safety and health aspects are very important demands and needs for individuals and groups (Ramli, 2010b). The government has also made it mandatory to implement Occupational Safety and Health in the workplace, which has been regulated in some regulations, one of which is in the Law of the Republic Indonesia No.1 of 1970 regarding Work Safety. The regulation is intended to all company sectors, including construction, manufacturing, and oil and gas.

Every employment sector has hazards and risks of accidents and occupational diseases. The size of the risk depends on the type of industry, technology, and efforts to control the risk (Suma'mur, 2014). Oil and gas business activities are one of several sectors that have a high risk of accidents, fires, explosions, and environmental pollution (Directorate General of Oil and Gas, 2018). A fire is an event that can occur due to natural disasters caused by human factors. A fire can occur anytime and anywhere because many possibilities can trigger a fire (Tarwaka, 2012). In the 2019 report in America, the number of fires reached 1,291,500 cases, resulting in 3,700 deaths, 16,600 injuries, and \$ 14.8 billion in property losses (Ahrens and Evarts, 2020). Fire incidents are considered serious because they can cause casualties or material losses (Abidin and Putranto, 2017).

Losses arising from work accidents and disasters such as fires are the effects of not implementing proper emergency response management (Pratiwi, Lestari and Ridwansyah, 2013). The application of the emergency response system must be improved

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to avoid the danger and risk of fire which can cause damage, disability, and even death. The achievement of the implementation of the emergency response system certainly involves all people in the company (Zurimi, 2017).

This company is a company located in Central Java and is engaged in the oil and gas sector. The company manages the exploration, exploitation, and production of oil and gas. Sources of the fire hazard in the company can occur in all areas of production. One of them is in the Production Container Center. Production Container Center is a production facility that accommodates crude oil, condensate, and gas from several sub-fields that are spread out and carries out processing. The location of the production container center is in the form of a large field with several available storage tanks and piping for receiving and sending products. This area contains a high risk of accidents and occupational diseases, especially the risk of fire, like the incidences of fires that occurred in 2014 and 2015 in one of the production fields which is also the working area of the Central Java Oil and Gas Company. Although the incidences did not have an impact on fatality, they still deserves attention. Meanwhile, in 2016 a fire also occurred in an oil pipeline which distributed crude oil in one of the production fields, causing 2 local residents to be injured and taken to the nearest hospital. The existence of a high risk of fire and the past incidents make the Central Java Oil and Gas Company implement preparedness in the face of fire emergencies to be later implemented by all workers. It is expected that the risk of fire can be minimized and the work environment is always in a safe condition. Based on this background, the purpose of this study is to describe the fire emergency response system in the Central Java Oil and Gas Company.

METHODS

This research was an observational research. The data analysis of this research used a descriptive method which aimed to describe the fire emergency response system in the Central Java Oil and Gas Company. The study design used was cross-sectional because the research process was carried out at a certain time.

The research location was conducted in the Central Java Oil and Gas Company Production Storage Center having the potential to fire hazards in February-April 2017. The research used primary data which were obtained from direct observation using the company observation sheets, and secondary

data which were obtained from OSH documents in the company. The variables to be studied were fire hazard potential, facilities, and fire prevention. The references that were used in this research were the Decree of the State Minister of Public Works No 10 of 2000, Government Regulation No 50 of 2012, Laws of the Republic Indonesia No 1 of 1970, Minister of Health No 48 of 2016, Minister of Manpower and Transmigration No 4 of 1980, Minister of Public Works No 26 of 2008, Indonesian National Standard 03-3989-2000, and some existing research.

RESULTS

Potential Fire Hazards

As a company engaged in the oil and gas sector, the company has high potential hazards from any production activity or process. The company identifies hazards to determine the potential hazards and impacts that may arise in the production activities or processes in the company. Besides, the identification of these hazards aims to determine the control of hazards that arise. Activities in hazard identification at least include analysis of the production process, work areas, incidents, engineering, monitoring, inspection, and routine accident reports. The identified activities are routine, non-routine, normal, abnormal, and emergency activities. Hazard identification includes the activities of all personnel who have access to the workplace which are carried out by each function in their respective areas with the hazard identification form provided.

One of the potential hazards that exist is the potential for fire hazards. The potential fire hazard that can arise in this Oil and Gas Company comes from production activities, among others, from taking photos using a smartphone camera which is prohibited from being carried out in this production field; operation of production facilities that have ignition sources that are a potential fire hazard, such as the use of electricity, compressors, and generators or oil pipelines, loading tanks and water treatment; fault in the road tank parking; oil catcher operation which causes oil, diesel, oil and other chemicals used spills; tank cleaning which is not up to standard causing leakage of H₂S gas coming from the oil storage tank; vacuum truck operation; and the last natural factors in the form of lightning strikes during the rainy season.

Table 1. Potential Fire Hazards at the Production Storage Center of the Central Java Oil and Gas Company in 2017

Potential Fire Hazards	Assessment					
	Severity				P	R
	M	T	E	I		
Taking photos without permission and using smartphone cameras	4	4	4	3	D	H
Operation of production facilities, including electricity, compressors and generators	5	5	2	3	D	H
Road tank parking	5	5	2	3	D	H
Operation of the Oil Catcher (spilled oil, diesel, oil and other chemicals)	5	5	2	3	D	H
Tank Cleaning (e.g., leakage of H2S)	5	5	2	3	D	H
Operation of the vacuum truck	5	5	2	3	D	H
Storing oil in the tank during lightning	5	5	2	3	D	H

Facility

Active Protection System

The active protection system is used to support the fire suppression process at the Production Storage Center. This active protection system is in the form of a fire extinguisher, hydrant, firebox or house cabinet, foam chamber, water sprinkler, fire alarm system, fire pump, and fire engine.

The fire extinguisher used is a type of carbon dioxide and dry chemical. The number of fire extinguishers available at the Production Container Center is 18 units of fire extinguishers. Regarding the placement of the fire extinguishers, they are

Table 2. Active Protection System Facility at the Production Storage Center of the Central Java Oil and Gas Company in 2017

Active Protection System	Availability
Fire Extinguisher	√
Hydrant	√
Firebox or House Cabinet	√
Foam Chamber	√
Water Sprinkler	√
Fire Alarm System	√
Fire Engine	√

installed by giving a mark as high as 125 cm and a distance of 15 meters from each other. The placement of the fire extinguishers is marked with a thick red line on the pole and a triangle mark on the wall, and all tubes are colored red. In addition, some fire extinguishers are hung, some are placed on racks made of iron, and the rest are placed on the floor. Inspection is carried out twice a year, namely in February and August.

A hydrant is a permanent fire extinguisher installation in the form of a piping network containing pressurized water. 11 hydrant pillar points are installed and located outside the building and are functioning properly. Meanwhile, there are 8 units of hydrant type fireboxes. The hydrant is said to function properly if each hydrant device can be operated properly. The firebox consists of a 2.5” fire hose, spray nozzle, foam nozzle, and jet. The hydrant pillar device consists of a nozzle, hose, coupling, valve connector or opening tap, pressure gauge, red-painted safety fence, and hydrant number for easy inspection. The time for hydrant inspection is different from the inspection time of fire extinguishers. Specifically, hydrant inspection at the Production Storage Center is carried out every 2 weeks for hydrant pillars and once a month for fireboxes carried out by the Health, Safety, Security, and Environmental (HSSE) team. Inspection is intended to prepare the hydrant in good condition and ready for use.

A foam chamber is an active protection system painted red which is installed in every crude oil storage tank. There are 7 oil storage tanks so there are 7 foam chamber units in the production storage center. The working system of this foam chamber is that it will break when it is pressured by a water channel that is opened with a foam mixture. The water that has been mixed with the foam will flow through the foam chamber pipes and into the tanks.

Table 3. Compliance of Active Protection System Facility at the Central Java Oil and Gas Company Production Storage Center in 2017

Compliance	Information
Fire Extinguisher	18 units
Type of Fire Extinguisher	CO ₂ , dry chemical
Placement Height	125 cm
Distance from one another	15 m
Sign	Red Triangle
Tube Color	Red
Inspection	Twice a Year
Hydrant Pillar	11 units
Nozzle	Available
Hose	Available
Clutch	Available
Valve Connector	Available
Pressure Gauge	Available
Security Fence Painted Red	Available
Hydrant Number	Available
Inspection	2 weeks
Fire Box	8 Units
Fire Hose 2,5"	Available
Nozzle Spray	Available
Nozzle Foam	Available
Jet	Available
Inspection	Once a month
Foam Chamber	7 units
Colour	Red
Installation	Storage tanks
Water Sprinkler	7 units
Installation	Storage tanks
Fire Alarm	2 types
Conventional Alarm	Available
Automatic Alarm	Available
Smoke Detector	Available
Level 1	For 3 minutes & thrice
Level 2	For 2 minutes & twice
Level 3	For 1 minute & once
Fire Pump	2 units
Capacity	1000 gpm
Inspection	Once a month
Fire Engines	2 types
Fire Truck	2 units
Media	Water
Water Tank Capacity	3000 L
Foam Capacity	500 L
Pump Capacity	500 gpm

Continued Tabel 3. Compliance of Active Protection System Facility at the Central Java Oil and Gas Company Production Storage Center in 2017

Compliance	Information
Fire Jeep	1 unit
Water Tank Capacity	500 L
Pump Capacity	500 gpm

Table 4. Passive Protection System Facility at the Central Java Oil and Gas Company Production Storage Center in 2017

Passive Protection System	Availability
Evacuation Routes	√
Muster Points	√
Evacuation Maps	√
Posters	√
Warning Signs	√

The inspection for the foam chamber is not carried out by the HSSE team but by the production team as the owner.

A water sprinkler is an active protection system that is installed above the crude oil storage tanks. The number of water sprinklers is 7 units according to the number of existing tanks. The water sprinkler working system is that when there is a fire the water sprinkler will open by itself, and the water will come out of the sprinkler head so that it activates an alarm. The water sprinkler not only functions during a fire but during the high dry season in which the water sprinkler will function to cool the tank. The water sprinkler inspection is the same as the inspection of foam chamber which is carried out by the production team as the owner.

Fire alarms used are automatic alarms and conventional alarms. The conventional alarm is a gong made of iron pipe which is hung near the guard post. If a fire occurs, the guard immediately sounds the gong to signal if there is an emergency. Meanwhile, the automatic alarm is in the form of a smoke detector in the room and an alarm that is activated automatically from the water sprinkler. The fire alarm is indicated by a long continuous sound. There are 3 sound levels in the production container center. Level 1 is an emergency level which can have a direct impact on health and safety or pose risks, damage to equipment, buildings, process losses, environmental damage, and even company image. Thus, it must be followed up immediately.

The indicator of this level is when the wavy siren sounds for 3 minutes 3 times, and the activation of the warning signal indicator at the early warning system will activate the combustible gas release. Level 2 is an incident which endangers human health and safety and creates the risk of damage to building equipment and others but can still be overcome and repaired permanently. The indicator of this level is if the siren sounds intermittently for 2 minutes 2 times. Level 3 is the level of safety and alertness which does not endanger human health and safety, so all activities can run normally. Conditions are said to be safe and alert when the siren sounds flat for 2 minutes.

A fire pump is a pump that is connected to a water storage source to be distributed to the installation network such as a hydrant or sprinkler. There are 2 fire pump units in the production storage center with a capacity of 1000 gallons per minute (gpm) each. Fire pump inspections are carried out once a month by the HSSE team.

The company also has fire engines in the form of fire trucks and fire jeeps. The fire truck is equipped with 2 units of water media for extinguishing with a water tank capacity of 3000 liters, 500 liters of foam, and a pump capacity of 500 gpm. 1 unit of fire jeep is equipped with firefighting equipment, with a water capacity of 500 liters and a pump capacity of 500 gpm. Usually, fire jeeps are used in nearby areas because the water capacity is only limited to 500 liters of water.

Passive Protection System

In addition to the active protection system, the company also has a passive protection system consisting of evacuation routes, muster points, evacuation maps, posters, and warning signs. In the event of fire, the company has designed a rescue route that is used to save oneself and get oneself away from fires that could endanger lives. All people who are at the location will move to a safer place that has been determined by the company in case of an emergency, such as a fire. The company has provided a safe place for temporary gathering or a strategically located muster point with the installation of a green sign that clearly reads the muster point. There are 2 points of evacuation routes that are connected to 2 muster points in the production container center. The first muster point is next to the security post (the entrance/exit for people) and to the west of the laboratory which does

Table 5. Fire Management at the Central Java Oil and Gas Company Production Storage Center in 2017

Fire Management	Information
3 Teams (6 persons in a team):	
Morning Shifts	(07.00 am – 07.00 pm)
Evening Shifts	(07.00 pm - 07.00 am)
Team Role:	
Team Commander	1
Nozzleman	2
Helper	2
Operator	1
Training	Once a month
Fire Drill	Available
SOP	Available

have a large enough area for people to gather in case of an emergency such as a fire.

Workers or partners who are in the production container center and who will save themselves from the fire must know the evacuation route and the muster point. Thus, workers or work partners need to understand the evacuation map at the production container center. This evacuation map is an indication that contains an evacuation route to facilitate the evacuation process in case of an emergency. This evacuation map is installed in an area that can be seen by everyone in the production container center, and it should be socialized to all workers, partners, or visitors who will enter the production container center area.

Besides, the company also provides posters and warning signs at the production container center containing announcements related to OSH or hazard information in the workplace. These posters and warning signs are in the form of pictures or writing and are placed in strategic areas for easy viewing. These posters and warning signs are made and posted as notifications, directions, attention, and prohibitions for every worker and other people in the workplace to be careful, be aware of the potential hazards that exist, and prevent work accidents.

Fire Management

The company has formed a fire fighting team to deal with fires consisting of 3 teams that are always on standby 24 hours with the distribution of the morning shifts from 07.00 am-07.00 pm and the evening shifts from 07.00 pm-07.00 am. Each team consists of 6 people, 1 person serving as the



Figure 1. The Fire Triangle Theory

team commander, 2 people serving as nozzleman, 2 people serving as a helper, and 1 person serving as an operator. The task of the team is to extinguish the fire in each section and the nearest section and to localize the fires that have occurred. In addition to extinguishing the fire, the team is also tasked with rescuing victims from the scene. The team also has the responsibility to always maintain all firefighting equipment so that it is always ready to use.

For this reason, the company provides training and fire simulations to the team to support its duties and increase the team's knowledge and skills in extinguishing fires. Besides, fire training is also provided to all workers, which is conducted once a month in 1 year and is carried out by the fire fighting team. This training aims to train, so in the event of a fire, workers remain calm, do not panic, and can use the available fire extinguishers. In addition, if a bigger fire occurs, a team of firefighters who are on standby will be assisted to divide the tasks into their respective team. There is also a fire drill, which is a training activity or fire simulation with a scenario created by the team. Fire drills are carried out so that all fire protection systems, both active and passive, can function and work properly. This is also to familiarize each individual or worker to be on alert, skilled, and trained in saving themselves or protecting company assets in the event of a fire.

The company also has a Standard Operating Procedure (SOP) for fire prevention which is carried out by a firefighting team. Thus, when a fire occurs, the fire fighting team must arrive at the location immediately. Upon arrival at the location, the commander team must coordinate where the fire trucks, pumps, and other equipment must be placed and must arrange a blackout strategy. Extinguishing is carried out using equipment, methods, and

materials appropriate to the type of fire or the type of material being burned. Firefighters who are close to the fire (nozzlemen) must be in a position above the wind direction or next to the direction of the wind, to avoid blowing smoke and flames. In carrying out their duties, the nozzleman must always follow the orders of the team head, and the team head must always communicate with the pump operator (Pump man) and firefighters. Communication is done via a walkie talkie radio or using a loudspeaker (Megaphone).

The most important thing in extinguishing fires is to localize the fire as much as possible and prevent it from spreading to other facilities that have not yet been burned. If facilities that have been burned are deemed unsustainable, the fire team must concentrate on cooling the facilities that have not been burned so that the fire does not spread.

When the fire has been successfully extinguished, the fire team is responsible for cooling down the fire area by spraying water to locations where there are still embers or smoke so that the possibility of a further fire can be avoided.

DISCUSSION

Potential Fire Hazards

Hazard is a situation that has the potential to cause material and non-material harms to humans, property, production processes, the environment, and even the company's image (Supriyadi and Ramdan, 2017). The types of potential hazards in the workplace include physical factors, chemical factors, biological factors, ergonomic factors, and psychological factors. The level of hazard risk also depends on the level of hazard possibilities that exist and their severity (International Labour Organization Jakarta, 2013). The presence of Occupational Safety and Health (OSH) aims to create a safe and healthy work environment from hazards in the workplace. The first step towards realizing this goal is to identify hazards in the workplace (Haqi, 2018). Hazard identification is carried out by classifying activities, locations, rules, and production functions or processes. Several steps can be taken to identify hazards in the workplace such as inspections, information gathering, work accident data, attendance, reports from the OSH, OSH committee, worker complaints, material safety data sheets, and others. Hazard identification can be done in routine or non-routine work in the company (Supriyadi and Ramdan, 2017).

As a company that operates in the oil and gas sector, the materials that are often used in the production process of the Central Java Oil and Gas Company are flammable chemicals, so it can be said that the potential for fire hazards in this company is quite high. Besides, the equipment used for production activities at this company is pipes and crude oil storage tanks which have the potential to cause fires. Fires can occur for many reasons, one of which is through leaks. The leak will release high-pressure gas from the flammable liquid, causing an explosion resulting in a fire (Haqi, 2018). A fire incident occurs through a process known as the fire triangle theory, where 3 elements interact with each other so that the fire is formed perfectly. These three elements are fuel, oxygen, and heat source.

As the first element, fuels are objects that easily react during the combustion process or the formation of a fire consisting of solid, liquid, and flammable gases. The second element is oxygen. A fire will not form if the oxygen level is less than 12% of the 21% oxygen content in the air. The third element is a heat source which acts as a trigger for the flame with a sufficient ignition temperature. The chain reaction of these three elements supports the fire so that the burning fire can live continuously. With this chain reaction, the perfect theory is called the tetrahedron of fire (Ramli, 2010a). Hence, the fire incident occurs through a process with 3 elements, namely fuel, oxygen, and heat sources. The three elements will meet and react in a chain. If one element is removed, the fire can be extinguished. This theory is also used as a basis for preventing fires and overcoming them (Wicaksono and Ernawati, 2013). The danger of fire needs to be handled seriously because of the risks and impacts that can cause material harm or loss of life (Abidin and Putranto, 2017).

Therefore, the company needs to determine and further research the potential fire hazard (Lubis, Soemirat and Permadi, 2019). The company itself has identified potential fire hazards following the Government Regulation No. 50 of 2012 concerning Occupational Health and Safety Management Systems as an initial review of OSH conditions. Hazard identification is the first step to systematically identify the hazards from the entire series of activities or production processes of the company. Identification contains an assessment of potential hazards based on the results of analysis and evaluation so that the magnitude of the risk can be determined. The results of this hazard identification will be used as a basis for risk control (Supriyadi and Ramdan, 2017). Besides, hazard identification

will help minimize the risk of potential hazards that arise through the control hierarchy (Abidin and Putranto, 2017).

Facility

Active Protection Systems

Fire facilities are fire protection systems, both active and passive systems, which are implemented as a form of fire prevention and control (Kowara and Martina, 2017). Decree of the Minister of State for Public Works No. 10 of 2000 explains that an active protection system is a fire protection system that is implemented using equipment that can work automatically or manually, used by residents or firefighters in carrying out extinguishing operations. Besides, this system is used in implementing the initial fire response. Active protection systems are used to support fire protection in the form of fire extinguishers, hydrants, sprinkler systems, and fire alarm systems (Minister of Health, 2016).

The use and installation of fire extinguishers in the workplace must certainly be adjusted to the potential hazards, hazard classification, and distance of placement. The materials and equipment used in the production area of this Oil and Gas Company, including crude oil, are included as inflammable liquid materials, and there is also an electrical installation in this company. Based on these considerations, the fire extinguisher used is a type of CO₂ chosen according to the class of fire which is a hazard risk in the production area (Pradipta, 2017). According to the Minister of Manpower and Transmigration No.4 of 1980, fires are classified based on the source of the fire, namely group A for fires of solid materials except metal, group B for flammable liquid or gas fires, group C for fires with voltage electrical installations, and group D for fires of metal types. Meanwhile, fire extinguishers are divided into 4 types which will help in extinguishing the fire precisely according to their purpose. The four types of fire extinguishers are liquid (water) type of fire extinguishers used to extinguish class A fires; foam type of fire extinguishers used used to distinguish class A and B fires; dry powder type of fire extinguishers used to extinguish class A, B, and C fires; and gas / CO₂ type of fire extinguishers used to extinguish class B and C fires. Meanwhile, class D fires require a special fire extinguisher to extinguish them. The placement of the fire extinguishers has also followed a regulation which states that the height of the installation marking is 125 cm from

the floor, the distance from one another does not exceed 15 meters, all fire extinguishers are coloured red and marked with a red triangle as a sign of the APAR installation, and inspections are carried out 2 times a year for 6 months. An appropriate placement of fire extinguisher signs is needed as information to workers so that the fire extinguisher is easily accessible and supports fire prevention efforts (Wicaksono and Ernawati, 2013).

To support fire prevention and control, it is necessary to implement a good hydrant in accordance with applicable regulations so that companies are ready to face fires to the maximum and can reduce the consequences that may occur and result in losses (Hamid, 2019). Hydrants are also useful when the fire extinguisher is not functioning properly. Besides, extinguishing a fire using a hydrant is considered better because the fire can be easily extinguished (Qiom, Sumangaun and Ashari, 2018). The placement of the hydrant, both the hydrant pillar and the fire box, also needs special attention. The hydrant must be placed in an area that is easily visible and easily accessible to make it easier for the firefighting team to put out fires (Abidin and Putranto, 2017). Hydrant inspections are carried out periodically to prepare the hydrant in good condition and ready to use when a fire occurs, which will minimize the severity of risks and losses (Hamid, 2019).

The tanks that hold crude oil also have an active fire protection system, namely a foam chamber and a water sprinkler. A foam chamber is a device designed to protect flammable liquid storage tanks. The foam will come out of the foam chamber and lead to the inside of the storage tank wall and the fuel surface. The foam chamber is attached to the top of the storage tank with a red enamel coating (Solberg, 2014).

Meanwhile, the water sprinkler according to the Indonesian National Standard 03-3989-2000 is a permanent fire extinguishing installation system that can extinguish fires automatically by spraying water where the fire starts. The system in this installation works automatically by emitting pressurized water in all directions to extinguish fires and prevent the fire from spreading. The water sprinkler is an effective and economical installation for fire fighting, especially in storage tanks, and it has been designed following fire protection engineering standards where the system is activated by heat from the fire. The water sprinkler works when the seal breaks due to the heat of the fire caused by the fire (Putri, 2017).

The seal will break when the heat released reaches a certain temperature, thereby activating the water sprinkle (Frank *et al.*, 2013).

The breaking of the seal on the water sprinkler will also activate the fire alarm that is connected to the water sprinkler. According to the National Fire Protection Association (NFPA), a good fire alarm system is one that is integrated with water sprinklers because fires are detected by not only workers' monitoring but also by detection devices such as this fire alarm system (Lubis, Soemirat and Permadi, 2019). In practice, the fire alarm must consist of a manual alarm as well as an automatic alarm (Ratnayanti, Hajati and Utama, 2019). The alarm on the water sprinkler is an automatic alarm. After the alarm is on, the fire pump will be active and the water sprinkler will automatically water the area where there is a fire. Besides, there is also a smoke detector which is a tool that can detect the presence of smoke from combustion through its sensor. Alarms use resonance to increase sound intensity. Therefore, alarms are more often used as a warning sign of an emergency because the sound produced is very noisy in the ears (Rizki, Sara and Gapy, 2017). The sound and rhythm of the alarm must also be distinctively designed and easily recognizable (Ratnayanti, Hajati and Utama, 2019).

Hydrants and water sprinklers cannot work without water flow as the main component. Hydrants and water sprinklers are assisted by fire pumps which play a role in the supply of water from the water reservoir to the fire extinguisher piping installation (Haramain, Effendi and Irianto, 2017). According to the NFPA, a pump (NFPA 20) is an extinguishing component that must be available to support the function of hydrants and water sprinklers as an active protection system (Arif and Widodo, 2014).

If the fire pump is damaged, water cannot flow because the fire pump plays an important role in the fire extinguishing system. This is why routine testing, inspection, and maintenance of the fire pump is important to determine the reliability of the unit. Thus, when a fire occurs the fire pump can operate properly. According to the NFPA, fire pump inspections need to be carried out at least once a year (Barametsakun and Thusneyapan, 2018).

Fires must also be handled as quickly as possible so that they do not cause the fire to spread and cause greater losses. Hence, when doing fire fighting, a mobile fire extinguisher that can work quickly, precisely, and efficiently like a fire engine is also needed. This vehicle is different from other

vehicles in general in terms of its function. A fire engine is a motorized vehicle that has high mobility and can easily move to the location of the fire by carrying equipment and water for extinguishing which is ready to be sprayed at the fire point. In addition, A fire engine must have a good operating system, both in terms of pumps, piping installations, water flow processes, and others so that fire fighting can be overcome (Sugiyanto and Anmar, 2018).

Passive Protection Systems

Passive fire protection systems are an important part of a fire emergency response strategy. Passive protection systems also play a role in protecting everyone and limiting damage to buildings and their contents from fires through the regulation of the use of building materials and components, compartmentalization or building separators based on the level of fire resistance, and protection of openings (Minister of Public Works, 2008). Means of escape from emergencies such as fires that must exist are evacuation routes and muster points. Fire support facilities such as self-rescue facilities are needed in every inhabited place which has a potential danger of emergencies such as a fire (Pratama, 2016). The evacuation route is a special rescue route that is not obstructed by something and that can be passed by the users to reach a safe point in the event of an emergency, for example, a fire. The evacuation route can be accessed by a large number of people with a limited time so that it does not hamper the evacuation time and minimize the loss of casualties (Nurfajrida, Afifuddin and Abdullah, 2019).

The evacuation route will be connected to a safe point or commonly called a muster point. A muster point is the area/location where everyone will gather when a fire occurs (Pratama, 2016). Muster points are made more than one point so that they can be scattered in other areas and do not gather at just one point (Lubis, Soemirat and Permadi, 2019). The muster point writing is made with a green background and white text so that the writing can be read clearly (Miranti and Mardiana, 2018).

Workers who will use the evacuation route to get to the muster point must understand the evacuation map at that location. This is intended to facilitate workers in the process of self-rescue. Hence, the evacuation maps are installed in strategic places and are easily seen by workers (Akhmadi, Kumalawati and Arisanty, 2017)

In addition, the availability of posters and warning signs is also useful in increasing worker

vigilance at work, considering that this production area has a high risk of fire (Ardi and Hariyono, 2018). It is important for everyone, especially workers in the area to know and understand the posters and warning signs at the work site. Therefore, posters and warning signs are placed in an area that is easily accessible, and easy to read and remember so that everyone or workers can easily understand (Wicaksono and Ernawati, 2013).

Fire Management

The company realizes that emergency response is important to implement considering its purpose, namely as preparedness in facing emergencies. The implementation of fire prevention is part of the company's emergency response (Mufida and Martiana, 2019). In combating fires, it is necessary to form a team to deal with fires within the company. Personnel in the fire management team must have the responsibility for carrying out tasks, training support and facilities, teamwork, initial response, and simulation (Saputra and Saputri, 2018). This can be supported by training and emergency response simulations. However, training and emergency response simulations should be provided to not only the fire management team but also all workers in the company. Training is provided with the aim that all workers including the team have knowledge, sensitivity and ability in fire management (Saputra, Kridawati and Wulandari, 2019). The time for providing training is at least every 6 months, and if the training is given as often as possible it will be much better because participants will often receive a refresher on fire fighting materials (Lubis, Soemirat and Permadi, 2019).

The implementation of the simulation is an activity that is deliberately structured to be practiced by workers in conditions resembling a fire incident. This aims to test the alertness, understanding, and skills of firefighting implementation by workers so that workers are calm and not panic at the time of a fire incident (Mufida and Martiana, 2019). Besides, simulation is useful for ensuring that all facilities, both active and passive protection systems, are always ready to use and functioning properly. Before carrying out the simulation, the team needs to prepare a fire scenario in advance so that the sequence of activities, duties, and responsibilities of each who plays a role in the simulation is clear (Handayana, Suroto and Kurniawan, 2016).

In combating fires, companies must also make fire management SOPs. The preparation of fire

management SOPs is important and is related to guidelines for taking steps or actions to be taken when a fire occurs (Mufida and Martiana, 2019). This SOP contains steps for a fire early notification, evacuation implementation, inspection and maintenance of fire protection equipment (Karimah, Kurniawan and Suroto, 2016). SOPs are made with the aim that the team can carry out targeted executions (Lubis, Soemirat and Permadi, 2019).

Fire suppression, especially in the Oil and Gas Company with several vital assets in it, needs right strategies to prevent the spread of fires, which might lead to a more diverse and bigger impact (Imamuddin and Zulwisli, 2019). One of the strategies is a cooling technique. Cooling is done to reduce the temperature of the burning steam or gas to its flame temperature. This technique is a technique commonly used by firefighting teams (Ramli, 2010a).

CONCLUSION

OSH has a broad scope in its implementation because OSH has now become a necessity for individuals and groups. Coupled with the government's obligation to implement OSH in all sectors of work, one of the efforts in OSH is related to the fire emergency response system. The Central Java Oil and Gas company has implemented an emergency response system, especially for fires by facilitating active and passive protection facilities. The company has also established a fire suppression system as part of its fire emergency response system.

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