Implementation of Risk Management Based on ISO 31000 as a Risk Prevention Strategy for Diesel Fuel Receiving and Distribution Facilities

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Abstract. The activity of receiving and distributing diesel fuel consists of several stages in which each of these activities has potential risks. To minimize these risks, good risk management is needed to prevent uncertainty with a methodological approach. The focus of this research is to identify risks at PT Rahardja Wirasakti Jaya Mandiri during the Covid-19 pandemic to analyze the risks that exist in each of these events and then provide recommendations. Job Safety Analysis (JSA) which refers to ISO 31000 is used for the identification, assessment, and management of existing risks. The JSA method is used to analyze and formulate prevention recommendations. In the process of receiving and distributing diesel fuel, there are 12 stages of activity with 33 potential hazards. Based on the measurement of likelihood and severity, there are 6 risks of high-level potential hazards and 27 risks of medium-level potential hazards.

Keywords: ISO 31000, diesel fuel, JSA, risk management, assessment.

1 Introduction

The demand for diesel fuel products during the Covid-19 pandemic throughout 2020 and 2021 in the Bangka and Belitung islands is still relatively stable, considering that biodiesel is needed as one of the main energy sources to date. To be able to meet the demand for diesel fuel, companies that can provide services for receiving, storing, and distributing oil products are needed. One company that can offer this service is Rahardja Wirasakti Jaya Mandiri (RWJM). The company is located in Belinyu District, West Bangka Regency, Bangka Belitung Islands Province. Currently, the company is collaborating with the National Electricity Company or Perusahaan Listrik Negara (PLN) for receiving, storing, and distributing activities of diesel fuel products. The fuel received by RWJM is sent by third-party logistics (3PL) using a Self Propelled Oil Barge (SPOB) from the nearest depot or Refinery Unit of Pertamina.

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The diesel fuel that arrives at the company's jetty will be unloaded by company workers and transported to the company's storage facilities using pipeline. The company's storage facilities can store up to 28,000 kiloliters of fuel products, divided into several sizes of storage tanks. Currently, the company has 5 units of storage tanks with a capacity of 5,000 kiloliters and 1 unit of storage tanks with a capacity of 3000-kiloliters. After the storage process is complete, the diesel fuel product will be distributed to Perusahaan Listrik Negara (PLN) and several public fuel filling stations (SPBU) in the Bangka and Belitung areas using tank trucks and small SPOB ships.

In the process of receiving and distributing diesel fuel, several stages have the potential to pose risks in terms of occupational health and safety which can cause harm to all parties involved. It is recorded that there have been 34 work accidents in downstream oil and gas business activities in Indonesia in 2020 consisting of 20 minor accidents where small accidents do not have a big impact on the company, 9 moderate accidents where an accident that has little impact on the company but does not make the company stop operating, 4 serious accidents where accidents can cause workers to become seriously ill or die, or the company stops operating for a while to correct the mistakes, and 1 fatal accident where a very unexpected accident occurs such as a fire or explosion because it can affect the surrounding area [1]. Seeing that there are still dangerous events that occur in this activity, the authors conducted this study to analyze the risks arising from the process of receiving and distributing diesel fuel that occurred at PT. Raharadja Wirasakti Jaya Mandiri so that it can provide preventive action strategies that can be taken by the company.

2 Literature Review

2.1 Risk

Risk can be said as a combination of the possibility of an event and the consequences of an unpredictable event with the possibility that the event can result in an unwanted loss impact [2]. Risk is also a hazard and consequence that can occur as a result of an ongoing process or future event or can be interpreted as an uncertain situation, where if an undesirable situation occurs it can result in a loss [3]. Risk can occur anytime, anywhere and to anyone, that's why it is said that risk is unpredictable. Therefore, it is necessary to carry out risk management to minimize the risks that can occur so that there are preventive actions that are certainly good for the company and workers. The risk management process applied in this research concerns the risk issues in the process of receiving and distributing fuel oil products which are then determined by expert consideration. Risk identification, risk analysis, risk evaluation, and risk treatment are processes that exist in risk management [4].

2.2 ISO 31000 – Risk Management and Policy of Risk Management

The International Organization for Standardization (ISO) has made a stipulation which is expected to become a risk management standard that can be used by all countries, one of which is ISO 31000. With the implementation of ISO 31000, not only international companies but national companies are also expected to create better coordination related to risk management based on harmony and communication of a company [5]. ISO 31000 was developed to provide general principles and guidelines for the implementation of risk management.

ISO 31000 also adapts the concept of PDCA (Plan, Do, Check and Act) in its implementation as a general framework for risk management. ISO 31000 is not a standard that is useful for uniform risk management throughout the company but is intended to provide an application of risk management to realize the vision and goals of the company which is not only in terms of security but also in terms of information systems, financial, operational management and so on [3]. The risk management policy must determine the company's attitude towards risk and its approach to risk management. The definition of risk management policy by ISO 31000 is stated as a statement of the company's overall intent and direction related to risk management [6]. In addition, the organization's goals and commitment to risk management must be clearly defined. The existence of risk management on the activity at work, it will help decision-makers to make policies quickly and adaptively to changes.

2.3 Job Safety Analysis

In identifying hazards and risks in the world of work, there are several methods. One of the commonly used methods is Job Safety Analysis (JSA). This method can be used as a tool to analyze the hazards of work by focusing on the relationship between objects of interest such as workers, tasks, tools and work environment. According to OHSA 3071 revised in 2002, Job Safety Analysis is an analysis of occupational hazards that focuses on observing work tasks to identify hazards that can lead to work accidents. The steps for using this method are starting with detailing the work steps, identifying potential hazards from the work activity steps and finally determining the control through an analysis that has been made previously.

3 Research Methodology

The methodology used in this research is the descriptive analysis method with qualitative and quantitative approaches through three processes, namely: early-stage and preparation process, risk management process, and final stage (discussion and result) process. By implementing risk management based on ISO 31000, the result is expected to assist RWJM to map out possible risks, the level, and criteria of risks that can occur.

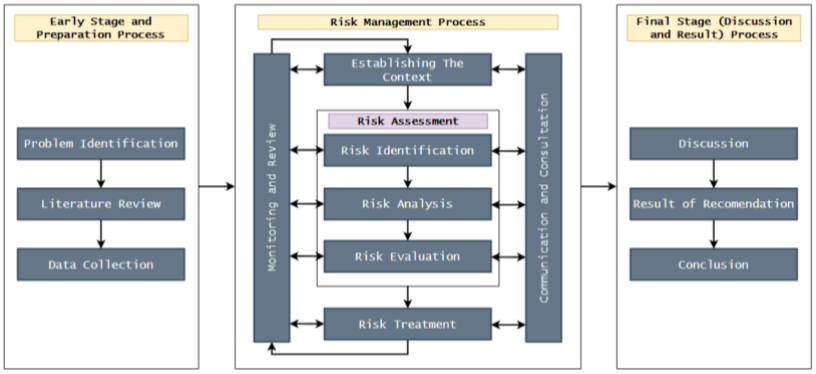

Figure 1. Research Method and Risk Management Process Based ISO 31000

The first stage is the preliminary stage of research, starting from identifying the problem and its objectives, then literature review to study the basis to the development of the topic raised, and finally data collection with data collection methods carried out by observation, literature study,

and interviews. The second stage is the stage of implementing the risk management process consisting of several parts, namely communication and consultation, establishing the context, and risk assessment. As for the risk assessment stage, it consists of 3 parts, namely risk identification, risk analysis, and risk evaluation which refers to the manual owned by PT. Pertamina Exploration and Production [7] and NEBOSH International Certificate in Oil and Gas Safety [8]. At this stage, JSA is used as a tool to identify, analyze and evaluate risks that may occur. In addition, JSA is used at this stage because the scope of this research focuses on activities in the process of receiving and distributing diesel. While the last stage is the discussion and result stage that discuss for risk treatment based on risk evaluation until meet the conclusion.

Table 1. Qualitative Measures of Severity

Level of Severity	Severity Description
1	Insignificant Impact
2	Minor Impact
3	Moderate Impact
4	Major Impact
5	Catastrophic Impact

Table 2. Qualitative Measures of Probability

Level of Probability	Probability Description
A (1)	Unheard of in the upstream and downstream oil and gas industry.
B (2)	Heard in the upstream and downstream oil and gas industries.
C (3)	This has happened in the upstream and downstream oil and gas industries in Indonesia.
D (4)	Happens several times per year in the upstream and downstream oil and gas industries in Indonesia.
E (5)	Occurs several times per year at a company or workplace.

Table 3. Measures of Risk Level

Value Range	*Risk Level*
1 - 7	*Low*
8 - 14	*Medium*
15 - 25	*High*

Table 4. Risk Mapping - Matrix of Risk Evaluation

Severity Level	Consequences to Objects			Probability Level				
				A (1)	B (2)	C (3)	D (4)	E (5)
	Human	Equipment	Environment	Rare	Unlikely	Possible	Likely	Certain
1	Insignificant Impact			1	2	3	4	5
2	Minor Impact			2	4	6	8	10
3	Moderate Impact			3	6	9	12	15
4	Major Impact			4	8	12	16	20
5	Catastrophic Impact			5	10	15	20	25

4 Result and Discussion

This research focuses on the process of receiving and distributing fuel in the company. The data collection process obtained information regarding the stages of receiving diesel fuel from the company, which can be seen in the following flow chart where AR shows activities of receiving and AD shows activity of distribution.

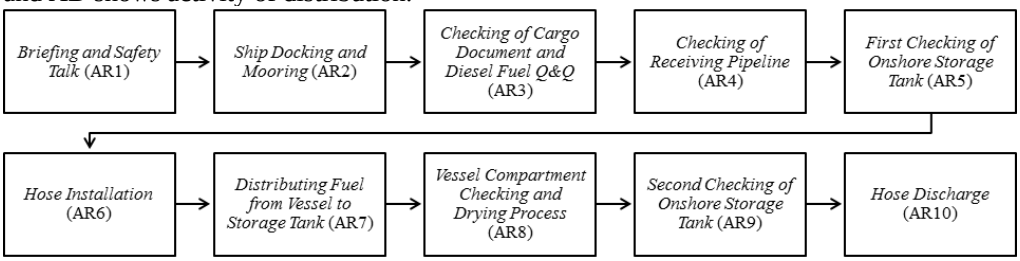

Figure 2 Diesel Receiving Activity

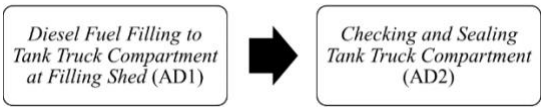

Figure 3 Diesel Distribution Activity

4.2 Communication and Consultation

To analyze the risks that may arise from the process of receiving and distributing diesel fuel at PT. RWJM and to provide an overview of risk management that must be carried out by the company, the authors refer to ISO 31000. In ISO 31000 there are several stages carried out in the risk management process. These stages are communication and consultation, setting context, risk assessment, risk treatment, and risk monitoring and review. To uphold the accountability of the implementation of risk management, in this section the authors have conducted interviews with PT. RWJM stakeholders consisting of General Manager, HSSE Manager, The Manager of Receiving, Storage and Distribution as well as the field coordinator.

4.2 Establishing Context

After going through the process of communication and consultation, then the next step is getting into the context setting process. In this study, the internal context consists of the company's scope, namely human resources, internal regulations, and the company's organizational structure. Meanwhile, the external context consists of a scope that affects risk management such as government regulations, 3PL for product transportation, and company service users. In this study, human resources, internal regulations, and organizational structure are all parties or regulations involved in the Receiving and distribution of fuel. As for government regulations, 3PL transportation of products and service users (Perusahaan Listrik Negara) is a party that has the potential to influence the risk management process in this study.

4.3Risk Identification

In the process of risk identification, the authors conducted observations and interviews with company stakeholders. The results of the risk identification are as follows.

Table 5. Risk Identification

ID	Potential Risk
R1	Contamination of the Covid-19 virus while doing work
R2	The hull was damaged due to hitting the pier hard during the docking process
R3	Mooring lines were cut off and hit the crew on duty during the docking process
R4	The crew's hands were caught in the mooring lines during the leaning process
R5	Workers and crew of the ship slipped and fell on the way to the ship
R6	Workers and ship crews inhale and are exposed to chemical splashes when sampling diesel fuel (Quantity and quality checks onboard)
R7	Explosions and fires in the ship's tank due to the formation of the fire triangle principle
R8	Workers inhale and are exposed to chemical splashes during receiving activities
R9	Receiving facility contaminated with oil spill
R10	Explosions and fires due to the formation of the fire triangle principle (oxygen, oil spills, and static electricity)
R11	Falling, tripping, and slipping while climbing the stairs of the tank during the opening process
R12	Falling, tripping, and slipping while climbing the stairs of the tank during the closing process
R13	Falling, tripping, and slipping while on the storage tank during the opening process
R14	Falling, tripping, and slipping while on top of the storage tank during the closing process
R15	Workers and ship crews inhale and are exposed to chemical splashes when taking fuel sampling from onshore storage tanks during the opening process
R16	Workers and ship crews inhaled and were exposed to chemical splashes when taking fuel sampling from onshore storage tanks during the closing process
R17	Explosions and fires due to the formation of the fire triangle principle in the area around the storage tank during sampling
R18	Human error: hose installation error during the bolt tightening process
R19	Pinched and crushed by the hose during the hose installation process
R20	Pinched and crushed by the hose in the process of releasing the hose
R21	Pump technical fault
R22	Leak in a Receiving pipe
R23	Explosions and fires due to the formation of the fire triangle principle (oxygen, oil spills due to leakage, and static electricity)
R24	There is an oil spill in the water area
R25	A technical fault on submersible pump
R26	Human error: incorrectly disconnecting the hose resulting in damage
R27	Human error: an error in the installation and removal of the bottom loader resulting in an oil spill in the filling shed area
R28	Workers and truck drivers slip on oil spills around the filling shed area
R29	Pumping errors by diesel distribution operators, causing the potential for shortages or excess volumes of diesel being distributed
R30	Errors in using the gatekeeper resulting in the gate hitting the truck body
R31	Falling, tripping, and slipping while on a truck
R32	Workers inhale chemicals during tanker truck manhole inspection and sealing
R33	There was an explosion and fire due to the formation of the fire triangle principle when workers were on a tanker truck.

4.4 Risk Analysis

Based on table 5 in the risk identification section, the authors set a risk level limit for each potential by referring to the NEBOSH International Certificate in Oil and Gas Safety [8] with the provisions listed in table 1, table 2 and table 3 in the research methodology section. Meanwhile, after going through interviews with stakeholders, the authors obtain a value for each probability and severity with the following details:

Table 6. Risk Analysis

ID	*Severity*	*Probability*	*Value*	ID	*Severity*	*Probability*	*Value*	ID	*Severity*	*Probability*	*Value*
R1	5	4	20	**R12**	5	2	10	**R23**	5	3	15
R2	5	2	10	**R13**	5	2	10	**R24**	4	3	12
R3	5	2	10	**R14**	5	2	10	**R25**	3	3	9
R4	4	3	12	**R15**	2	4	8	**R26**	3	3	9
R5	4	3	12	**R16**	2	4	8	**R27**	4	3	12
R6	2	4	8	**R17**	5	3	15	**R28**	5	2	10
R7	5	3	15	**R18**	3	3	9	**R29**	4	3	12
R8	2	4	8	**R19**	3	3	9	**R30**	4	3	12
R9	3	4	12	**R20**	3	3	9	**R31**	4	3	12
R10	5	3	15	**R21**	4	3	12	**R32**	2	4	8
R11	5	2	10	**R22**	4	3	12	**R33**	5	3	15

Based on the risk analysis, there are 5 out of 33 risk which based in their severity are classified as minor impact, while the other 6, 9 and 13 are respectively grouped as moderate, major and catastrophic. Based on the possibility of occurrence 7 out of 33 are likely to happen, 19 out of 33 are possible while the remaining 7 are unlikely. The severity and occurrence of 33 risks are shown in figure 4.

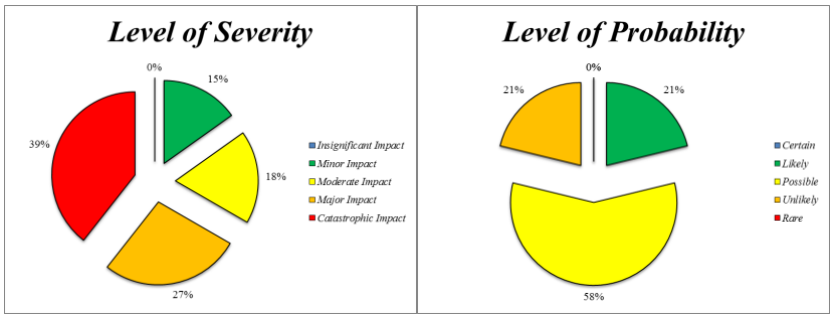

Figure 4. Level of Severity and Level of Probability

4.5 Risk Evaluation

In the evaluation process, the authors used JSA Risk Assessment Technique to provide recommendations for preventive actions from possible potential hazards that can occur and then make a risk mapping recapitulation as a matrix of risk evaluation for the Receiving and distribution of diesel fuel at PT. RWJM. The details of JSA in acceptance activities can be seen in figure 5 where AR shows activities for receiving, AD shows activity for distribution and R shows about risk that may occur based on table 5.

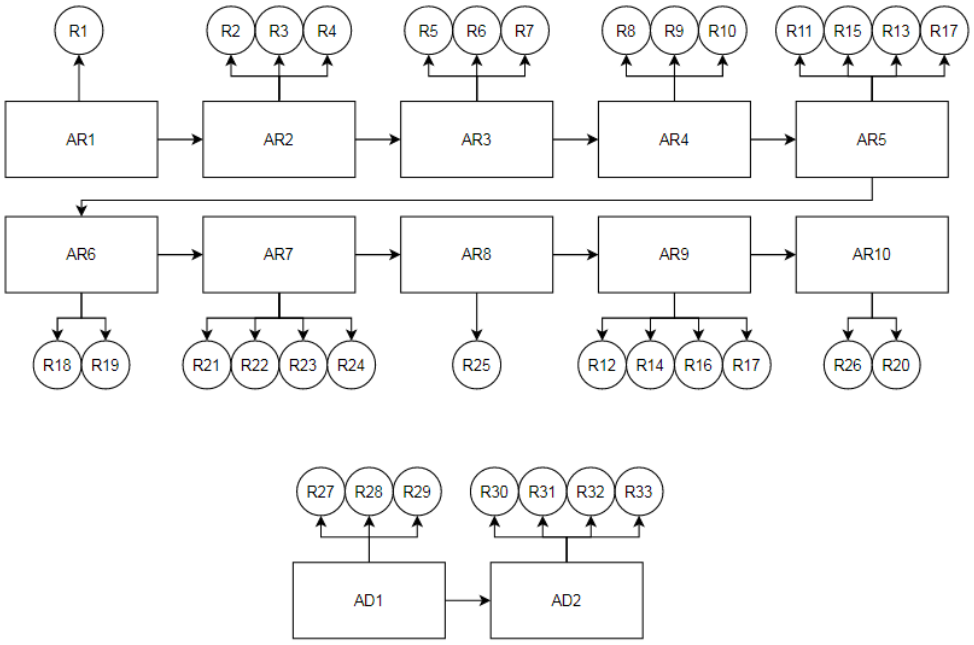

Figure 5. Risk Recapitulation JSA - Diagram

Table 7. Risk Mapping - Risk Evaluation Recapitulation

Severity Level	Consequences to Objects	Probability Level				
		A (1)	B (2)	C (3)	D (4)	E (5)
		Rare	Unlikely	Possible	Likely	Certain
1	Insignificant Impact					
2	Minor Impact				R6, R8, R15, R16, R32	
3	Moderate Impact			R18, R19, R20, R25, R26	R9	
4	Major Impact			R4, R5, R21, R22, R24, R27, R29, R30, R31		
5	Catastrophic Impact		R2, R3, R11, R12, R13, R14, R28	R7, R10, R17, R23, R33	R1	

From the risk evaluation results, it was found that 6 out of 33 risks were classified as high risk (18%). While the rest fall into the medium level risk (82%) without any risk categorized the low-level risk as shown in Figure 6.

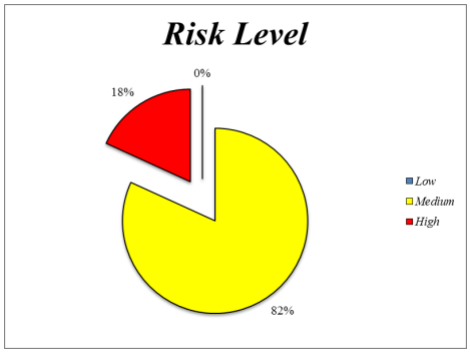

Figure 6. Risk Level

4.6 Risk Treatment

To overcome the problems that exist in PT. RWJM, the following is an arrangement of treatments that can be used by companies to overcome potential hazards that occur in the process of receiving and distributing diesel fuel based on an analysis that has been carried out with job safety analysis. The type of treatment can be seen in table 8.

Table 8. Risk Treatment

Risk Treatment ID	Description
PA1	Hold on to the stair railing when climbing stairs
PA2	Standing on iron on the safe path that is available while doing a check on the tank
PA3	Good communication between ship crew and chief officer
PA4	Carry out activities according to applicable SOP
PA5	Re-check the hose before diesel fuel is distributed
PA6	Carry out routine pump maintenance processes in accordance with applicable SOP
PA7	Carry out the sampling process in accordance with the SOP
PA8	Conducting an antigen test to all workers and ship crews and requiring the use of masks during work.
PA9	Wear full PPE
PA10	Ensure the installation of the rope according to the SOP
PA11	Bring extra lighting if it's dark
PA12	Observe and analyze the sea level
PA13	Pay close attention to footsteps when climbing and being on the tank
PA14	Using full body harness when on the tank
PA15	Stopping activities when it rains heavily and conditions are slippery
PA16	Stop the disassembly process and make repairs to damaged pipes
PA17	Avoid standing in the snapback zone
PA18	Improve coordination and good communication between workers
PA19	Maintain a safe distance between workers during the initial briefing.
PA20	Provide APAR and firefighting facilities and install grounding
PA21	Provide rubber on the edge of the jetty
PA22	Providing oil bombs in the waters around the jetty
PA23	Provide sand, sawdust, rags and drums when carrying out activities

Risk Treatment ID	Description
PA24	Provide a crossing ladder to the ship in accordance with applicable standards
PA25	Periodic inspection of mooring lines before activities
PA26	Increase concentration and remind each other among workers
PA27	Improve concentration while on the truck

Furthermore, the process of risk treatment to prevent the potential risk in receiving and distributing diesel fuel can be seen in table 9 where AR shows activities for receiving, AD shows activity for distribution and PA shows about preventive action based on risk treatment that list on table 8.

Table 9. Risk Treatment Recapitulation

Activity	*Potential Risk*	*Risk Treatment*	*Activity*	*Potential Risk*	*Risk Treatment*	*Activity*	*Potential Risk*	*Risk Treatment*
AR1	R1	PA8, P19	AR5	R13	PA9, PA2, PA1, PA11, PA15, PA14	AR9	R14	PA9, PA2, PA1, PA11, PA15, PA14
AR2	R2	P21,PA3, PA12		R15	PA9, PA7		R16	PA9, PA7
	R3	PA3, PA25, PA12, PA17, PA10		R17	PA20		R17	PA20
	R4	PA18	AR6	R18	PA18, PA5	AR10	R20	PA18, PA5
AR3	R5	PA9, PA24		R19	PA9, PA18		R26	PA9, PA18
	R6	PA9, PA7	AR7	R21	PA6	AD1	R27	PA9, PA18, PA23
	R7	PA20		R22	PA16		R28	PA21, PA3, PA12
AR4	R8	PA9, PA4		R23	PA20		R29	PA26
	R9	PA23		R24	PA22	AD2	R30	PA9, PA1, PA2
	R10	PA20	AR8	R25	PA6		R31	PA9, PA27, PA4, PA18
AR5	R11	PA9, PA1, PA13, PA11, PA15	AR9	R12	PA9, PA1, PA13, PA11, PA15		R32	PA9, PA7
							R33	PA9, PA20

5 Conclusion

By conducting a risk assessment using the JSA technique which refers to ISO 31000 for risk management, it was found that the implementation of ISO 31000 for RWJM risk management during the Covid-19 pandemic is highly recommended as risk prevention actions in the process of receiving and distributing diesel fuel. After going through risk management processes such as establishing the context, risk identification, risk analysis, risk evaluation, and risk treatment, it was found that there are 33 risks which are divided into 6 medium-level risks and 27 high-level risks in the Receiving and distribution of diesel fuel. The risk categories for low, medium, and high levels refer to the guidelines (NEBOSH International Certificate in Oil and Gas Safety) that can be seen in tables 3 and 4. These risks can be treated with types of treatment such as avoiding risks, controlling risks, separating risks, transferring risks, and accepting risks and preventive measures from these types have been listed in the JSA in the risk evaluation and risk treatment.

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