Warehousing Process Risk Management at PT Pertamina Internasional Refinery Unit II Production Sei Pakning: An Analysis With The HIRARC Method

Resista Vikaliana[1], Abdullah Salam Almutamakin[2]

{resista.vikaliana@universitaspertamina.ac.id[1],102419044@student.universitaspertamina.ac.id[2]}

Logistics Engineering, Faculty of Industrial Engineering, Universitas Pertamina, Jakarta, Indonesia

Abstract. PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning which was founded by Refining Associates (Canada) in 1968. This refinery is one of the Refinery Unit II which carries out oil management activities in the Sumatra area. At PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning, it has a warehouse which is divided into 4 sheets, and sheet 2 is used as a storage place for chemical materials and general materials. This study aims to identify hazards, analyze risk levels, and carry out risk controls that can be applied to the PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning warehouse using the Hazard Identification Risk Assessment and Risk Control (HIRARC) method. The results of this study indicate that there are 17 potential hazards, of which 9 are found for low risk levels, 4 for medium risk levels, 1 for high risk levels, and 3 for extreme risk levels.

Keywords: HIRARC, risk, warehouse, refinery unit, mitigation

1 Introduction

In a company, the logistics sector has an important role in supporting the company's activities. There is no industrial company that does not have logistics activities in it. In logistics, many things are learned such as distribution and transportation, supply chain, and warehousing from a company. In a company, there is a warehouse to support their activities because it is an important part of a logistics activity [2], the warehouse has an important role in the activity of the flow of goods for the company and is part of the industry [6]. Warehouse can be interpreted as a place or room that is used as a temporary storage area for goods which will be stored first before being given to the user or consumer based on the needs required by that party [13]. In a warehouse, if the conditions, management and service are good, it is expected to prevent the company from losses, minimize existing costs, and speed up the operations of the company's warehouse [8].

In its activities, all entities have the possibility of having potential risks [11][15]. Risk is the possibility of an event occurring that has the potential to affect objectives or a state of

ICONIC-RS 2023, September 21-22, Bali, Indonesia
Copyright © 2024 EAI
DOI 10.4108/eai.21-9-2023.2345669

uncertainty, the level of uncertainty can be measured in the form of numbers or quantitative data [1][7]. Risk is something that is always related to almost every work activity [12]. Because risks can threaten the safety of workers or cause harm to the company, serious action is needed. Meanwhile, risk is a hazard, result, and consequence that can occur due to a process that is happening or that will happen in the future [5]. In this case, risk can also be interpreted as an uncertain situation where if an unwanted situation occurs it can cause losses to the company. However, these risks can be anticipated by preventing risks or controlling these risks.

PT Pertamina Internasional Refinery Unit II Sungai Pakning is a company engaged in the oil and gas industry. At PT Pertamina Internasional Refinery Unit II Sungai Pakning, it processes crude oil into BBM (fuel oil) and non-fuel products. The finished products for BBM are MFO (Marine Fuel Oil), diesel or ADO (Automotive Diesel Oil), LSFO (Low Sulfur Fuel Oil), Kerosene, and Naphtha. As for non-fuel products, PT Pertamina Internasional Refinery Unit II produces LSWR (Low Sulfur Wax Residue) products.

The warehouse at PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning is divided into 4 Sheets. Warehouse 1 is divided into 3 sections where section 1 is used as a storage area for general material goods, section 2 is used as a storage area for spare parts such as belts and gaskets. And in section 3, namely the cold warehouse where the warehouse is used to store goods that must be stored in cold temperatures, for example, the goods stored in the cold warehouse are bearings. Sheet 2 is used as a storage area for large general material items. These goods are not stored in warehouse 1 because the goods to be stored are large which will make warehouse space 1 smaller. Apart from being used as a storage area for large general materials, Sheet 2 is also used as a storage area for chemicals. Sheet 3 is used as a storage area for oil, and Sheet 4 is used as a storage area for scrab items or materials that are no longer used because the unit is no longer in use.

A warehouse is a place or storage area for an item where the item can be in the form of raw goods that will be processed into finished goods or finished goods. The item is temporarily stored until it can be shipped. A warehouse is an area where goods are stored in the form of raw materials which will then be carried out by the production process or where finished goods are stored ready to be issued [9]. In the warehousing there are not only goods storage activities, but there are many other activities such as receiving, recording existing stocks of goods, selecting, sorting and selecting goods, labeling goods, handling a material, and the shipping process.

A warehouse is a building that has the function of storing goods or materials [14]. The stored goods or materials can be in the form of raw goods, semi-finished goods, spare parts, and goods that will be processed and prepared for the needs of the production process. A warehouse is a place or area that is used to store goods such as raw goods, semi-finished goods, and finished goods [10]. In the warehouse there are several activities carried out such as receiving goods, storing goods, handling goods, maintaining goods, packaging goods, issuing goods, sending goods, distributing goods, inspecting goods, and controlling goods.

In the chemical warehouse area of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning in the warehousing processes that occur there are risks that arise. Starting from the method of storing and caring for the stored material which still poses a risk, the material handling equipment (MHE) used was not functioning, and the method for taking and

dispensing material can still pose a risk. With these existing risks, it is important for the chemical warehouse area of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning to be used as an observation area for practical work reports. Based on observational activities in the chemical warehousing area, it was found that risks were a problem and would have a major impact on activities in that area. To identify the risks that occur and how to minimize these risks, the authors use the HIRARC (Hazard Identification Risk Assessment Determining Control) method. By using this method, it can assist in the process of identifying existing hazards, then analyzing the level of hazard that occurs and taking preventive measures [11].

Based on the background, the objectives of this study were:to know what factors are causing problems in the chemical warehouse area of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning.and also provide appropriate risk mitigation for problems that exist in the chemical warehouse area of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning.

2 Method

Collecting data in this study were field observations, interviews, and literature studies. The data analysis used is Hazard Identification Risk Assessment and Risk Control (HIRARC).

HIRARC is a method used to identify hazards, analyze hazards, and control risks in the activity process of a system [11]. The risks obtained from this method are then carried out risk assessment and risk control which aims to minimize the hazards that occur in each type of work [3].

The HIRARC method provides an important component that is useful in assessing existing hazards, evaluating the possibility of a hazard occurring, and providing the best control and relevant hazard identification [4]. In implementing the HIRARC method, there are three stages, namely hazard identification, risk assessment, and risk control.

3 Results and Discussion

The production business of PT Pertamina operates six refineries located in several regions with a total capacity of 1,046.70 thousand barrels. The six production refinery units owned by Pertamina are RU II Dumai-Sungai Pakning, RU III Plaju, RU IV Cilacap, RU V Balikpapan, RU VI Balongan, and RU VII Kasim. The RU II Sungai Pakning Fuel Oil Production Refinery is part of the Pertamina RU II Dumai refinery. PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning has a production capacity of 120 MBCD (Million Barrel Crude per day)..

PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning which was founded by Refining Associates (Canada) in 1968 and started production in December 1969. This refinery is one of the Refinery Unit II which carries out oil management activities in the Sumatra area. PT Pertamina Internasional Refinery Unit II Sungai Pakning manages crude oil into BBM such as Naptha, Kerosene, ADO, Marine Fuel Oil (MFO).The following Figure 1 is an organizational structure chart for the Procurement section of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning.

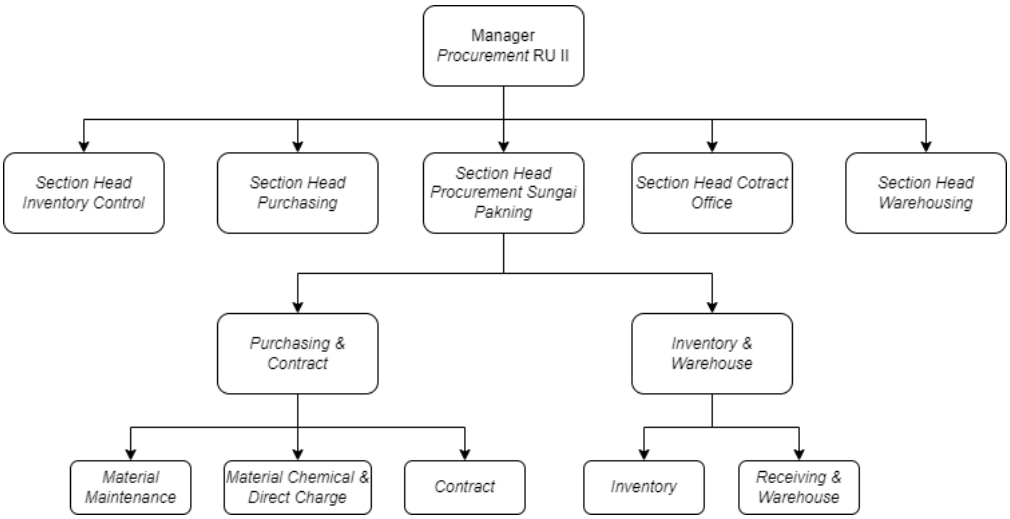

Fig.1. Organizational Structure of Procurement at PT Kilang Pertamina Refinery Unit II Sei Pakning.

The following is an explanation of the organizational structure of the Procurement Refinery Unit II:

- Section Head Procurement Sei Pakning
  1. Responsible for leading a certain section in an organization. Provide direction and coordinate team members to achieve the expected goals.
  2. Plan and organize activities within the team lead.

- Inventory and Warehouse
  1. Responsible for managing inventory or stock of goods owned by the company.
  2. Manage the process of receiving goods into the warehouse.
  3. Ensuring the bangs are neatly placed and easy to access. As well as managing efficient storage space to maximize warehouse capacity.
- Purchasing and Contracting
  1. Responsible for purchasing goods and services required by the company.
  2. Evaluating potential suppliers, including quality and price assessments.
  3. Prepare and draw up purchase contracts with suppliers.

In collecting the data needed in research to solve the problems raised, it is necessary to know the flow of the warehousing process at PT Pertamina Internasional Refinery Unit II Sungai Pakning. Figure 2 below is an illustration of the flow of the warehousing process.

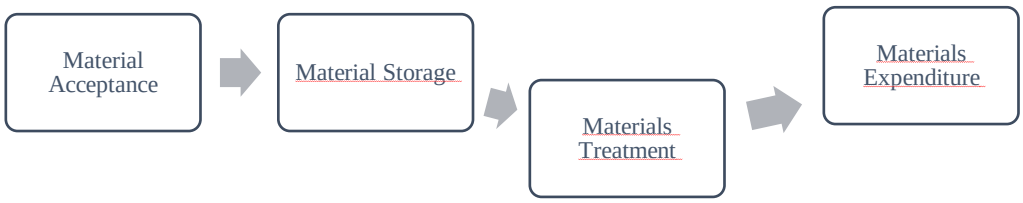

Fig.2. Warehousing process flow.

3.1 Risk identification

Risk identification is carried out in order to get any potential risks contained in each warehousing activity and help workers to be more careful and alert so that risks can be minimized. The method used in carrying out this risk identification stage is by making direct observations to see how each process of warehousing activity occurs and conducting interviews with workers who work in the large Chemical and general material warehouse division of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning. The following are potential hazards that have been found in the chemical and general material warehousing processes of PT Kilang Pertamina Internasional.

Based on the results of hazard identification that has been carried out, the potential hazards found in the Chemical warehouse of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning are as follows:

a. Manual handling
b. Have direct contact with chemical materials
c. Other workers/materials were hit by the pick up
d. Storage of solid chemical goods close to general materials
e. Storage of solid chemical materials using forklifts
f. Corroded material exposed to rainwater
g. Chemical packaging is damaged
h. The wooden pallets used were weathered by standing water
i. Incorrect storage of gas cylinders
j. General materials exposed to solid chemical materials
k. Hit by workers/other materials by forklifts
l. Stagnant water that interferes with the material taking process when it is raining

3.2 Risk assessment

Risk assessment is carried out to determine the value of the potential risks that have been obtained. This risk assessment is based on the likelihood of the risk occurring (probability) and the potential severity of the event if it occurs (severity). The results of the assessment are then categorized based on the risk matrix used. Below is the result of the risk assessment that has been obtained.

There are 17 potential hazards that can cause work accidents and losses for the company, consisting of 9 low risk categories, 4 medium risk categories, 1 high risk category, and 3 extreme risk categories. It can be seen in the Figure 3 below.

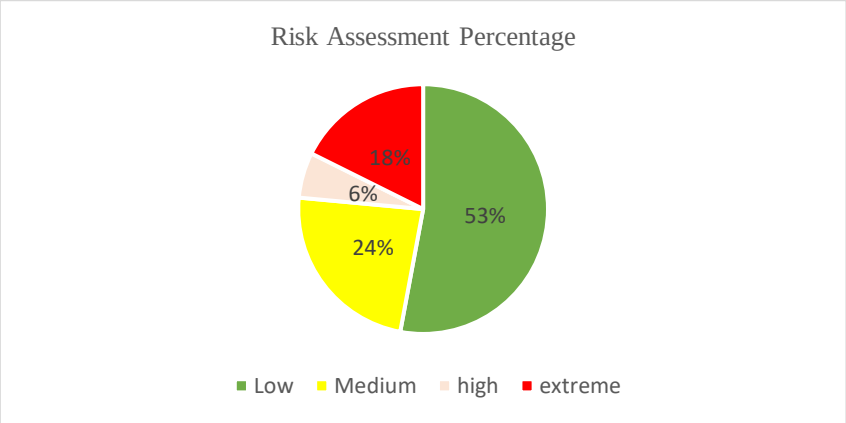

Fig.3. Percentage of risk assessment

3.3 Risk control

Risk control is carried out by prioritizing the identified hazards obtained in the identification process by considering the risk risk assessment. Controls are put in place to reduce the severity and seriousness of the identified hazard. The goal is to minimize the level of risk obtained. The following is a risk control table for the warehousing process at PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning.

The results of risk mitigation are obtained from the results of researchers' thoughts, journals, and SOPs at PT. Pertamina International Refinery Unit II Sei Pakning refinery. The following are suggested mitigations, especially for extreme levels of risk:

a. Potential hazard: storage of solid chemical goods close to general materia.

   Impact; general goods become corroded due to chemical substances

   Mitigation: Covering the chemical material with a lid so that no substance gets on the general material.

b. Potential hazard: chemical packaging is damaged

   Impact: chemical spills that can endanger workers and cause general materials to deteriorate quickly.

Mitigation: make repairs by closing or sewing up tears in chemical packaging

c. Hazard potential: general material exposed to chemical materials

Impact: in a solid chemical spill that spills onto the floor causes general material corrosion

Mitigation: carry out repairs by closing or sewing up tears in chemical packaging and immediately taking cleaning actions on spilled chemicals on the floor using work tools and PPE/Personal Protective Equipment,

4 Conclusion

Based on the results of hazard identification, risk assessment and risk control, it can be concluded that the hazard identification obtained is 12 potential hazards found in the Chemical warehouse of PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning. Meanwhile, based on the results of the risk assessment that has been carried out, the percentage of risk in PT Kilang Pertamina Internasional Refinery Unit II Sei Pakning's warehousing for a low risk level is 53%, a medium risk level is 24%, a high risk level is 6%, and an extreme risk level is 18%.

This research recommends PT. Refinery Pertamina Internasional Refinery Unit II Production Sei Pakning to make a cleaning place for workers if they have direct contact with chemicals in the warehouse, repair damaged chemical packaging by closing or sewing the packaging, storing gas cylinders in chains and securing them to the wall, and carrying out repairs on the roof of the warehouse which has a leak so that rainwater cannot inundate the warehouse and make the wooden pallets rot and corrode general materials.

References

[1] 4360, AS/NZS.: Risk Management guidelines. pp. 52-55. Standards Australia/ Standards New Zealand, Sidney (2004)

[2] Bencana, Badan Nasional Penanggulangan.: Pedoman Pergudangan. Jakarta: Badan Nasional Penanggulangan Bencana. (2009)

[3] Castillo, A., Bilbao, A., & Bilbao, E.: A Risk Management Method Based on the AS/NZS 4360. (n.d.)

[4] Erliana, C. I., & Azis, A.: Hazard Identification and Risk Assessment At Switchard Station At PT. PJB UBJ O&M PLTMG ARUN Using Hazard Identification, Risk Analysis and Risk Control (HIRARC) Methods. Industrial Engineering Journal, (2020)

[5] Hanafi, M.: Manajemen Risiko. Unit Penerbit dan Percetakan Tinggi Ilmu Manajemen YKPN, Yogyakarta (2006)

[6] Lembaga Manajemen Pergudangan.: Modul Manajemen Logistik dan Peralatan. Sentul. IPSC, Bogor (2008)

[7] Mulyawan, S.: Manajemen Risiko. Pustaka Setia, Jakarta (2015)

[8] Purnawati, Y. N., Nurpajriani, & Dahlan.: Kajian Risiko Pengoprasian Gudang Materil. (2015)

[9] Purnomo, H.: Perencaan dan perancangan Fasilitas. Edisi Pertama. Penerbit Graha Ilmu, Yogyakarta (2004)

[10] Siahaya, W.: Sukses Supply Chain Management Akses: Demand Chain Management. In Media, Jakarta (2013)

[11] Smith, C. W.: Corporate Risk Management: Theory and Practice. Vol. 2(4), pp. 21-30. Journal De-rivatieves, (1990)

[12] Triswardana, I. W., & Armaeni, N. K.: Penilaian Risiko K3 Konstruksi Dengan Metode Hirarc. Vol. 4(1), pp. 97-108. Jurnal UKARST (Universitas Kediri Riset Teknik Sipil), (2020)

[13] Van den Berg, J. Z.: Models for Warehouse management : Clasification and Exempels. Vol. 59, pp. 519-528. International Jounal of Production Economics, (1999)

[14] Warman, J.: Manajemen Pergudangan, Edisi Ketujuh. PT Puka Sinar Harapan, Jakarta (2012)

[15] Wijaya, A., Panjaitan, W. S., & Palit, H. C.: Evaluasi Kesehatan dan Keselamatan Kerja dengan Metode HIRARC pada PT. Charoen Pokhphand Indonesia. Vol. 3(1), pp. 29-34. Jurnal Tirta, (2015)