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Occupational Health and Safety (OHS) Analysis at The PG Kremboong Production Department using The Risk Priority Number and 5 Whys Method

Yoniv Erdhianto

Industrial Engineering Department, Faculty of Industrial Technology, Institut Teknologi Adhi Tama Surabaya

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ABSTRACT

Occupational Health & Safety (OHS) is not only important for improving the social security and welfare of its workers but far from that, K3 has a positive impact on the sustainability of employee work productivity. In term of safety, the production department of PG Kremboong still bring some risks that may cause work accidents, such as the leaks in the evaporator and juice heater body that frequently happened in the processing department. The hazard identification assessment uses the RPN (Risk Priority Number) method where each risk-causing factor is assessed by its value of severity, frequency or probability (occurrence), and detection, then illustrated with a Pareto Diagram to determine the most dominant problem. and using the five why's analysis method to analyze the root causes of the problem in order to obtain a solution. The most dominant risk in PG. KREMBOONG is a leak in the evaporator body that hits the worker and a leak in the juice heater body, based on RPN values which reached 36 and 27.

Keyword: *Work Safety And Health, Work Accidents, Risks*

EMAIL

yoniv@itats.ac.id

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Telp/Fax: 031-5997244

ABSTRAK

Kesehatan & Keselamatan Kerja (K3) tidak hanya penting untuk meningkatkan jaminan sosial dan kesejahteraan pekerjanya tetapi jauh dari itu, K3 berdampak positif terhadap keberlanjutan produktivitas kerja karyawan. Dari sisi safety, bagian produksi PG Kremboong masih memiliki beberapa risiko yang dapat menyebabkan kecelakaan kerja, seperti kebocoran pada evaporator dan body juice heater yang sering terjadi di bagian processing. Penilaian identifikasi bahaya menggunakan metode RPN (Risk Priority Number) dimana setiap faktor penyebab risiko dinilai berdasarkan nilai keparahan, frekuensi atau probabilitas (kejadian), dan deteksi, kemudian diilustrasikan dengan Diagram Pareto untuk menentukan masalah yang paling dominan. dan menggunakan metode analisis lima mengapa untuk menganalisis akar penyebab masalah untuk mendapatkan solusi. Risiko paling dominan di PG. KREMBOONG adalah kebocoran pada body evaporator yang menimpa pekerja dan kebocoran pada body juice heater, berdasarkan nilai RPN yang mencapai 36 dan 27.

Kata kunci: *Keselamatan Dan Kesehatan Kerja; Kecelakaan Kerja; Risiko.*

INTRODUCTION

Work safety is safety related to human work activities both in industry, manufacturing and construction, which involves machinery, equipment, material handling, steam planes, pressure vessels, raw material work tools and their processing processes, workplaces and their environment as well as methods. doing work, as well as service industries, which involve building cleaning equipment, means of transportation, and others Meggison in [1]. Occupational Safety and Health is not only important to improve social security and welfare of workers, but far from it, Occupational Safety and Health has a

positive impact on the sustainability of work productivity. Therefore, occupational safety and health for now is not just an obligation that must be considered but must be fulfilled for the needs of workers.

PG. Kremboong, which is located in Kremboong Village, Krembung District, Sidoarjo Regency, is one of the national sugar production industries under the auspices of PTPN X. The Sugar Factory founded by N.V. Cooy and Coster Van Voor Hout in 1847 as a private Dutch company, which at first was only a home industry with simple equipment. Along with the times, science and technology, there have been several improvements to replacement of equipment. Although until now there are still tools or machines that were made in 1908.

In the production section, there are still risks that cause work accidents, such as accidents in the processing department, namely frequent leaks in the evaporator body and juice heater body. So far, to minimize the risk of work accidents, the factory uses the IBPR method (Hazard identification and risk control) but it has not been maximized to deal with work accidents that occur, so an effort is needed that can minimize the risk of work accidents by assessing the risks that exist in the installation, processing and quality control departement at PG.Kremboong. The purpose of this research is to identify the most dominant risk factors that can occur and to formulate the efforts that must be made to minimize the risk of work accidents that can occur in the production department of PG KREMBOONG.

LITERATURE REVIEW

Work safety is a series of efforts to create a safe and peaceful work environment for some employees who work in the company [2]. According to [3], in OHSAS 18001: 2007, OHS is a condition and factors that have an impact or could have an impact on health an worker safety. Meanwhile, Mathis & Jackson in [4] state that safety refers to protection, physical well-being and work-related injuries. Health refers to the general state of physical, mental and emotional stability in general. Klassen et al, declare that during the last decades of the twentieth century, occupational health and safety (OHS) practices attracted debate and discussion, but related to the supply chain are far from demonstrating results [5].

The occurrence of a work accident that results in injuries or disabilities based on research and experience is the result of various factors as follows [6]: (1) Physical type: sound and vibration, work room temperature, X-ray radiation or radioactive rays , (2) Chemical group: dust, powder, mist, poisonous gas and liquid, (3) biological group: plants and animals that are poisonous or cause allergies, (4) Physiological group: construction of machinery or equipment that is not in accordance with the mechanism the human body, work attitudes that cause fatigue and physical abnormalities, tedious work methods / high saturation points, (5) psychological groups: routine and boring work processes, unharmonious work relationships between employees, unsafe working conditions. Current exchange-traded funds (ETFs) that focus on health are those that represent healthcare services, not investment into companies with established cultures of health, distinguished by caring for their workforce’s well-being in remarkable ways. While there are funds that focus on socially responsible investing (SRI), which may incorporate environmental, social, and governance (ESG) criteria, the focus on the workforce’s health and safety is unique [7].

Vaughan, translated by [8], suggests that risk is something that contains the possibility of loss and uncertainty. Risk is related to uncertainty, that's why it can be said that Risk is uncertainty. So it can be understood that risk contains both possible losses and uncertainty. According to [9] risk assessment can use the RPN (Risk Priority Number) method. RPN is a mathematical assessment of the seriousness of the effect (Severity), the possibility that the cause will cause a failure related to the effect (Occurrence), and the ability to detect failures before they occur to customers (Detection) and in the assessment using the RPN method using a scale of 1- 5.

RESEARCH METHODS

The research method as a guide for conducting research systematically. The research method can be seen in the following figure:

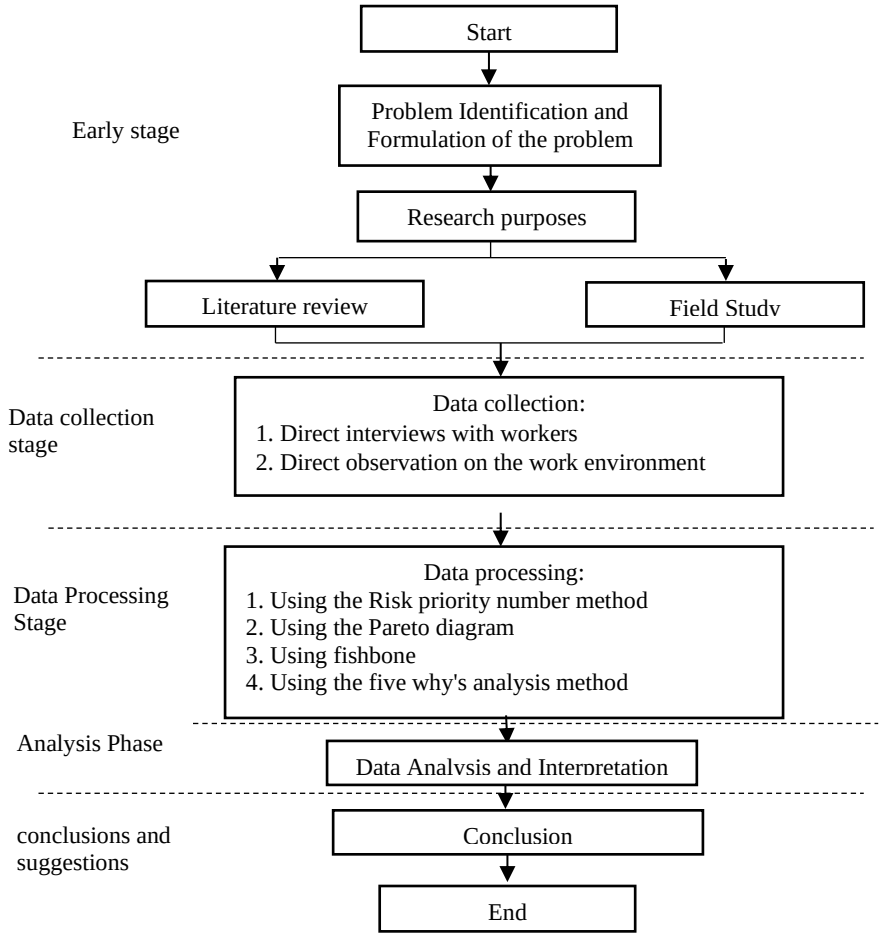

Figure 1. The Research Methodology Flowchart

Observations were done at the Production, Processing and Quality Control departments of PT. PG KREMBOONG Sidoarjo by interviewing and giving questionnaires to 3 heads of divisions/departments, namely the Head of Installation, Head of Manufacturing, Head of Quality Control and several employees. The reason is that they know the risks that occur in each department.

Data processing is carried out by giving a value to the risks caused by the hazards that occur. The hazard identification assessment is assessed through values of severity, frequency or likelihood, and detection, using the Pareto diagram to determine improvement and using the five why's analysis method to analyze the root causes of the problem so that a solution is obtained. The results obtained form the basis for proposing improvements based on the risk of work accidents that need to be minimized.

RESULTS AND DISCUSSION

Data Discussion 1: RPN (Risk Priority Number)

Before the assessment is carried out, the researcher must classify the risk-causing factors that occur in 3 departments with different types of work as in the following table:

Table 1. Risk Analysis

Department	Risk Causes
Instalation	1. There is a fine dregs that are carried by the air 2. Leak in the steam pipe 3. Shocked by electricity 4. Noisy 5. There is water leakage and fine dregs dust 6. There is a fine dregs that are carried by the air 7. Leak in the steam pipe

Department	Risk Causes
	8. There is a fine dregs that are carried by the air
	9. Leak in the steam pipe
	10. Shocked by electricity
	11. Noisy
	12. There is water leakage and fine dregs dust
	13. Fire in the fuel tank
	14. Fire resulting from a short circuit,
	15. Slippery stairs
	16. Oil spills
Quality Control	17. Blasting upon interaction of easily oxidized chemicals
	18. Inhalation of chemicals
Processing	19. Spilled phosphoric acid when pouring in the tank
	20. Leak in the juice heater body
	21. Leaks in the evaporator body
	22. Leak in the vacuum pan body
	23. Drip overflow occurred
	24. The production process creates an odor
	25. Fall from a height
	26. Bagasse spill due to damage to the conveyor

The risk factors in the table above are then assessed by providing the SOD (Saverity, occurrence, detection) value for each risk factor so that the RPN value will be obtained, here is the table:

Table 2. The Result of The Calculation of RPN

Risk factors	No.	Cause	Code	S	O	D	RPN
Respiratory tract obstructed	1.	The worker inhales the fine dregs	A1	2	4	1	8
	2.	A drip overflow has occurred	A2	2	2	3	12
	3.	The worker inhales the chemical	A3	2	2	2	8
	4.	The production process creates an odor	A4	1	5	2	10
	5.	There is water leakage and fine dregs dust	A5	2	2	2	8
Injuries, bruises, slips, irritations	6.	Oil spills	B1	2	3	1	6
	7.	Slip the slippery ladder	B2	2	3	1	6
	8.	The fall of the blotong	B3	2	2	3	12
	9.	Leaks in the steam pipe	B4	2	3	3	18
	10.	Spilled phosphoric acid when pouring in the tank	B5	3	3	2	18
	11.	Electric shock	B6	3	2	2	12
	12.	Falling from a height	B7	3	1	2	6
	13.	Leak in the evaporator body	B8	3	4	3	36
	14.	Leaks in the body of the vacuum pan	B9	2	3	3	18
	15.	Leaks in the juice heater body	B10	3	3	3	27
Explosion	16.	Explosive at oxidizing chemical interactions	C1	2	1	2	4
Fire	17.	Fuel tank fire	D1	5	1	4	20
	18.	Fires resulting from short circuits	D2	3	1	5	15
Hearing disorders	19.	Noisy	E1	1	5	2	10

The following is the Risk Map to interpret the risk factors that occur when the sugar production process is underway at PG KREMBOONG:

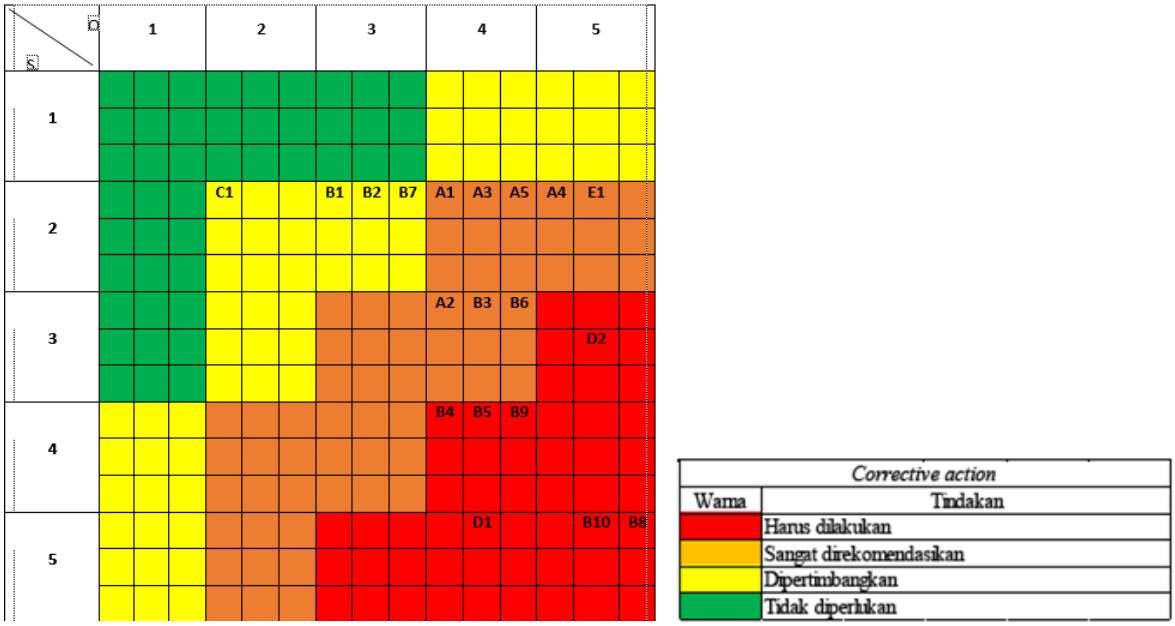

Figure 2. Risk map for occupational health and safety.

Data Discussion 2: Pareto Diagram

After calculating the ranking and RPN value of each risk factor occurring in each department, then a risk level percentage table, along with the risk level percentage data, are created (see Table 3).

Table 3. Percentage of risk level

No.	RPN Value	Percentage (%)	Cumulative Percentage (%)
1.	36	14.17	14.17
2.	27	10.62	24.79
3.	20	7.90	32.69
4.	18	7.10	39.79
5.	18	7.10	46.89
6.	18	7.10	53.99
7.	15	5.90	59.89
8.	12	4.72	64.61
9.	12	4.72	69.33
10.	12	4.72	74.05
11.	10	3.94	77.99
12.	10	3.94	81.93
13.	8	3.14	85.07
14.	8	3.14	88.21
15.	8	3.14	91.35
16.	6	2.36	93.71
17.	6	2.36	96.07
18.	6	2.36	98.43
19.	4	1.57	100.00
Total	**254**	**100.00**	**100.00**

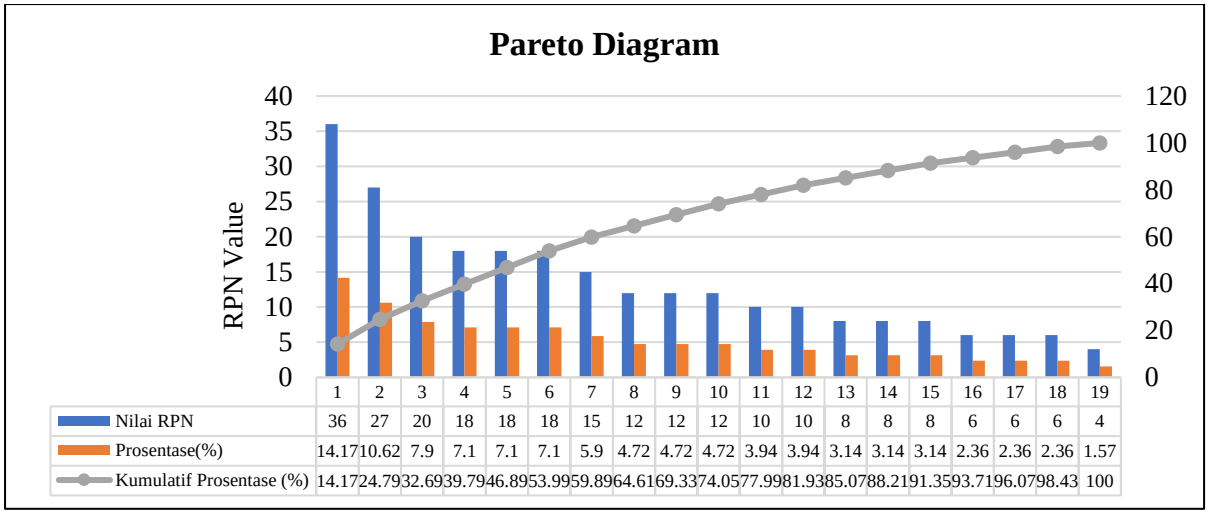

Figure 3. Pareto Diagram of the Risk Cause Factors.

Data Discussion 3: Five Whys Analysis

After identification and analysis of the dominant risk factors using the Pareto diagram, the most dominant risk factor is the risk of leakage in the evaporator body and leaks in the juice heater body, then these factors will be analyzed to determine the root of the problem and find a solution to these risks.

Table 4. Five Whys Leakage in the Evaporator Body

Questions	Fact
Why is the leak on the evaporator body about the workers?	Because when workers are in the area of the evaporator body, workers do not use complete personal protective equipment.
Why don't workers use complete personal protection such as gloves, safety shoes, and project helmets?	Because workers feel uncomfortable and are not used to wearing personal protective equipment in accordance with the provisions.
Why do workers feel uncomfortable and not used to wearing personal protective equipment in accordance with the provisions?	Because workers feel that there are no standard SOPs and there are no sanctions if workers violate regulations.
Why do workers feel that there are no standard SOPs and no sanctions if workers violate the rules?	Because there is no socialization to workers about the standard SOP that has been determined by the company
Why is there no socialization to employees about the standard SOP that has been determined by the company?	Because the company is not strict enough to enforce SOPs and sanctions against workers who have violated it

Table 6. Five Whys Leakage in the Juice heater body

Question	Fact
Why does the leak in the juice heater body hit the worker?	Because workers are not careful when they are in the juice heater area.
Why are workers less careful when in the juice heater area?	Because workers feel safe in the juice heater area.
Why do workers feel safe in the juice heater area?	Due to the lack of K3 warning signs in the juice heater area.
Why is there a lack of K3 warning signs in the juice heater area?	Because the company did not apply the appropriate K3 procedures.
Why is the company not implementing appropriate K3 procedures?	This is because the company pays less attention to warning signs for K3 on every machine / tool.

From the results of data processing that has been carried out, it is known that the potential cause of accident risk that has the highest RPN value is a leak in the evaporator body resulting in a work accident that causes workers to be exposed to the liquid in the juice heater.

After that, an analysis was carried out using the Pareto Diagram on 19 potential causes of the risk of a work accident at PG. KREMBOONG. With the 80/20 principle, the priority for finding solutions to the risk factors above is that the evaporator body leak has a value of RPN 36 which has a percentage of 14.17% of the total 100% and a leak in the juice heater body which has an RPN 27 value has a percentage 24.79% of the total 100% because it is more than 20% then it has met the principles of Pareto 80/20. So that the 2 factors that cause these risks must be found solutions to minimize the risk of the accident occurring.

From the potential causes of the risk, the right solutions are sought so as to minimize the risks that occur. This risk can occur because workers while on the evaporator body do not use complete personal protective equipment because there is no standard SOP and sanctions when breaking the regulations do not complete personal protective equipment. In addition, there is a risk of leaks in the juice heater body that hits workers in the area, because there is a lack of warning signs for K3 on the juice heater body.

CONCLUSION

From the discussion that has been carried out in the previous stage, the following conclusions can be drawn:

1. The most dominant risk in PT. PG. KREMBOONG is a leak in the evaporator body that hits the worker and a leak in the juice heater body. This can be seen from the RPN values which reached 36 and 27. Therefore, companies are expected to focus more on risk management by equipping workers with personal protective equipment (PPE) so as to increase work effectiveness and reduce the risk level of work accidents.
2. Efforts that must be made by the management of the company are to provide socialization to all workers so that workers know the SOP that has been determined, besides that the company must enforce and impose sanctions on workers who have violated the specified regulations, and the company must give a warning K3 signs on each machine / tool so that it knows the dangerous area, with these efforts it is hoped that the risk of work accidents at PT. PG. KREMBOONG can be minimized.

BIBLIOGRAPHY

[1] A. A. A. P. Mangkunegara, *Manajemen Sumber Daya Manusia Perusahaan*. Bandung: PT. Remaja Rosdakarya Bandung, 2007.

[2] Suma'mur, *Keselamatan Kerja dan Pencegahan Kecelakaan*. Jakarta: PT. Gunung Agung, 1981.

[3] S. Darmiatun and Tasrial, *PRINSIP-PRINSIP K3LH: Keselamatan dan kesehatan Kerja, dan Lingkungan Hidup*. Malang: Gunung Samudera, 2015.

[4] D. Angelica, R. L. Mathis, and J. H. Jackson, *Human Resource Management: Manajemen Sumber Daya Manusia*, 10th ed. Jakarta: Salemba Empat, 2011.

[5] R. D. Klassen and A. Vereecke, "Social issues in supply chains: Capabilities link responsibility, risk (opportunity), and performance," *Int. J. Prod. Econ.*, vol. 140, no. 1, pp. 103–115, 2012, doi: 10.1016/j.ijpe.2012.01.021.

[6] B. Silalalahi, *Manajemen Keselamatan dan Kesehatan Kerja*. Jakarta: Pustaka Binaman Pressindo, 1995.

[7] R. Fabius, S. G. Frazee, D. Thayer, D. Kirshenbaum, and J. Reynolds, "The Correlation of a Corporate Culture of Health Assessment Score and Health Care Cost Trend," *J. Occup. Environ. Med.*, vol. 60, no. 6, pp. 507–514, 2018.

[8] H. Darmawi, *Manajemen Resiko*. Jakarta: Bumi Aksara, 2013.

[9] R. J. Mikulak, R. McDermott, and M. Beauregard, *The Basic of FMEA 2nd Edition*, 2nd ed. New York: CRC Press, 2009.

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