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Risk Assessment of Occupational Safety & Health (OSH) Hazards at Small and Medium Enterprise (SME)

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Abstract: Most of SMEs industries refuse to provide and conduct safety program for the employees in order to cut the budget. Thus, this industries are exposed to the occupational safety and health (OSH) hazards. Therefore performing the Hazard Identification, Risk Assessment and Risk Control (HIRARC) method are important to control the hazards. The objective of this research was to review occupational safety and health hazards related to small to medium enterprises (SMEs) industry. Besides that, this research conducted to identify the OSH hazards related to the selected SMEs industry using HIRARC method and to propose a suitable risk control to prevent the hazards. The selected SME industries are located in Rompin, Negeri Sembilan in production of cendol. For this research, two method of hazard identification were selected that are workplace inspection and hazard identification checklist. A total of 8 hazards were identified from the production process. 50% of the risk level were classified as low and 50% classified as medium risk level. The most hazardous work activity is related to ergonomic problem that is back pain as most of the activities were repetitive for a long time. As a conclusion, recommendation has been proposed to eliminate the identified hazards such as elimination, engineering control and personal protective equipment based on the hierarchy of risk control.

Keywords: SMEs industries, HIRARC, OSH, Hierarchy of Risk Control

1. Introduction

Occupational Safety and Health (OSH) is important in Malaysian Industrial Relations and receiving most attention [1]. Currently, 98.5% of the total business establishment goes to SMEs industries thus became the biggest contributor to the number of business establishment [2]. Besides SMEs were being notable to contribute a higher number of occupational accident compares to the larger company as the higher the number of establishment and contribution [3]. This is because, the poor financial capability in SMEs industries to provide and develop safety program in order to comply with OSD compliance compare to large companies [4]. SOCSO reported that roughly, SMEs recorded 80 to 90 percent of the total occupational accident [1].

The major contributing factors in SMEs include physical factors, environmental factors, individual factors and work organization factors [5]. Ergonomic issues are the mostly effects by working posture and design of workstations or tools in SMEs industries. Punnett and Wegman (2004) also stated that a rapid work pace and repetitive motion patterns are some of the risk factor in SMEs. Besides, insufficient recovery time, repetitive motion patterns, heavy lifting and forceful manual exertions are common risks at work. In year 2014, a study was conducted in metal industry within SMEs and reported that the most frequent hazard happened in major companies are (55%) noises, followed by physical hazard (50%), ergonomic hazards (30%), slip or fall (33%) and electrical hazards (23%) [6].

Hazard is a source or a situation that might be harmful and lead to injuries, illness, and cause damage to the property, environmental damages or any combination of these (DOSH, 2008) [7]. The previous studies discussed about the possible accident and health effect from the activities in the workplace including muscular or back pain, damage to the respiratory system, fatigue and fall. In response to this problem, this study proposes to assess the Occupational Safety and Health (OSH) hazard in SMEs industry [5,8,9].

2. Materials and Methods

A review of previous study was conducted to study about the risk assessment in SMEs to get a better understanding. A SME industry was selected to conduct the risk assessment. By performed HIRARC method to assess the risk, the onsite data were collected and the data had been analyze based on the identified hazards. Lastly, the best control measure were proposed in order to minimize the risks at the selected SME industries.

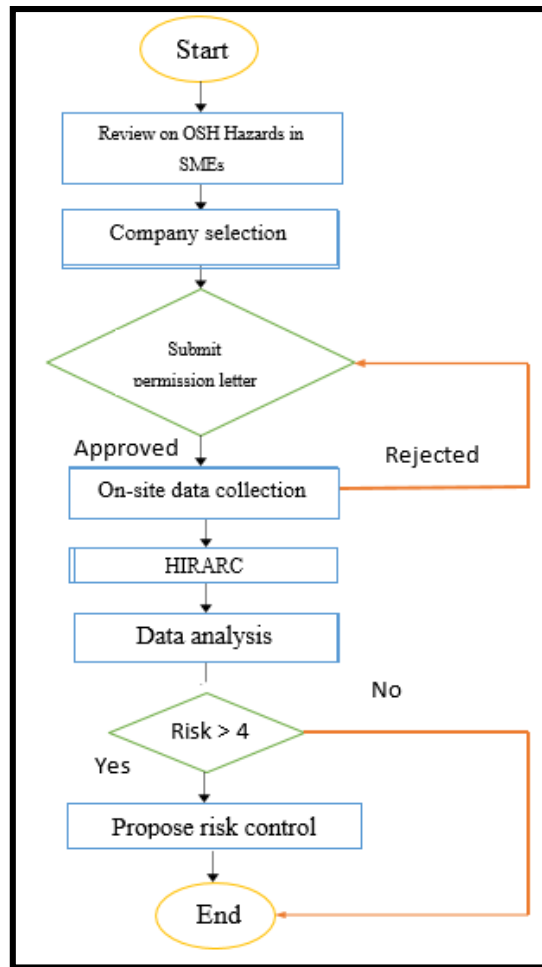


Figure 1: General step for risk assessment

2.1 Selection of Workplace and Work Areas

The selected work area are based on the work done by the worker at the specific work section. For this research, there are up to 8 work areas that exposed to hazards in the production process.

2.2 Hazard Identification, Risk Assessment and Risk Control (HIRARC)

Hazard Identification, Risk Assessment and Risk Control (HIRARC) is the basic of risk management as it has become fundamental to the practice of planning, management and the operation of a business. By conducting risk assessment at the work place, numerous positive changes have been recorded in their working practice. This is because, the hazards at the workplace can be identified and the implementation of suitable control measures that will minimize the hazards.

- a) Hazard identification: Hazard identification related to the identifying the potential condition that may lead to injury, illness or death to workers. The damages that

might be occurred includes loss of body system, equipment or damage to the environment.

- b) Risk Assessment: Risk assessment is to evaluate the risks regarding safety and health arising from hazards at work [2]. Risk assessment was assessed based on likelihood of risk occurrence and severity of the risk.

Likelihood is the determination of the event that likely to occur within the specific time in certain situations [9].

Table 1: Likelihood Table

LIKELIHOOD (L)	EXAMPLE	RATING
Most likely	The most likely result of the hazard / event being realized	5
Possible	Has a good chance of occurring and is not unusual	4
Conceivable	Might be occur at sometime in future	3
Remote	Has not been known to occur after many years	2
Inconceivable	Is practically impossible and has never occurred	1

Severity is the effect from an event such as severity of injury to people, damages to property, harmful to the environment that caused by the hazardous events. Severity can be categorized into five classifications that are catastrophic, fatal, serious, minor and negligible [2].

Table 2: Severity Table

SEVERITY (S)	EXAMPLE	RATING
Catastrophic	Numerous fatalities, irrecoverable property damage and productivity	5
Fatal	Approximately one single fatality major property damage if hazard is realized	4
Serious	Non-fatal injury, permanent disability	3
Minor	Disabling but not permanent injury	2
Negligible	Minor abrasions, bruises, cuts, first aid type injury	1

2.3 Data Analysis

Risk is an unsafe practice that can be evaluated not only a hazard . OSH (2008) stated that in mathematical term, risk can be calculated by the equation:

$$Risk = Likelihood \times Severity \quad \text{Eq. 1}$$

Table 3: Risk Matrix [2]

Likelihood (L)	Severity (S)				
	1	2	3	4	5
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5

High	■
Medium	■
Low	■

From the identified hazards, find the severity column that described the hazards and the outcome risk. Then, find the level of likelihood of the hazards. The risk level is given when the row of likelihood and column of severity meet. The relative risk value be used to find the necessary actions based on the priority.

Table 4: Action needed [2]

RISK	DESCRIPTION	ACTION
15 - 25	HIGH	A HIGH risk requires immediate action to control the hazard as detailed in the hierarchy of control. Actions taken must be documented on the risk assessment form including date for completion.
5 - 12	MEDIUM	A MEDIUM risk requires a planned approach to controlling the hazard and applies temporary measure if required. Actions taken must be documented on the risk assessment form including date for completion.
1 - 4	LOW	A risk identified as LOW may be considered as acceptable and further reduction may not be necessary. However, if the risk can be resolved quickly and efficiently, control measures should be implemented and recorded.

2.4 Hierarchy of control

The National Institute for Occupational Safety and Health (NIOSH) (2015) illustrated that the hierarchy of controls as an inverted pyramid with elimination is the most preferable to be selected and the least effective control measure is personal protective equipment at the bottom. From the identified hazards, a suitable control measure will be selected to prevent the hazards.

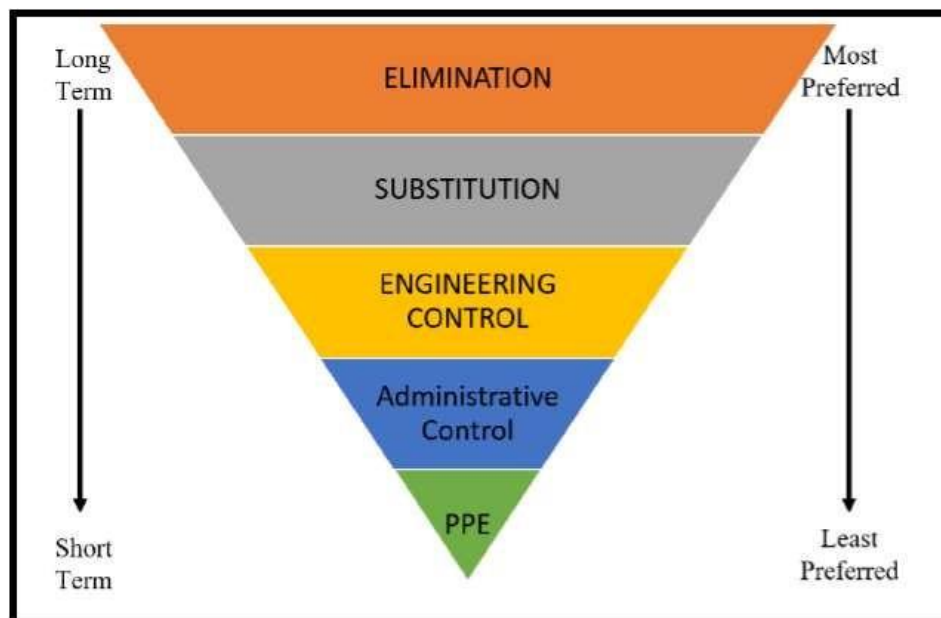


Figure 2: Hierarchy of control [2]






3. Results and Discussion




The result of this study is focused on the potential hazards and risks that may occur in SME A, the production of cendol. From the identified hazards, a risk assessment of each potential hazard was performed. From the risk assessment, the determination of the risk level of priority was identified and the suitable risk control were proposed to the company. The results are divided to 3 parts that are hazard identification, risk assessment and risk control for each company.

3.1 Hazard identification

Based on the work inspection from production process for Cendol, the potential hazards can be seen in every work activity. The detail of the inspection summarized in the following table:

Table 5: Hazard identification for SME A

No	Activity	Picture	Potential Hazard	Risk	Source of Hazard
1	Cutting Pandan leaves		Worker exposed to hand cut and insects	- Cause wound - Back pain	- The machete - The insects - Body structure
2	Washing Pandan leaves		The worker's hand exposed to small thorns of pandan leaves	- Cause wound	- Pandan leaves - Bare hand
3	Cutting Pandan leaves to small size		The worker hand exposed to hand cut	- Cause wound	- The use of machete - The speed of cutting - Bare hand
4	Blend the Pandan leaves		-The worker exposed to electric shock	-Electric shock - Cause leg pain	Blender pandan leaves involves water and electric current
5	Squeezig blended pandan leaves		The hands of worker exposed to pandan leaves	- The skin become reddened, itching, and irritation	Blended pandan leaves

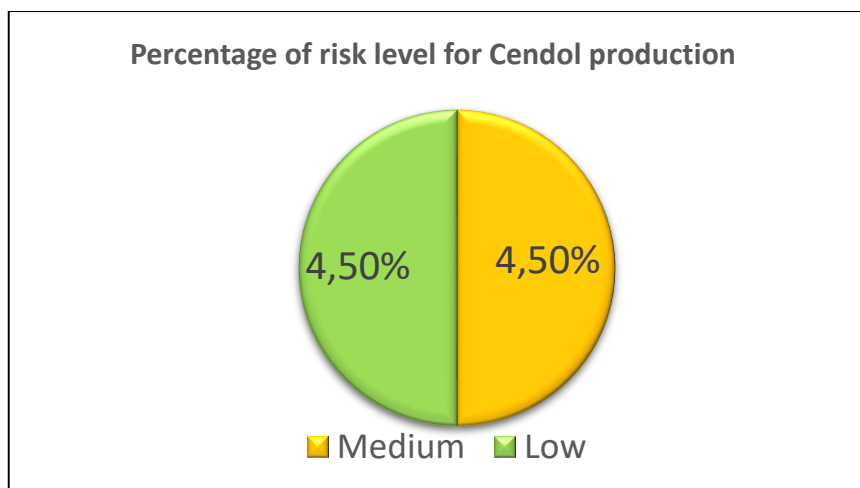
6	Stir the cendol mixture		Worker exposed to heat continuously for 20 minutes	The skin become reddened, heat also cause sore on the eyes and skin	Hot steam from the gas stove
7	Pouring cendol mixture to cendol printer		Cooked cendol might spill	The skin become reddened, heat also cause sore on the eyes and skin	-Hot steam -Hot cooked cendol
8	Pressing cooked cendol mixture to form cendol		The worker's hands exposed to heat from the cooked cendol	The skin become burns	- Hot cooked cendol - Bare hand

3.2 Risk Assessment

Based on the identified hazards for each work activity, a risk assessment was determined by using the formula stated in methodology. The level of risk was determined. The result of risk assessment can be seen in the following Table 6.

Table 6: Risk Assessment for SME A

No	Potential Hazard	Likelihood	Severity	Number of risk	Level of risk
1	Worker exposed to hand cutting and insects	4	1	4	Low
2	The worker's hand exposed to small thorns of pandan leaves	3	1	3	Low
3	The worker hand exposed to hand cut	4	2	8	Medium
4	The worker exposed to electric shock	2	2	4	Low
5	The hands of worker exposed to pandan leaves	5	1	5	Medium
6	Worker exposed to heat continuously for 20 minutes	5	2	10	Medium
7	Cooked cendol might spill	3	2	6	Medium
8	The worker's hands exposed to heat from the cooked cendol	4	1	4	Low



Graph 1: Percentage of risk level for cendol production

The pie chart above represent the percentage of risk level for Bahulu production. The low risk is 50%, and medium risk level is 50%

3.3 Risk Control

Risk Control is necessary to control the potential hazard from the certain work activity to ensure the health and safety of the workers. The hierarchy of control was used to purpose the suitable risk control to prevent the potential hazard to occur. Table below shows the risk control for each work activity of company A.

Table 7: Risk Control for SME A

4. Conclusion

No	Work Activity	Risk Control
1	Cutting Pandan leaves	Elimination <ul style="list-style-type: none"> Buying Pandan leaves from suppliers Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while cutting process
2	Washing Pandan leaves	Engineering Control <ul style="list-style-type: none"> Using water gun to wash Pandan leaves Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while washing process
3	Cutting Pandan leaves to small size	Engineering Control <ul style="list-style-type: none"> Using shredding machine to cut the Pandan leaves Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while cutting process
4	Blend the Pandan leaves	Engineering Control <ul style="list-style-type: none"> Using bigger blender / Industrial blender to ease the blender process Redesign the blender position to avoid back pain
5	Squeezing blended pandan leaves	Engineering Control <ul style="list-style-type: none"> Use squeezing machine to avoid squeeze the Pandan leaves Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while squeezing process
6	Stir the cendol mixture	Engineering Control <ul style="list-style-type: none"> Use stirring machine to stir the Cendol mixture Use bigger crater to cook the Cendol Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while stir the cendol
7	Pouring cendol mixture to cendol printer	Engineering Control <ul style="list-style-type: none"> Use automatic pouring machine from the crater to the printer Personal Protective Equipment (PPE) <ul style="list-style-type: none"> Use gloves while lift the crater Use thicker apron

The objectives of these research has been achieved which are to review occupational safety and health hazards related to the selected small to medium enterprises (SMEs) industry and identify and assess the occupational safety and health hazard related to small to medium enterprises (SMEs) industry by using Hazard Identification, Risk Analysis and Risk Control (HIRARC) method. From the conducted on-site research, every work activity have a potential hazards that might be faced by the workers. Based on the identified hazards, the suitable control measure was propose by referring to the hierarchy of risk control in order to control the hazards and help to minimize the risk.

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