

Installation of Turbine Ventilators and Lighting Systems to Improve Occupational Health and Safety in The *Randang Kacang* Industry, West Pasaman

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Abstract

Randang Kacang is an industry which is part of food processing industry. This industry is still a SME (Small Medium Enterprise). SME *Randang Kacang* is a growing industry, make by consumer order. Besides SME *Randang Kacang* is also able to provide manpower, as means to facilitate the production process. This utilized manpower to expedite the process of production. The production process is carried out in the room that have higher temperature. And the production room that has not had alighting system, workers can lead to carelessness causes accidents, so that workers are not comfortable in working. Therefore we need an increase in Occupational Health and Safety. So workers can work comfortably, healthy and safe during the production process. In this researched need to perform the installation of the turbine ventilator, aiming to stabilize room temperature in the production room, according to the Indonesian National Standard (SNI). Including to design of artificial lighting systems. Utilized TL bulbs (flourescent) in some point in the production process rooms to avoid the worker accidents. Installation of turbine ventilator performed at the top of the roof. At the top of the roof installed 2 turbine ventilator which has a diameter of 60 cm. Turbine ventilator can absorb 200% more air temperature. To reduce lack of lightening systems utilized 18 watt Philips Light bulbs (flourescent) in 28 points according to SNI.

Keyword : Accident, Turbine Ventilator, SNI, Lighting Systems.

1. Introduction

SME *Randang Kacang* is a growing industry, make by consumer order. Besides SME *Randang Kacang* is also able to provide man power, as means to facilitate the production process. To improve production, workers must be able to operate and run production well. This is taking into account the quality standards of beans that have been determinate by SME *Randang Kacang*, and also must pay attention to safety and health, in order avoid work accidents. To facilitate and increase production well, workers must be able to operate and run production well. This taking into account the quality standard of beans set by SME *Randang Kacang*

Carelessness of workers often occurs during the production process. The high number of work accidents that occurred on SME *Randang Kacang* thus making workers feel uncomfortable with the work they do. The handling of the accident problem should be done as soon as possible. Because potential dangerous work accident can cause losses. In addition to preventing, at least can reduce accidents. Therefore warranty is required in safety and health, safety and health is a thing that must be realized in work, so that workers feel comfortable, safety and healthy in work.

Notes that the current condition SME *Randang Kacang* in has high temperature that exceeds NAB in the production room and not for in door lighting system so it will lead to work accidents for workers. Workers feel uncomfortable in working with an accident that occurred.

Constraint by SME *Randang Kacang*, view from the current conditions, such as :

1. Temperature in production space is high, exceeds the thresholds value. Temperature measurement using a room thermometer.
2. Production space and storage room is not found lighting, just depend on sunlight during the daytime.
3. To anticipate accidents that not of lighting systems, SME *Randang Kacang* conduct indoor lighting, measurements using LUX Meter.

Table 1. Work Accident Data at SME *Randang Kacang* in West Pasaman

| No | Type of accident | Times/year |
|----|---------------------|------------|
| 1. | Burns fingers | 15 |
| 2. | Burns hand to elbow | 1 |
| 3. | Sprained (hand) | 24 |
| 4. | Sprained (legs) | 5 |

Based on the above work accident data, the reasearcher is interested to conduct aims on SME *Randang Kacang* it in the title "Installation of Turbine Ventilators and Lighting Systems to Improve Occupational Health and Safety in *the Randang Kacang* Industry, West Pasaman"

Attention to the description above can be formulated problem in this research is the temperature in the production room at SME *Randang Kacang* is higher than the threshold value and Not of indoor lighting system at SME *Randang Kacang*. This research focuses on the high temperature in the production room and not of indoor lighting system, while in the storage warehouse if the door is opened then the heat in the storage space will be reduced and the lighting will be good.

According to the background and the formulation of the problem then As for the aims is conducting the installation of turbine ventilator to stabilize the temperature in the production room of SME *Randang Kacang* and designing a good lighting system on SME *Randang Kacang*.

2. Method

2.1. Type of Research

Type of survey research that aims to make comparison or evaluation and describes an ongoing of research certain period of time.

2.2. Site of Research

SME *Randang Kacang* in Kampung Melayu Nagari Talu, Talamau District, West Pasaman

2.3. Variable

Based on the problem identification then that included in the research variable is temperature of production room and lighting system in production room.

2.4. Data Source

Obtained from the collection of data in the form of measurement of temperature and lighting in the room.

2.4.1. Installation of Turbine Ventilators

Based on measurement made in the production room, this space can generate high heat, excess the threshold value based on applicable legislation and may cause workplace accidents for workers. To overcome the hazards caused by heat can use turbine ventilator. Turbine ventilator used does not use electricity, but by wind aid. Installation of turbine ventilator mounted on the slope of the roof or on the roof top position.

The temperature measurement is done by hanging the room temperature tool for 2 -5 minutes around the room to be measured, then the mercury or alcohol used as a thermometer filler will expand or shrink in accordance with the measures air heat, so the air temperature in the room can be read in a thermometer scale.

Turbine ventilator used in SME *Randang Kacang* made from aluminum material with the diameter 60 cm, volume 312 m³, paired 2 turbine ventilator, turbine ventilator can absorb heat 70-90 m³ per hour so temperature in room and outside temperature is same.

Turbine ventilator capable of sucking hot air more than 200 %, so that workers more comfortable in work area and avoid accident caused by indoor heat

The formula determines the amount of ventilator required in the area SME *Randang Kacang* :

$$\text{amount of turbine ventilator} = \frac{\text{volume of room}}{\text{suction capacity} \times \text{time of circulation}} \quad (1)$$

2.4.2. Lighting System Design

SME *Randang Kacang* requires a lighting system. If seen in the initial state, SME *Randang Kacang* does not have a lighting system yet. Lighting uses only sunlight. Therefore is necessary to measure the lighting using LUX meter. Lighting in the production room can cause an accident. This is due to the dark conditions of the factory, and makes us difficult for the workers to require bright lighting. The design of the lighting system is the installation TL fluorescent bulbs with a Philips brand spread evenly in the workspace or place of the production process.

Installation of a light bulb with length of 10 meters x width of 8 meter will produce maximum illumination. Watt amount used is 18 watt and place to some point. To determine the points of placement of light bulbs can be determined from the strong lighting, the area of the room and by knowing the total lumens of lights, light factors, utilization factors and the number of lights in one point. According to SNI 04-0225-2000, the maximum lighting power for office or industrial space is 15 watts/m². it can be determined that the amount for 18 watt obtained at 6,3 watts/m², is still within the limits specified by the Indonesian National Standard (SNI).

3. Results and Discussion

Based on the analysis of the result of the previous data processing can be analysed as follows :

3.1 Installation of Turbine Ventilator

Based on measurement made in the production room, this space can generate high heat, excess the threshold value based on applicable legislation and may cause workplace accidents for workers. To overcome the hazards caused by heat can use turbine ventilator. Turbine ventilator used does not use electricity, but by wind aid.

Turbine ventilator used in SME *Randang Kacang* made from aluminum material with the diameter 60 cm, volume 312 m³, paired 2 turbine ventilator, turbine ventilator can absorb heat 70-90 m³ per hour so temperature in room and outside temperature is same. Turbine ventilator capable of sucking hot air more than 200 %, so that workers more comfortable in work area and avoid accident caused by indoor heat in ventilator.

With length : 13 m, width 8 m for turbine ventilator with diameter 60 cm then turbine suction capacity is a 30 m³/minute and choose time circulation 10 minutes :

$$\text{amount of turbine ventilator} = \frac{312 \text{ m}^3}{30 \frac{\text{m}^3}{\text{minute}} \times 10 \text{ minute}} = 1.04$$

So for each volume of SME *Randang Kacang* needed 1,04 turbine ventilator and made 2 turbine ventilator.

3.2 Lighting System Design

Lighting in the production room can cause an accident. This is due to the dark conditions of the factory, and makes us difficult for the workers to require bright lighting. The design of the lighting system is the installation TL fluorescent bulbs with a Phillips brand spread evenly in the workspace or place of the production process.

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According to SNI 04-0225-2000, the maximum lighting power for office or industrial space is 15 watts/m². it can be determined that the amount for 18 watt obtained at 6,3 watts/m², is still within the limits specified by the Indonesian National Standard (SNI). The area required by SME *Randang Kacang* is with length 10 meters dan width 8 meters ,so :

Area = length x width

Area = 10 meters x 8 meters

Area = 80 m².

To determine the bulbs mounting point can be determined by the formula :

$$N = \frac{E \times L \times W}{O \times LLF \times CU \times n} \quad (2)$$

Given :

E = 200

L = 10 meters

W = 8 meters

O = 1098 (for 18 watt)

Luminous Efficacy Lamp = 61,

LLF = 0,8

CU = 65 % and

n = 1

$$N = \frac{200 \times 10 \times 8}{1098 \times 0,8 \times 65 \% \times 1} = 28 \text{ point light bulb}$$

So far the space of 10 meters x 8 meters required installation of lamps as much as 28 points with and power 18 watt by using fluorescent lamps in the form of vertical with the Phillips brand.

4. Conclusion

According to the result of the study of the installation of turbine ventilators and lighting systems to improve occupational health and safety in the SME *Randang Kacang*, West Pasaman can be concluded that :

1. Installation of turbine ventilator at SME *Randang Kacang* by installing 2 turbine ventilator on roof top, turbine ventilator made from aluminum material with diameter 60 cm and able to suck 200 % more hot air.
2. The design of lighting system at SME *Randang Kacang* is done by the installation of fluorescent light bulb with Phillips brand. Power 18 watt and mounted on 28 spots scattered indoors. With a maximum distance of 3 meters and installed in parallel. In order to achieve maximum illumination in accordance with SNI

From these conclusion, some things into suggestions or recommendation towards improvement on SME *Randang Kacang*. It's good SME *Randang Kacang* to propose a proposal, which makes a turbine ventilator with a diameter of 60 centimeters mounted on the roof position in order to reduce work accidents when the room temperature is high.

References

- [1] Directorate of Occupational Safety and Health. 2006. Construction of Occupational Health Guidelines Space. Cilled on September 18, 2012.
- [2] International Organization for Standardization (ISO) 9001:2000 on Temperature Decline.
- [3] Health Ministerial Decree No. 1405 of 2002 on Risk of Lighting.
- [4] Decree of the Minister of Manpower of the Republic of Indonesia, No. Kep-51/MEN/1999 on the Threshold Value of Physical Factors in Workplace.
- [5] Minister of Manpower. Circular Letter No. SE.01/Men/1978 About Threshold Value (NAB) for Work Climate and Threshold Value for Noise at Work. 1978.
- [6] Muhaimin. Lighting Technology. PT. Refika Aditama. Bandung 2001.
- [7] Nurdi, I. Fan Exhaust Function for Convenience. Retrieved on September 18, 2012. Through the site.
- [8] Rifai, Ahmad. Visual Display Design in Production Process Room (Case Study PT Inti Vulkatama Padang). STTIND, Padang. 2011.
- [9] Smith, B.J.Peters, R.J. Owen, Stephen. Acoustic and Noise Control. Addison Wesley Longman Limited, England.1996.
- [10] Indonesian National Standard 03-6575-2001 on Room Lighting Systems
- [11] Law Number 1, year 1970. on Occupational Safety and Health.
- [12] Law Number 9, year 1995. Regarding Small-Medium Enterprises (SME).
- [13] Law Number 13, year 1995. Regarding Occupational Safety and Health Control.