UNIVERSITI TEKNIKAL MALAYSIA MELAKA

DESIGN OF A NOISE INSULATOR FOR RIPPLE MILL AT KERNEL RECOVERY PLANT IN PALM OIL MILL

This report submitted in accordance with requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor Degree of Manufacturing Engineering (Management) (Hons.)

by

RAGUVARAN A/L V. SEGARAN

B051110331

870707-23-5495

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Date	:	23 June 2014

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APPROVAL

This report is submitted to the Faculty of Manufacturing Engineering of UTeM as partial fulfillment of the requirements for the degree of Bachelor of Manufacturing Engineering (Management) (Hons). The member of the supervisory is as follows.

……

Supervisor

(Dr. Isa bin Halim)

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ABSTRAK

Pemulihan kernel merupakan salah satu bahagian utama di kilang kelapa sawit. Proses pemisahan kernel daripada cengkerangnya merupakan fungsi utama bahagian pemulihan kernel. Bahagian ini mengandungi beberapa mesin yang mengeluarkan bunyi yang kuat. Persekitaran pekerjaan sebegini akan mengakibatkan ketidak selesaan dan hilang pendengaran kepada para pekerja. Objektif pertama kajian ini ialah untuk menentukan stesen kerja yang menghasilkan bunyi bising di bahagian pemulihan kernel. Seterusnya, kajian ini mengukur tahap bunyi di setiap stesen kerja. Terakhirnya adalah merekabentuk penebat bunyi bagi mesin 'ripple mill'. Kajian soal selidik telah dilakukan di kalangan para pekerja untuk menentukan stesen kerja yang bising. Kemudian, alat pengukur bunyi telah digunakan untuk mengukur tahap bunyi di setiap stesen kerja tersebut. Mesin 'ripple mill' telah dikenal pasti sebagai mesin yang mengeluarkan bunyi yang terlalu kuat. Kajian ini telah membangunkan satu prototaip penebat bunyi dengan menggunakan fiber kelapa sawit dan kadbod. Prototaip tersebut mampu mengurangkan tahap bunyi sebanyak 14.4%. Kesimpulannya, berdasarkan kajian ini, penebat bunyi yang diperbuat daripada fiber kelapa sawit dan kadbod dapat mengurangkan bunyi dari mesin 'ripple mill' dengan berkesan.

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ABSTRACT

Kernel recovery plant is one of main divisions in palm oil mill industry. The main function of the kernel recovery plant is to process nut separation to recover kernels. The kernel recovery plant consists of several machines that produce an excessive noise. This working condition can lead to discomfort and hearing loss to workers. The objective of this study is to determine workstations that produce noise at the kernel recovery plant. Consequently, this study assesses the noise level of each workstation. The third objective is to design a noise insulator for ripple mill machine at the kernel recovery plant. A questionnaire survey has conducted among the workers to determine workstations that produce noise at the kernel recovery plant. A sound level meter was applied to assess the noise level at each workstation. The ripple mill machine has been identified as main contributor to excessive noise. This study developed a noise insulator prototype for ripple mill machine using combination of oil palm fiber and cardboard. A pre-post noise assessment proved that the prototype of noise insulator can reduce the noise level by 14.4%. Based on this finding, this study concluded that application of noise insulator made of oil palm fiber and cardboard is effectively reduce the noise level at the kernel recovery plant.

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DEDICATION

This is for my beloved parents who have been the greatest supporters and helpers to complete this final year project.

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LIST OF ABBREVIATIONS, SYMBOLS AND NOMENCLATURE

dBA	-	Adjusted Decibels
PPE	-	Personal Protection Equipment
OSHA	-	Occupational Safety and Health Act
SOP	-	Standard of Procedure
NIHL	-	Noise Induced Hearing Loss
ACOEM	-	American College of Environmental Medicine
SPL	-	Sound Pressure Level
Hz	-	Hertz
DOE	-	Department of Environment
DOSH	-	Department of Occupational and Health
SLM	-	Sound Level Meter
3D	-	3 Dimension
HSE	-	Health, Safety and Environment
CAD	-	Computer Aided Design
CAM	-	Computer Aided Manufacturing
CAE	-	Computer Aided Engineering

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IBM	-	International Business Machine
AIX	-	Advanced Interactive Executive
HP-UX	-	Hewlett-Packard UniX
SG meter	-	Specific gravity meter
CATIA	-	Computer Aided Three-dimensional Interactive Application
FKP	-	Fakulti Kejuruteraan Pembuatan
PPOM	-	Paloh Palm Oil Mill

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CHAPTER 1

INTRODUCTION

Generally, this chapter explains about the background of the project, problem statement, objectives and the scope of the study. Besides that, outline of the study is also included in this chapter.

1.1 Project Background

This study focuses on how to reduce noise level at ripple mill section of kernel recovery plant in palm oil mill industry. This industry is one of the industries in Malaysia that growing in a global level. This industry helps to extract oil from palm tree fruit. The oil extracting processes, such as sterilizing, threshing, press and digestion, clarification, and kernel recovery are starting from the delivery of fruit from the estates until become crude oil. Nowadays, global competition among the manufacturing industries is intensifying. Many companies in order to survive in this competition need to implement a continuous improvement in terms of occupational health. Occupational health plays a

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vital role to improve company's performance and profit. Palm oil mill consists of many workstations such as loading ramp station, sterilization station, digestion and pressing station, kernel recovery plant, clarification station, and water treatment station. All these stations contribute significantly in producing high quality crude oil. Kernel recovery plant is one of the main plants in palm oil mill. The main purpose of kernel recovery plant is for nut separation processing to recover kernels. This plant divided into three processes; de-pericarper, nut cracking and kernel drying. De-pericarper process is for separating fiber and nut. Nut cracking process is for separation of kernel and shell. Meanwhile, kernel drying is a process of drying kernel before storage. Figure 1.1 shows the kernel recovery plant in palm oil mill.

Figure 1.1 Kernel recovery plant in palm oil mill

Even though the kernel recovery plant has wide applications and good performance in kernel and shell separation process, however it contributes to occupational hazards that can affects the occupational health of the machine operators and the co-workers. One of the occupational hazards identified in the kernel recovery plant is noise. This

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occupational hazard creates unsafe working environment due to excessive noise exposure at the nut cracking station. This condition can be found during nut cracking process using nut crackers also known as ripple mill. The ripple mill is a machine used to crack nuts and separate kernel and shell. During the cracking process, a very loud noise produced by the machine. This exposure of noise can lead to hearing loss to workers when they are continuously exposed to the noise in a long period. According to Occupational Safety and Health Act 1994 (OSHA 1994), the noise hazard can be prevented using three approaches such as administrative controls, engineering controls, and personal protective equipments. In this study, the second approach is used to design a noise insulator for ripple mill. In the recognition the importance of minimizing occupational hazard associated with noise exposure at the nut cracking station, the aim of this study is to design a noise insulator for ripple mill to reduce noise risks among the machine operators and the co-workers.

1.2 Problem Statement

Due to the excessive noise exposure, the motivation, productivity and efficiency of the workers may be affected. Exposure of long period in hazard area such as noisy area will cause hearing disorder and resulted in decrease of work performance. Additionally, the design of ripple mill machine (Figure 1.2) produces high level of noise, can lead to hearing loss and health problem to the workers. The aim of this study is to design a noise insulator for ripple mill machine at kernel recovery plant.

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Figure 1.2 Ripple mill machine design in kernel recovery plant

The excessive noise exposure due to the ripple mill machine design is caused by several factors as shown in the cause and effect diagram (Figure 1.3). The following section describes the details of each factor.

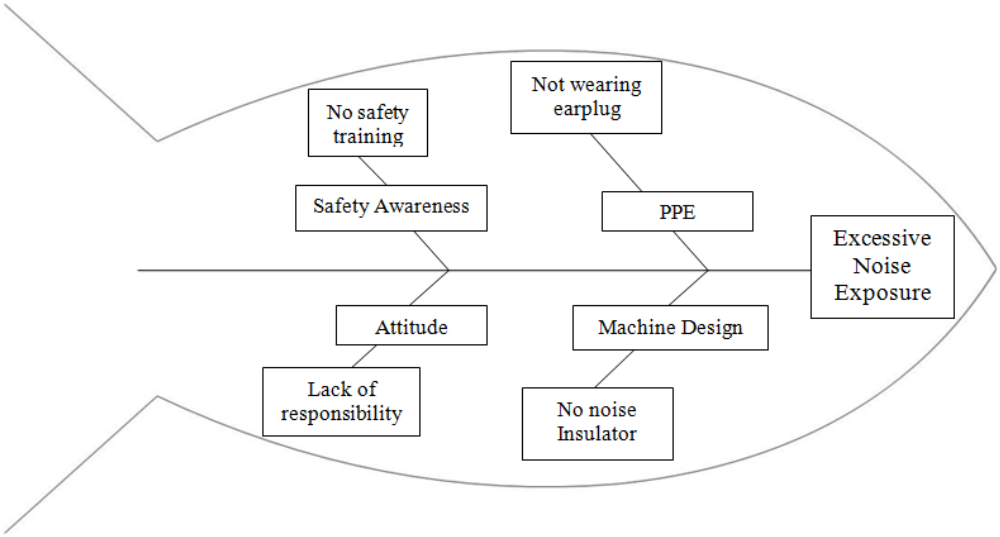

Figure 1.3 Cause and effect diagram of excessive noise exposure

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1.2.1 Machine Design

The design of ripple mill in palm oil mill caused high excessive of noise. This area should more concern because the excessive noise will harm the operators and co-workers. Most of the ripple mill do not provided with noise insulator. This noise insulator is useful to prevent noise from the machine.

1.2.2 Personal Protective Equipment (PPE)

One of the factors to excessive noise exposure is not wearing Personal Protective Equipment (PPE). The PPE helps workers to reduce the occupational risks while doing their daily tasks. To reduce noise, a common PPE used is wearing an earplug. In real condition, most of the machine operators or co-workers do not wear this PPE due to uneasy feeling and looking weird. This situation results worst condition such as hearing loss to the operators and co-workers.

1.2.3 Attitude

Attitude of workers in industry is very important to sustain occupational health. Bad attitude such as lazy, irresponsible, and less self-motivation will lead to big problems to the workers in term of health, increment, and job termination.

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1.2.4 Safety Awareness

Safety awareness is necessary for each worker in the industry. If a worker with no safety awareness, could be injured or killed during his tasks. The workers should concern of some awareness while working, such as Standard Operation Procedure (SOP), chemical handling and PPE wearing. Besides that, management also should take concern about their workers safety and health with provide them safety training, fire drill training, and motivation courses.

1.3 Objective of Study

The aim of the study is to design a noise insulator for ripple mill machine at kernel recovery plant in palm oil mill. Meanwhile, the specific objectives are:

i. To determine workstations that produce excessive noise at kernel recovery plant in palm oil mill.
ii. To assess the noise level of each workstation at kernel recovery plant in palm oil mill.
iii. To design a noise insulator for ripple mill machine.

1.4 Scope of Study

This study focused on the excessive noise exposure that has exposed by the industrial workers in their workplace. A kernel recovery plant was selected to conduct the project

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