IMPLEMENTATION OF PERFORMANCE MONITORING FOR BAG FILTER DUST COLLECTOR MACHINE AT ANIMAL FEEDMILL PLANT

LIM KEE KEONG

MASTER OF MANUFACTURING ENGINEERING
(MANUFACTURING SYSTEM ENGINEERING)

2021

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Faculty of Manufacturing Engineering

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DEDICATION

I dedicate my dissertation work to my whole family members and my friends. A special feeling of gratitude to my father and mother, Lim Chye Hway and Ang Paik Hua whose words of encouragement for me and support me to futher study my master degree. My both elder sister, Lim Kah Boon and Lim Chia Lin have never left my side and helping me in my master study. Thank You.

ABSTRACT

The environmental damage is taking place in our world, because mainly due to dust or gas generated by manufacturing industry to the environment. The global warming, climate change and ozone layer depletion is clear indicator of our environment degradation. The impact of this is likely to increase in the future and having devasting consequences for the next generation and human health issues. The main focus on the master project is to focus on the Bag Filter Dust Collector Machine which can improve and implement the performance monitoring of the Bag Filter for Animal Feed Extrusion Plant. Leong Hup Feedmill Animal Feed Extrusion Plant air pollution control system (APCS) is located at the particle reduction/grinding section. In this section grains such as corn and soy bean is grinded and transferred by bucket elevators to be stored in daily raw material bin. This Bag Filter Dust Collector is a closed loop system where by the dust collected from the source is directly feed into the bucket elevator. The filter bag is used on daily basics， however the operation of filter bag is subjective to the operation of hammermill. Grinding is a continuous process in animal feed extrusion production and Hammermill run continuous in order to feed the raw material in to the extrusion bin. A hammermill is a mill whose purpose is to shred or crush aggregate material into smaller pieces by the repeated blows of little hammers. This will create high speed air flow inside the grinding chamber and light dust particle will follow the air. The objective of the filter bag house is to suck the air out and to control the pressure build up in the mill and also to filter the dust which is carried by the air. This will also increase the efficiency of the hammermill. So the modern age horizontal hammermill is equipped with filter bag with high pressure purging system or also known as pulse jet system. So in order to control or avoid the dust generated by the grinding process release to the environment, the implementation of the performance monitoring is needed.

ABSTRAK

Kerosakan alam sekitar berlaku di dunia kita, kerana terutamanya disebabkan oleh habuk atau gas yang dihasilkan oleh industri pembuatan ke alam sekitar. Pemanasan global, perubahan iklim dan penipisan lapisan ozon adalah petunjuk yang jelas mengenai kemerosotan persekitaran kita. Kesannya kemungkinan akan meningkat pada masa akan datang dan mempunyai akibat buruk bagi isu-isu generasi akan datang dan kesihatan manusia. Fokus utama pada projek induk adalah memberi tumpuan kepada Mesin Penapis Debu Penyaring Bag yang dapat meningkatkan dan melaksanakan pemantauan prestasi Bag Filter untuk Tanaman Penyemperitan Makanan Haiwan. Sistem kawalan pencemaran udara (APCS) Loong Hup Feedmill Animal Feed Extrusion Plant terletak di bahagian pengurangan / pengisaran zarah. Dalam bahagian ini biji-bijian seperti jagung dan kacang soya digiling dan dipindahkan oleh elevator baldi untuk disimpan dalam tong bahan mentah setiap hari. Pengumpul Debu Penyaring Beg ini adalah sistem gelung tertutup di mana oleh habuk yang dikumpulkan dari sumbernya dimasukkan terus ke dalam baldi lif. Beg penapis digunakan pada asas harian; namun operasi beg penapis adalah subjektif untuk operasi hammermill. Penggilingan adalah proses berterusan dalam pengeluaran penyemperitan makanan haiwan dan Hammermill berjalan berterusan untuk memasukkan bahan mentah ke tong bahan. Hammermill adalah kilang yang tujuannya adalah untuk menghancurkan atau menghancurkan bahan agregat menjadi kepingan yang lebih kecil dengan pukulan berulang dari palu kecil. Ini akan mewujudkan aliran udara berkelajuan tinggi di dalam ruang penggilingan dan zarah debu ringan akan mengikuti udara. Objektif rumah beg penapis adalah menyedut udara untuk mengawal tekanan yang menumpuk di kilang dan juga untuk menyaring habuk yang dibawa oleh udara. Ini juga akan meningkatkan kecekapan hammermill. Jadi hammermill mendatar zaman moden dilengkapi dengan beg penapis dengan sistem pembersihan tekanan tinggi atau juga dikenali sebagai sistem jet nadi. Oleh itu, untuk mengawal atau mengelakkan debu yang dihasilkan oleh proses penggilingan ke persekitaran, pelaksanaan pemantauan prestasi sangat diperlukan.

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CHAPTER 1

INTRODUCTION

1.1 Background

Leong Hup International ("LHI") produces the best quality animal feed from our feedmill plants in Malaysia, Indonesia and Vietnam. Selection of raw materials for feed production, such as corn and soybean, is conducted under a strict quality controlled environment in order to produce feed of highest standard grades.

Combination of deep understanding in poultry farming and research leads greater development to produce feed products with the optimum amount of nutrition, thereby making LHI's feeds the right choice for chicken and other livestock. LHI provides a variety of feed choices in accordance with each rearing stage of the respective livestock and type of livestock.

One of the main air pollution control system widely used in the industries in Malaysia for the control of dust particle pollutant is bag filter dust collector systems. The excellent operation of the Bag Filter Dust Collector System is primarily in the hands of the operator and maintenance team. A knowledgeable and skilled operator, supervisor or engineer knows how to monitor the bag filter processes occurring in the system, and understand what are the factors affect the bag filter system efficiency and performance, known what operational condition is the best ways for the bag filter and how to keep maintain in the good condition are very important. [1]

A bag filter dust collector is a type of pollution control equipment designed to collect and store dust particles and particles from industrial exhaust streams. This equipment is

widely used to recover valuable granular pollutants from gaseous exhaust streams in many different manufacturing industries including woodworking, woof furniture, steel, feedmill and flour. A pulse jet bag filter dust collector machine is designed to achieve maximum operating efficiency while reducing machine maintenance cost and time.

The general function of the bag filter dust collectors are generally used in application requiring high yield recoveries from pneumatic transport systems or for the removal of hazardous materials from the working environment.

Successful operation of a bag filter dust collector system is an integral part of the operation of a successful manufacturing industry. So, performance monitoring of the bag filter dust collector system are very important to the industry operation and to overcome environmental issue. In order to ensure the operating bag filter dust collector in the optimally condition, performance monitoring of the bag filter system should be implement.

1.2 Problem Statement

Bag filter dust collector machine have widely used in the operation of animal feedmill industry nowadays. Before further study and implementation of performance monitoring for bag filter dust collector machine, the machine is monitor by the maintenance staffs and production operators for the bag filter in the processes operation. They mainly inspect condition of the bag filter dust collector machine body, blower fan and filter bag condition only. Sometime, the monitoring is overseen by operator. However, there is no any preventive maintenance checklist and performance monitoring record has done. They just perform daily visual checking and to make sure the operation is not interrupted. It is happened before, during the operation running the bearing of the blower motor shaft sudden jam and broken cause the blower motor trip. So with this problem happened it will delay the production output rate and loss. Hence, the implementation of performance monitoring for bag filter

dust collector is very important and it can be eliminate the number of unnecessary stop during production and keep on maintain the performance of the bag filter dust collector machine in the optimum and efficient condition.

1.3 Research Objective

The main aim of this research is to implementing a performance monitoring methodology to bag filter dust collector system at the animal feedmill industry. Specifically, the objectives are as follows:

a) To implement performance monitoring for the Bag Filter Dust Collector System and preventive maintenance.

b) To ensure the Bag Filter Dust Collector System in optimum good condition and provided smooth production.

c) To ensure cost reduction in maintenance and production down time.

1.4 Scope of Research

The scope of this research are as follows:

- Implementation of perfomance monitoring for the bag filter dust collector system at animal feedmill industry.
- Understand the working principle and the structures of the bag filter dust collector system.
- Determine the parameter for performance monitoring in this research study.
- Study the current condition for bag filter dust collector machine before implementing performace monitoring and preventive maintenance.
- Study the bag filter dust collector system condition after implementing performance monitoring.

1.5 Contribution of Research

Contributions of this thesis are made in the following related areas:

i) Implementation of Performance Monitoring for Bag Filter Dust Collector System: The first contribution of this work is to implementation of performance monitoring for bag filter dust collector machine. Before focus on the project with the performance of the bag filter machine, the operator and maintenance team just monitor the bag filter machine based on the machine body, blower fan condition and filter bag condition only. Sometime they may overlook and did not performance correct procedure for preventive maintenance checking. So, this performance monitoring implementation is useful to provide better understanding of the key parameter to maintaining the bag filter dust collection function in the good condition and eliminate unnecessary sudden stop of the production. This help the maintenance technician and operators more understand the working principle of the bag filter machine and do the maintenance checking for the right methods.

ii) Trained the maintenance technician and operator to be more skilled and understand for the bag filter machine: The second contribution of this project is to train the operation operator and maintenance technician more understand the working principle of the bag filter dust collector machine. Besides that, there are few performances parameter for bag filter dust collector are identify and recorded by the operator. So when any occurrences happened the operator and maintenance technician will based on the performance monitoring data to investigate and troubleshooting the problem and plan to do for the proper maintenance before the machine parts breakdown and damaged and causes the production stop during operation.

iii) Compile with the government laws and regulation about the dust emission to the environment. The third contribution of this project is to compile with the Clean Air Regulation. Preventive maintenance and performance monitoring of a pollution control system, be it an effluent treatment system to treat an industrial effluent, or an air pollution control system to abate the release of air contaminants into the atmosphere, is a prerequisite for an uninterrupted and efficient operation of the control system.

1.6 Thesis Outline

Based on the objectives previously presented and on the approach proposed before, this thesis is made up of five (5) chapters, which contents are summarized as follows:

- Chapter 1. Introduction. This chapter presents the background of the study, research problems, objectives, scopes, contributions and significance of the research.
- Chapter 2. Literature review. This chapter starts with brief overview of
- Chapter 3. Methodology. This chapter presents the methodology that has been developed to implement performance monitoring for bag filter dust collector system. The parameter for the performance monitoring has been determined.
- Chapter 4. Results and Discussion. This chapter summarizes the task done and the data obtained for Master Project 1. The performance monitoring parameter are indentify and the methodology has developed. Based on the results obtained from the performance monitoring, we can future take action for preventive maintainence of bag filter dust colletor machine.