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Bachelor of Mechanical Engineering (Design and Innovation)’

Signature : .....
Name of Coordinator I : .....
Date : .....

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DESIGN AND ANALYSIS ON STRUCTURAL OF SHRIMP PASTE CUTTING MACHINE FOR SMALL MEDIUM INDUSTRIES (SME) IN MALAYSIA

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This report is submitted in accordance with requirement for the Bachelor Degree of Mechanical Engineering (Design & Innovation)

Faculty of Mechanical Engineering
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APRIL 2010

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"I hereby declared that this dissertation titled
„Design and analysis on structural of shrimp paste cutting machine" is the result of my own effort except as cited in references".

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Date : 6th April 2010

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ACKNOWLEDGEMENTS

I would like to extend my sincere gratitude to my supervisor, Mr. Shafizal Bin Mat, for his assistance and guidance towards the progress of this dissertation project. Throughout the year, Mr. Shafizal has been patiently monitoring my progress and guided me in the right direction and offering encouragement. Obviously the progress I had now will be uncertain without his assistance. Special thanks must also go to, lecturers of Faculty of Mechanical Engineering, Universiti Teknikal Malaysia Melaka for their advice and help.

My special appreciation and thanks to all my friends for their invaluable assistance towards this project. Most of all, I am very grateful to my family especially my dearest parent, Mr. Roslee Bin Mohamad and Mrs. Jamaliah Binti Abd Manaff and all my siblings for their unfailing encouragement and financial support given to me over the years.

Thank you very much. Your sincere help will be remembered for my whole life.

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ABSTRACT

The purpose of this study is to design and perform structural analysis on shrimp paste cutting machine. In accomplishing this study, the literature review was implemented and there are some method that has been conducted which includes internet research, concept design, concept selection, detail design,and CAE analysis. In the initial stage, all the information or research that have been done about this topic are gathered as a guidance for things to core. Then, further study are continued based on the information collected from questionnaire, interview and observation. The information then need to be related with the objective of the project. From this, the research continues by design study on the component that will be used in this structure which is shrimp paste cutting machine. After that, ideas for conceptual design are developed on shrimp paste cutting machine that fullfils the engineering design specification. For analysis the design, there are several approach have been made to minimized the factor of safety. The material chosen and size of hollow square is the criteria required to find a best factor of safety. Finite element approach is used in the study by using FEA software which CATIA analysis software will be performed from CATIA structure frame modeling to seek the stress concentration on the structure frame for static load condition. This project also investigates how to reduce failure phenomenon on structure frame and the factor of safety (FS) as a benchmark for a better improvement to the structure frame overall. With all this research, the new improvement on structure produced with all aspect has been count suitable to shrimp paste cutting machine operation.

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ABSTRAK

Tujuan utama kajian ini adalah untuk merekabentuk dan menganalisis „Mesin Pemotong Belacan". Bagi menyempurnakan kajian ini, kajian ilmiah telah dibuat dan terdapat beberapa kaedah akan diaplikasi iaitu carian dari jalur lebar (internet), konsep merekabentuk, konsep pilihan, rekabentuk penuh dan analisis dari CAE. Dalam peringkat awal, semua data atau penyelidikan yang telah dilakukan berkaitan dengan topik ini akan dikumpul untuk dijadikan panduan. Kemudian, kajian lanjut akan disambung berteraskan maklumat – maklumat yang dikumpul. Data yang dikumpulkan itu kemudiannya perlu dikaitkan dengan objektif kajian. Dari sini, penyelidikan akan diteruskan dengan mengkaji rekabentuk terhadap rekabentuk mesin pemotongan belacan. Selepas itu, mencari idea dan menghasilkan konsep rekabentuk mesin pemotongan belacan dengan memenuhi spesifikasi kejuruteraan. Dalam menganalisis rekabentuk, ada beberapa pendekatan telah dilakukan untuk meminimumkan faktor keselamatan. Bahan yang dipilih dan ukuran persegi besi berongga adalah kriteria yang penting untuk mencari faktor keselamatan yang terbaik. Pendekatan elemen yang akan digunakan untuk menganalisa pemodelan struktur kerangka adalah dari perisian CATIA dimana ia bertujuan untuk mencari konsentrasi tegangan pada struktur rangka dalam keadaan pegun. Projek ini juga adalah bertujuan mengkaji bagaimana cara untuk mengurangkan faktor kegagalan struktur rangka dan untuk mendapat faktor keselamatan yang sesuai untuk dijadikan panduan. Kajian ini adalah bertujuan untuk membuat peningkatan baru pada struktur yang akan dihasilkan dengan memenuhi semua aspek untuk mengahasilkan mesin pemotongan belacan.

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CHAPTER 1

INTRODUCTION

1.1 Project Background

Projek Sarjana Muda' is a compulsory syllabus needed for each student of Universiti Teknikal Malaysia Melaka, (UTeM) to participate and contribute their knowledge in order for them to receive their bachelor's degree in mechanical engineering. Through the PSM, students will be given a chance to prove themselves through series of theories, research, experiments, analysis, optimization and a whole lots more method known to the engineering world.

The project for my PSM is to design and perform structual analysis of shrimp paste cutting machine. Traditionally, entrepreneurs of shrimp paste made shrimp paste by using manual method where the shrimp has to be boxed by using mortar until it is fine and well mixed. This method is then replaced by using pneumatic system, kneading machine, meat grinder machine or conveyor system. With the existence of the machine, the entrepreneur of shrimp paste can enhance productivity as they can increase their profit easier and in a fast way.

At this modern age, various machine has been developed to help human to increase producing quality shrimp paste and to reduce the making time of the shrimp paste. In order to meet customer needs, a complete shrimp paste cutting machine are needed to be developed which uses pneumatic system for cutting and conveyor for delivery. All these features are aimed to simplify work and to save cost in recruitment to generate high quality shrimp paste.

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1.2 Problem Statement

During the forging process of the shrimp paste, there are a few problem arise as this process is conducted only by human where shrimp prawns needed to be weighed first before proceeding to the moulding process. This process takes a lots of times to be completed and it wastes entrepreneurs time. During the molding process, the shrimp paste workers must tap and press the shrimp paste only by using hand and it can causes crampness among workers. The main problem here is the time consuming process that comes from the fully manual process and the current design of shrimp paste machines are not optimized.

1.3 Objective of The Study

The main objectives of this project are to design and perform structure analysis of shrimp paste cutting machine for Small Medium Industries (SME) in Malaysia.

1.4 Study Scope

To ensure this study achieve the objective prescribed, the scopes of this study are limited as follows:

i. Carry out the conceptual design of the machine.
ii. Selection of the conceptual design.
iii. Construct 3D model of the shrimp paste machine.
iv. Perform the structual analysis of the machine.
v. Propose a new material for the final design.

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1.5 Outline of Dissertation

Chapter I introduces the basic theory, problem encountered, the main objectives and also scopes of the project that are related designing shrimp paste cutting machines. In Chapter II of this dissertation, previous component that has been used in design of shrimp paste cutting machines as well as the existing machines used by consumer nowadays were explained. Chapter III addressed the methodology including generating designs and data analysis from collected data. There was also information for the implementation of this dissertation until the design was verified. Concept generation and detail design will be presented in Chapter IV and Chapter V respectively. The result and analysis of this project will be discussed in Chapter VI. Conclusions and recommendations for the whole project are presented in Chapter VII.

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CHAPTER II

LITERATURE REVIEW

2.1 Background

Shrimp pastes were made from small 'geragau' shrimp. It is divided to 3 grades namely grade 1, 2, and 3. First grade is made of white and coloured white prawn. Second grade shrimp paste is also made from small 'geragau' shrimp but were added with small 'bilis' fish mostly dark in colour. Third grade shrimp were made from mixture of small fishes and it is also black in colour.

All the shrimp or the sources that would be made into paste will be mixed altogether along with white salt (Australian-made high quality). After that , it goes into the grinder machine (meat mincer) to be crushed. This grinding process were repeated 2 or 3 times to ensure that it is crushed throughly. This mixture then were scattered onto a wooden shelf to bask until it achieve 70% dryness level (Tarsina, 2002).

The dried shrimp paste were then placed inside grinder machine for the second time to grind the shrimp prawns into a subtler and further make the prawn more well-mixed. Then this shrimp paste will be weighed based on the measurement standard that had been set by the shrimp paste entrepreneurs. The weighed lump of shrimp paste will then placed into a PVC mould to shape it into a round or square shape. After the moulding process, it is then vacuum-wrapped or manually wrapped one by one and the label of the company that had produced the shrimp paste were attached and then it will be distributed among suppliers to be sold.

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The traditional method practised by ancient entrepeneurs were to press the shrimp paste using a punching devices. Therefore, the usage of grinder machine had accelerated the production of shrimp paste, replacing the traditional method. The punching devices were replaced by the more modern machineries aimed to reduce workload and increase the quality and productability of the shrimp paste.

2.2 Meat Grinder / Meat Mincer

In this project, the most important thing is how to broke and integrate the shrimp. A meat grinder or meat mincer is a machine that can be applied to mix the shrimp and salt until it is fine and thoroughly mixed.

There are various types and size of meat mincer where the size of meat mincer influences the viscosity level or strength to integrate the meat. Meat mincer size could be obtained in five sizes namely M42, M52, M82, M45S, Cast Steel (M32C), and Stainless Steel (M32S) (Eik Seng Machinery Sdn.Bhd, 2009).

A basic optional feature for larger grinders is the mixer unit. This unit can mix different kinds of meat (for example beef or mutton) with each other or can be mix with additives, like salt or spices, before grinding it. Without such mixer unit, the additives must be mixed into the meat after grinding it, which adversely affects the taste and appearance of most products.

(a) (b)

Figure 2.1: (a) Meat Mincer Size M82, (b) Meat Mincer Size M45S (Stainless Steel) (Source: www.eikseng.com, 2009)

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2.2.1 Example of Meat Mincer in Market

There are many available meat mincer technology used today in following field of the automatic (use electrical device), manual condition, fix condition and more as shown below.

2.2.1.1 Patent No: No. 419,103.

Patented:	7 Jan 1890
No of Patented:	No.419, 103
Inventor:	Edwin Baltzley
Characteristic:	Manual, Mobile, Medium Quantity of Process

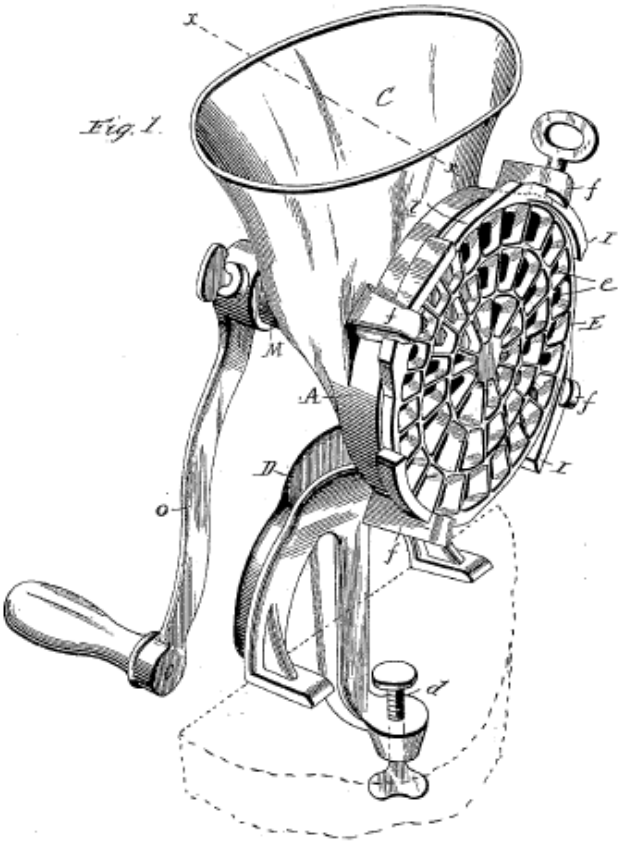

Figure 2.2: Meat Mincer (E. Baltzley, 1890)

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2.2.1.2 Patent No: Des. 222, 209

Patented:	5 Oct 1971
No of Patented:	Des. 222, 209
Inventor:	Downer P. Dykes, Lawrence, and Kans
Characteristic:	Automatic (use electrical source), Mobile, Small Quantity of Process

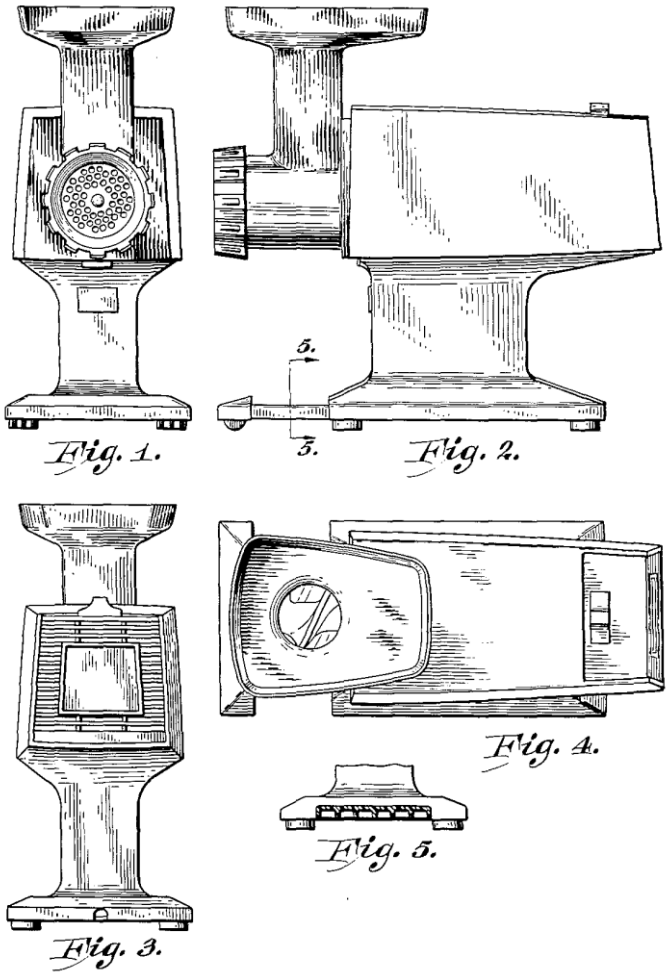

Figure 2.3: Meat Mincer (Downer P. Dykes, Lawrence, and Kans, 1971)

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2.2.1.3 Patent No: US D531, 850 S

Patented:	14 Nov 2006
No of Patented:	US D531, 850 S
Inventor:	Yan Kwong Wong
Characteristic:	Manual, Fix, Medium Quantity of Process

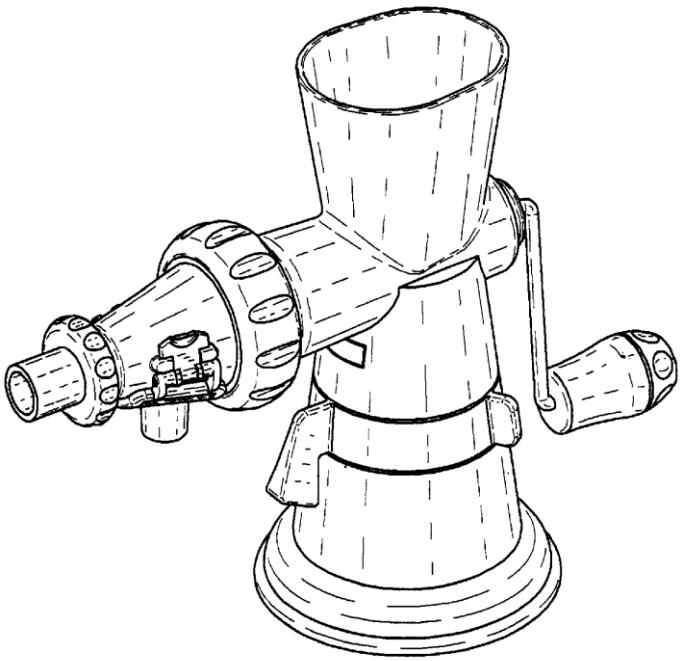

Figure 2.4: Meat Mincer (Yan, K. W., 2006)

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