Pengesahan penyelia

"Saya akui bahawa saya telah membaca karya ini dan pada pandangan saya karya ini adalah memadai dari segi skop dan kualiti untuk tujuan penganugerahan Ijazah Sarjana Muda Kejuruteraan Mekanikal (Rekabentuk dan Inovasi)"

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Nama Penyelia	:…………………………….
Tarikh	:…………………………….

PROCESS DESIGN FOR MASS MANUFACTURING OF POWDER FORMED SOLID FUEL FROM DRIED FIBROUS GARDEN LEAVES

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Laporan ini diserahkan kepada Fakulti Kejuruteraan Mekanikal
sebagai memenuhi sebahagian daripada syarat penganugerahan
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Pengakuan

"Saya akui laporan ini adalah hasil kerja saya sendiri kecuali ringkasan dan petikan yang tiap-tiap satunya saya jelaskan sumbernya"

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ABSTRACT

This research is based on the design of a device to crush/pulverize the dried fibrous leaves into powder form. There are lots of dried leaves especially in our country, Malaysia. This dried leaves is the main contribution of the air pollution. This is because; many of our civilian especially villager burn it to vanish it. This crusher machine is design to crush it into powder form or state near it. This is because; we can use it for made the powder form solid fuel that will be use in special kitchen for cooking. This project is importance to stop the pollution and create another source of fuel for cooking.
The biggest advantage in designing this machine is to create another source of fuel (solid fuel) for cooking beside of gas, electric and charcoal. It also helps to reduce the air pollution problem especially in our country. In this report also, I try to provide the information about the components that are related to the main objective. It helps in the research of the design.

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LIST OF ABREVIATIONS

		DESCRIPTION
ABS	:	Acrylo-nitrile Butadine Styrene
BASS	:	Break Away Support System
CAD	:	Computer Aided Design
CAM	:	Computer Aided Manufacturing
RPM	:	Revolution per Minute
HP	:	Horsepower
LAN	:	Local Area Network
LOM	:	Laminated Object Manufacturing
PC	:	Programmable Computer
3D	:	Three-Dimensional
kg	:	Kilogram
m	:	Mass
s	:	Second

CHAPTER 1

INTRODUCTION

In engineering field latest, a lot of new technology is used by manufacturer to make certain part in manufacturing process become easier. In this case, the most important criteria are the methods that we used to make the process simpler than before. This needs us to make continuous improvement by modification the common method with another method that proved more efficient in all aspects. This is what we called updated technology that helps our engineering field expanding from day by day.

Design as applied to mineral processing is similar in concept to that applied in many other industries. The basic requirement is that a safe, efficient, sustainable design should deliver the desired results. The desired results vary, but again the essentials are that the basics are covered, with the other main drivers being the optimisation in terms of minimum capital, minimum operating cost and maximised return on investment.

The dilemma is always that to reach a design that satisfies the requirements, and covers all bases, would demand a level of study that would consume too much time and money. The design process therefore needs to be automated. Automation traditionally meant the methodical application of certain processes in a "blind" manner, i.e. a massive iterative search that ploughed through a huge number of alternatives. The application of optimisation algorithms to "blind" searches has led to more efficient techniques, but essentially these techniques tend to provide a means of narrowing the search, which in turn can preclude the pursuit of options that may be desirable. Essentially the ideal method should not limit the design scope at any stage in the synthesis, but rather it should develop and modify the search to reach the best solution. Crushers are critical components of the comminuting process; they provide a relatively simple means of crushing raw material into smaller sizes. The performance of a crusher is governed by many factors, **Bearman (1994).**

1.1 PROJECT SCOPE

This project consists to develop a Design of crusher machine for mass manufacturing of powder formed solid fuel from dried fibrous garden leaves. These projects need to perform the best way to make a powder formed from dried leaves for human requirement. Other than that, this project report covers the design of the crusher machine. The design do must archive the objective for this project. Literature review and other research by inventor before use as a guide line to develop this project. The scopes of this study are:

1. The completed design of leaves crusher machine that used to make a powder formed from dried leaves. Needs to go through one by one of components.
2. The study of materials that used for crusher machine from the old until the latest technology of its.
3. Choose one set of crusher machine that suitable to crush the dried leaves.
4. Study of crushing process step by step.
5. Study the basic of mechanical reduction methods that will be used in this project.
6. Application of design software (CATIA) by completing a drawing of crusher machine.

1.2 OBJECTIVE

The objectives of study are:

1. To make a prototyping of dried fibrous garden leaves crusher machine.
2. To study and understand the crusher machine especially the suitable type of crusher that want to use in this project.
3. Understand the components of crusher machine.
4. To redesign each component of crusher machine and completed drawing using design software (CATIA).
5. To use the application of CAD (CATIA) that has been studied in course.

1.3 PROBLEM STATEMENT

The problems occur is when:

1) To determine the design of the crusher machine. The design must be able to crush the dried leaves into the powder or near state.
2) The type of crusher that suitable to redesign in this project.
3) The type of crusher blade that suitable to crush the dried leaves.
4) The dimension of the crusher machine.

1.4 THESIS OUTLINE

In this part will summarize all the chapters contain in this first draft.

Chapter 1:
This chapter contains the introduction, problem statement, objective, and scope of project. It summarizes the basic information about the project which will be performed and the objective of this project.

Chapter 2:
This chapter concludes all the research that has been done to provide ideas and specification as a guideline to produce the design. Beside that it also covered the study of the wind condition that can influence the performance of the project development.

Chapter 3:
This chapter summarizes the design methodology and flow processes that have been planned for this project. Beside that, the criteria selection for the best concepts idea also determined.

CHAPTER 2

LITERATURE REVIEW

A **crusher** is a machine designed to reduce large solid chunks of raw material into smaller chunks. Alternately, the term may be used as a synonym for compactor. Crushers are commonly classified by the degree to which they fragment the starting material, with coarse crushers not reducing it by much, intermediate crushers fragmenting it much more significantly, and grinders reducing it to a fine powder. The two best known types of coarse crusher are the jaw crusher and gyratory crusher. A jaw crusher consists of a set of vertical jaws, one jaw being fixed and the other being moved back and forth relative to it by a cam and pitman mechanism. The jaws are farther apart at the top than at the bottom, forming a tapered chute so that the material is crushed progressively smaller and smaller as it travels downward until it is small enough to escape from the bottom opening. The movement of the jaw can be quite small, since complete crushing is not performed in one stroke. A gyratory crusher is similar in basic concept to a jaw crusher, consisting of inner and outer vertical crushing cones; the outer cone is oriented with its wide end upward, and the inner cone is inverted relative to the outer with its apex upward. The inner cone has a slight circular movement, but does not rotate; the movement is generated by a cam arrangement. As with the jaw crusher, material travels downwards between the two cones being progressively crushed until it is small enough to fall out through the gap between the two cones at the bottom.

One type of intermediate crusher consists of a pair of horizontal cylindrical rollers through which material is passed. The two rollers rotate in opposite directions, "nipping" and crushing material between them. A similar type of intermediate crusher is the edge runner, which consists of a circular pan with two or more heavy wheels known as mullers rotating within it; material to be crushed is shoved underneath the wheels using attached plow blades.

Hammer mills involve the use of impact rather than pressure to crush material. They utilize heavy metal bars attached to the edges of horizontal rotating disks by hinges, which repeatedly strike the material to be crushed. The material is contained within a cage, with openings on the bottom of the desired size to allow pulverized material to escape. This type of crusher is usually used with soft material such as coal. A typical type of fine grinder is the ball mill. A slightly inclined or horizontal rotating cylinder is partially filled with balls, usually stone or steel, which grinds material to the necessary fineness by rubbing and impact with the tumbling balls. The feed is at one end of the cylinder and the discharge is at the other. Ball mills are commonly used in the manufacture of Portland cement. Another type of fine grinder commonly used is the Buhrstone mill, which is similar to old-fashioned flour mills.

2.1 MECHANICAL REDUCTION METHODS

There are four basic ways to reduce a material by impact, attrition, shear or compression and most crushers employ a combination of all these crushing methods.

2.1.1 IMPACT

Figure 2.1 Impact Diagram

In crushing terminology, impact refers to the sharp, instantaneous collision of one moving object against another. Both objects may be moving, such as a baseball bat connecting with a fast ball, or one object may be motionless, such as a rock being struck by hammer blows.

There are two variations of impact: gravity impact and dynamic impact. Coal dropped onto a hard surface such as a steel plate is an example of gravity impact. Gravity impact is most often used when it is necessary to separate two materials which have relatively different friability. The more friable material is broken, while the less friable material remains unbroken. Separation can then be done by screening.

The Pennsylvania Bradford Breaker employs gravity impact only. This machine revolves so slowly that for all practical purposes, gravity is the only accelerating force on the coal.

Material dropping in front of a moving hammer (both objects in motion), illustrates dynamic impact.

When crushed by gravity impact, the free-falling material is momentarily stopped by the stationary object. But when crushed by dynamic impact, the material is unsupported and the force of impact accelerates movement of the reduced particles toward breaker blocks and/or other hammers.

Dynamic impact has definite advantages for the reduction of many materials and it is specified under the following conditions:

- when a cubical particle is needed
- when finished product must be well graded and must meet intermediate sizing specifications, as well as top and bottom specifications
- when ores must be broken along natural cleavage lines in order to free and separate undesirable inclusions (such as mica in feldspars)
- when materials are too hard and abrasive for hammermills, but where jaw crushers cannot be used because of particle shape requirements, high moisture content or capacity

Dynamic impact is the crushing method used by Pennsylvania Impactors.

2.1.2 ATTRITION

Figure 2.2 Attrition Diagram

Attrition is a term applied to the reduction of materials by scrubbing it between two hard surfaces. Hammermills operate with close clearances between the hammers and the screen bars and they reduce by attrition combined with shear and impact reduction.

Though attrition consumes more power and exacts heavier wear on hammers and screen bars, it is practical for crushing the less abrasive materials such as pure limestone and coal.

Attrition crushing is most useful in the following circumstances:

- When material is friable or not too abrasive.
- When a closed-circuit system is not desirable to control top size.

2.1.3 SHEAR

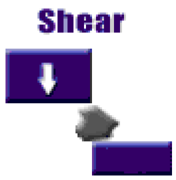


Figure 2.3 Shear Diagram

Shear consists of a trimming or cleaving action rather than the rubbing action associated with attrition. Shear is usually combined with other methods. For example, single-roll crushers employ shear together with impact and compression. Shear crushing is normally called for under these conditions:

- when material is somewhat friable and has a relatively low silica content
- for primary crushing with a reduction ratio of 6 to 1
- when a relatively coarse product is desired, usually larger than 11/2" (38mm) top size

2.1.4 COMPRESSION

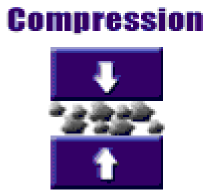
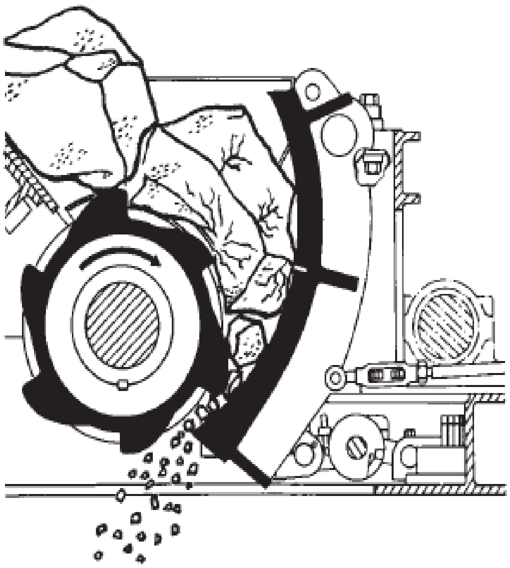


Figure 2.4 Compression Diagram

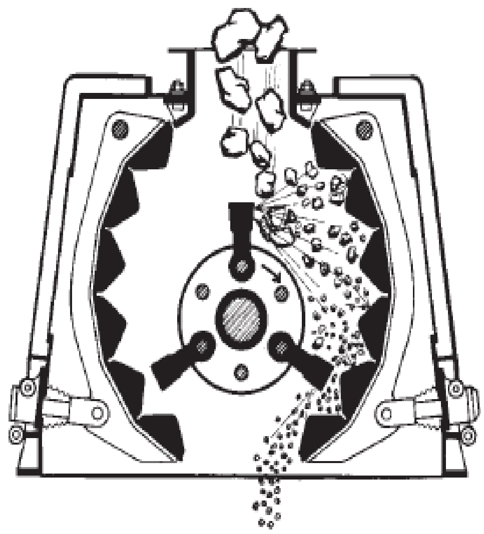
As the name implies, crushing by compression is done between two surfaces, with the work being done by one or both surfaces. Jaw crushers using this method of compression are suitable for reducing extremely hard and abrasive rock. However, some jaw crushers employ attrition as well as compression and are not as suitable for abrasive rock since the rubbing action accentuates the wear on crushing surfaces. As a mechanical reduction method, compression should be used as follows:

- if the material is hard and tough
- if the material is abrasive
- if the material is not sticky
- where the finished product is to be relatively coarse, i.e., 11/2" (38mm) or larger top size
- when the material will break cubically

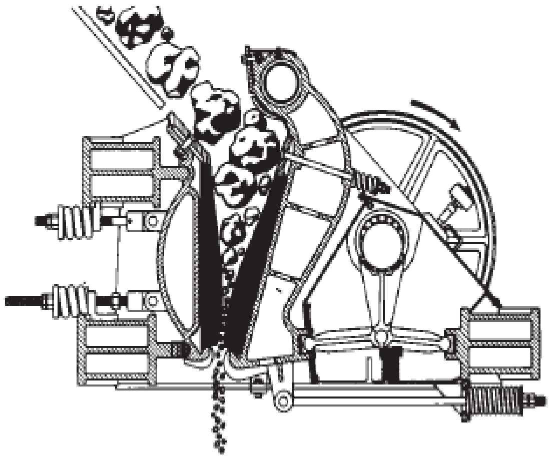
Examples of mechanical reduction method in crusher machine:



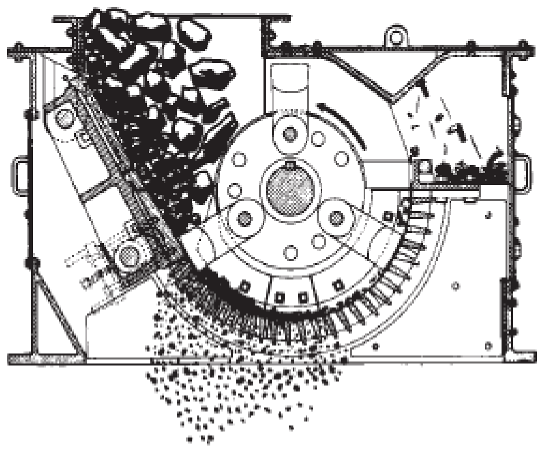
Single Roll Crushers reduce large input by a combination of shear, impact and compression. They are noted for low headroom requirements and large capacity.



The bottom of the Pennsylvania Reversible Impactor is open and the sized material passes through almost instantaneously. Liberal clearance between hammers and the breaker blocks eliminates attrition, and crushing is by impact only.



The Pennsylvania Jaw crushes by compression without rubbing. Hinged overhead and on the centerline of the crushing zone, the swinging jaw meets the material firmly and squarely. There is no rubbing action to reduce capacity, to generate fines or to cause excessive wear of jaw plates.



When a Pennsylvania Non-Reversible Hammermill is used for reduction, material is broken first by impact between hammers and material and then by a scrubbing action (shear and attrition) of material against screen bars.

Figure 2.5 Examples mechanical reduction method in crusher machine

2.2 TYPES OF CRUSHER

2.2.1 BRADFORD BREAKERS

These machines are used for crushing, sizing, band cleaning of run-of-mine coal and other friable materials. They are used to produce a product that is relatively coarse, with minimum fines, and that is 100% to size. Bradford Breakers crush by gravity impact only. A large cylinder made of perforated screen plates is fitted with internal shelves. As the cylinder rotates, the shelves lift the feed and, in turn, the feed slides off the shelves and drops onto the screen plates below, where it shatters along natural cleavage lines.

The size of the screen plate perforations determines the product size. Sized product falls through these perforations but oversized pieces will again be lifted and dropped by the shelves until they too pass through the screen plates.

Tramp iron, lumber, or other uncrushable debris that enters the breaker along with the feed is transported to the discharge end of the cylinder. There, these uncrushables are scooped out continuously by a refuse plow which channels this debris out of the cylinder and into a disposal bin. Often a Bradford Breaker is used merely to clean debris from coal that has already been sized. This gives some indication of the economy of operation and versatility of this machine.

Breaker cylinders rotate at slow speeds of 12 to 14 RPM depending upon cylinder diameter. Compared with most other crushers, Bradford Breakers are extremely long lived. Screen plates, for example, frequently last ten years or more, crushing millions of tons of coal, and there are numerous examples of Bradford Breakers in continuous service for upwards of forty years. It also designed the screen plates in the breakers to be interchangeable, so that the screen plates from the feed end, where wear is greatest, can be switched with screen plates from other areas of the cylinder where there is less wear.