

# Designing The Crab Shell Crusher as an ingredient for The Teeth Restoration using Grinding and Sizing Method

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**Abstract**— Grinding is the process of reducing the particle size of processed material from a large (coarse) shape converted into a smaller size. For that whose name is grinding is the process of splitting or milling. Sizing is the process of leveling the sizes in a sieve according to the desired size so that the particle size becomes homogeneous. Making or designing a crab shell crusher machine using grinding and sizing system this requires clear design concept. This becomes very important because of the basic design of a machine that will guide the designer in making the tool. The design procedure crusher shell crusher waste using grinding and sizing system, namely: literature study, design analysis, drawing work, procurement tools and materials, component manufacturing, and assembly of components. Then from experiment result from crusher waste crusher machine by using grinding and sizing system is obtained as granule  $\pm 1$  mm with an average time of destruction 4 minutes 39 second (low rotation) and 2 minutes 36 second (medium rotation) for each initial weight 1 kg of crab shells.

**Keywords**—Polishing Machine, Metallographic, Carbon Steel

## I. INTRODUCTION

In the industrial world, a person is required to be more active and creative. Someone must be creative enough to have ideas and pour his ideas. The more intense the competition in the world of the job industry is demanded faster and more accurately. Seeing the opportunity to create and innovate a crab shell crusher waste tool by using fast and precise grinding and sizing system.

Crab is one of the most popular food choices by the world community. The amount of crab consumption causes a lot of crab waste is the shell. The whole crabmeat is covered by a fairly hard shell. Therefore, crab shells can be used from head to crab fingers.

In designing crab shell crusher by using grinding and sizing systems, some things are the basics of calculation, namely gasoline engine motor, shaft, belt V, pulley, bolt, pads, and welded joints. In general, the design of crushing waste crab shells by using grinding and sizing system. In addition, to simplify and accelerate the work, the resulting product is also more appropriate to be more effective and efficient.

Treatment of dental restorations is done to restore the anatomical and dental function [1]. One method of dental restoration is a platinum restoration using an ionomer cement [2]. This ionomer cement provides a finer restoration surface and bonding ability with dentine tissue and email. Testing of the ionomer cement is done to improve its mechanical properties by adding natural ingredients such as chitosan [3]. Chitosan can be obtained by the conversion of chitin. Meanwhile, chitin can be obtained from shrimp shells, crab shells and insects [4].

Based on the things described above, then we took the initiative to design the crab waste crusher using grinding and sizing system that can be used as a tool to destroy the crab shells. In addition, the crab waste crusher can reduce the waste of crab shells that can be used as animal feed.

## II. RESEARCH METHODOLOGY

### A. Materials and Equipment

Crab shells were obtained from Nisombalia Village, Marusu District, Maros Regency, South Sulawesi Province. Location of design, manufacture, assembling and testing crab shell crusher waste machine by using the grinding and sizing system will be done at the workshop of Mechanical Engineering Fajar University Makassar.

Oil and cat paint, bolts, nuts, and rings, bearings, pulley 4 inch and 12 inch, V-belt A 62, Wheels, Iron plate 5 mm and 6 mm, Full iron 8 mm and 10 mm, paintbrush, masks, hand shirts, and eyeglasses, drive motor of gasoline, Hinges, Crude rubber or rubber machine holder, Sieve with hole diameter  $\pm 1$  mm, 6 inch iron pipe and 10 inch, and 6.5 mm, grinding sandpaper, grinding/scraping Eye, Grinding Wheels, 1½ mm steel plate, 4x4cm elbow, electrode, rivet nails, Solid iron  $\varnothing$  1 inch.

The tool used is grinding machine, electric welding machine, drilling machine, lathe, rifle shooter, welder hammer, wooden hammer, screwdriver (+) (-), wrench, ring pass 1 set, pliers, slide rule, pencil or markers, meter, ruler's elbow.

### B. Designing Method

The making of the machine requires a clear design concept. This becomes very important because of the basic design of a machine that will guide the designer in making the tool. The design procedure crusher shell crusher waste using grinding and sizing system, namely:

- Analysis of design; This stage will be done data processing and information obtained by analyzing so that obtained the calculation of the strength of materials and calculation of components to be used.
- Drawing; It was using 3D for drawing to design the crab waste crusher shredder machine with grinding and sizing system.



Figure 1. Design of crab shell crusher

### III. RESULTS AND DISCUSSION

Crab shell waste crusher machine using grinding and sizing system is a tool that can destroy the waste of crab shells to ashes quickly so that more effective and efficient. Specification of crab shell crusher:

- Dimensions (60 cm of Length, 70 cm of width, and 75 cm of height)
- 6.5 HP of the motor drive,
- 4x4 cm elbow arm frame,
- The cylinder body uses an iron pipe,
- The function to destroy crab shell waste into granules  $\pm 1$  mm,
- Dull blade model with the horizontal-vertical eye.



Figure 2. Design of crab shell crusher

The working principle of this crab shell crab machine is horizontally modeled, the energy generated by the gasoline motor is passed to the pulley via v-belt to produce the required rotation to destroy the crab shell waste, the crab shell is inserted into the funnel or the crab shell infestation place to be destroyed, then the knife the crushing or spinning grinder will crush or crush the crab shell, then filter or sift through a sieve with a 1 mm sieve hole, and then exit through the discharge pellet already  $\pm 1$  mm.

This experiment was conducted in order to convert a large particle into finer, smaller parts to facilitate its handling. The material contained in a size that is too large in general requires physical treatment to reduce its size. Grinding is often done to change the size of large particles into smaller particles. The working principle in the grinding process is the breaking and smoothing operation. In the process of grinding in the use of the crusher and grinding machine in which there are compression operations (pressure), punches and friction. During the breaking and smoothing operation, the particle particles inside will initially undergo distortion and then strain.

The things that should be noticed in the grinding experiment so that the results are good and efficient are:

- The size of the feed is suitable and the feed goes at a uniform rate.
- The result must reach the desired size.
- Non-split materials may not enter the machine.

Table 1. Testing result of crab shell crusher

No.	Initial Weight (kg)	Final Weight (kg)	Crusher Time (minute)	Type of Speed
1	1	0.75	4.5	Low
2	1	0.90	4.7	Low
3	1	0.80	2.5	Medium
4	1	0.90	2.7	Medium
5	1	0.85	1.0	High
6	1	0.90	0.9	High

Based on Table 1, it can be concluded that the faster the engine rotation the faster the time used to destroy the crab shell waste.

#### IV. CONCLUSION

Designing a crab shell crusher machine using grinding and sizing system was required clear design concept. This becomes very important because of the basic design of a machine that will guide the designer in making the tool. The design procedure crusher shell crusher waste using grinding and sizing system, namely: literature study, design analysis, drawing, procurement of tools and materials, manufacturing component, assembling components, testing machine.

The experimental results of the crab shell-crushing machine using grinding and sizing system were obtained in the form of granules  $\pm 1$  mm with an average time of destruction of 4 minutes 39 seconds (low speed), 2 minutes 36 seconds (medium speed), and 70 seconds for each initial weight of 1 kg crab shells.

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#### REFERENCES

- [1] Kay, E. *Dentistry at the Glance*. British Library. 2016
- [2] Garg, N and Gard, A. *Textbook of Operative Dentistry*. New Delhi. Jaypee Brothers Medical Publisher. 2015
- [3] Kaban, Jamaran. "Modifikasi kimia dari kitosan dan aplikasi produk yang dihasilkan." *Naskah Pidato Pengukuhan Jabatan Guru Besar Tetap Dalam Bidang Kimia Organik Sintesis Pada Fakultas MIPA, Universitas Sumatra Utara* (2009).
- [4] Kaimudin L. Karakterisasi kitosan dari limbah udang dengan proses bleaching dan deasetiasi yang berbeda. *Majalah Biam* 12 (1): 1 -7. 2016.
- [5] Radzikowska, Janina M. "Effect of specimen preparation on the evaluation of cast iron microstructures." *Materials characterization* 54.4-5 (2005): 287-304.
- [6] Lin PC, Loper CR. Observation on the graphite morphology in cast iron. *Trans AFS* 1980;88:97
- [7] Unnikrishnan, Rahul, Amit Kumar, Rajesh K. Khatirkar, Satish K. Shekhawat, and Sanjay G. Sapate. "Structural developments in un-stabilized ultra-low carbon steel during warm deformation and annealing." *Materials Chemistry and Physics* 183 (2016): 339-348.
- [8] Silva, Rafael M., Fabiano V. Pereira, Felipe AP Mota, Evandro Watanabe, Suellen MCS Soares, and Maria Helena Santos. "Dental glass ionomer cement reinforced by cellulose microfibrils and cellulose nanocrystals." *Materials Science and Engineering: C* 58 (2016): 389-395.