RESEARCH ARTICLE OPEN ACCESS

A REVIEW PAPER on VARIOUS COMPONENTS of PULVERIZING MILL

Anilkumar.H.Ingle[1], Akash Ghate[2], Avinash Ghughuskar[3]

[1]Associate Professor Of Department of Mechanical Engineering, Smt. Radhikatai Pandav College of Engineering Nagpur, India. Email-id- anil_ingle943@rediffmail.com

[2]Student of Department of Mechanical Engineering, Smt. Radhikatai Pandav College of Engineering Nagpur, India. Email-id- akashghate.21@gmail.com

[3]Student of Department of Mechanical Engineering, Smt. Radhikatai Pandav College of Engineering Nagpur, India. Email-id avinashbg93@gmail.com

Abstract:

The pulverizing mill is used to disclose the dry and wet materials and foods which are used in daily life for eating. The mixture is one of the types of mill which used to make homemade pastes. The juicer machine is also one type of mill which is to make the fruit juice. And also other the pulverizing mill which pulverizes the material is used home work in daily life. In this pulverizing mill, the rotor is support by two bearing at centre with same shaft diameter of blade. The blades are supported at predetermined points which rise the rotor maximum safe operating to achieve a higher output of pulverized product. The mill inlet housing is attach by quick release toggle fasteners associated with fiber optic sensing means to prevent mill operation unless the housing is fully secured in one of two proper operating positions..

Keywords **— Pulverizing mil, Chilli Powder, Grains, Hammer Blade.**

I. INTRODUCTION

A pulveriser is a mechanical device for the grinding of many different types of materials and particle. For example, a pulveriser is used to pulverize coal. This mill is suitable for pulverizes grain and crushing the chilli into chilli powder by using the crushing blade and grinder. This project involve the design of crushing blade considering forces required for crushing factor that operator need. This pulveriser is use to both operation like crushing grain and grinding chilli in one machine by using different blade. The design of this machine is such a way that it would require optimum load to crush grains and grid chillies. The design of machine is simple and required less electric supply and less human effort. It is very cheap.

Types of Pulverisers

1) Coal pulverisers
   1.1) Low Speed
   1.2) Medium Speed
      1.2.1) Ring and ball mill
   1.3) Vertical spindle roller mill
   1.4) Bowl mill
   1.5) High Speed
      1.5.1) Attrition Mill
2) Beater Wheel Mill
3) Hammer Mill
4) Demolition pulveriser

Fig.1 pulverizing mill

As of today, in the rural area, many people is used pounding method of crushing. In this traditional method a wooden mortar having one or more shallow pockets for keeping the paddy and one or two rural woman folk pound the paddy by mean of round log of 5ft-6ft called pestle. Then we introduce pulverizing mill by the help of some people. But we cannot used is to for multipurpose. So, we were working on multipurpose pulverizing mill for use it to crush the chilli and also grains. Also the chilli powder is the main contain of our dishes in all around the world. The chilli powder makes the dishes testy and spicy. Chilli powder is made from the dried

red chillies from removing or without removing the seeds. Z. Shsyfull, M. Fathullah et al [1] his make machine which is separate the seeds from the chilli by doing some process for ready to make the chilli powder. He concludes that, the purpose for making this machine because of increasing the demand of dried red chillies without seeds in the market.

II. LATERATURE SURVEY

DESING ANALYSIS OF MATERIAL

2.1 The Blade Design

2.1.1 Blade for Grains

Ebunilo P. O., Obanor A. I. And Ariavie G. O.[2] says that, the conventional hammer mill operate on the principles of impact and pulverization. In hammer mill, consist of steel hammer are used axially and radially on steel shaft with required space and rotate with high speed in strong housing (usually made of thick steel sheets).

Fig.2 Casing with Hammer blade

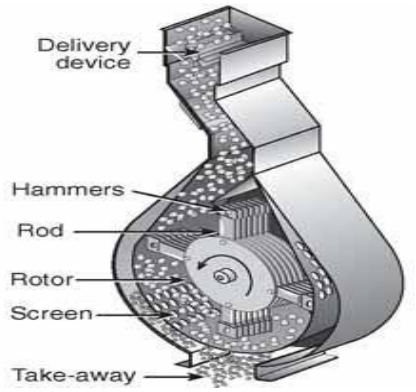
Fig.3 Hammer Blade

When the material is feed in pulveriser through hopper, then the blade hammer strike it with maximum force and rapidly pulverise it. This hammer is used to pulverise the grains. After the pulverising of grains, the fineness of particle is regulated by the use of sieve of same mesh size. The conventional hammer mill is shown in fig.

2.1.2 Blade for Chilli

Chilli is part of human diet in the world since at least 7500 BC. It is an important component of the food in daily life of human. Today India is the major producer of chilli. Most the production is from the village. Also India is the producer, consumer and exporter of this spicy commodity. Mohd. Shahjad Aspak Shaikh,[3] he did design of machine which is crushing the chilli and make fine powder of it. This machine is fully manual operated (pedal operated). From this project, he made the chilli powder using some mechanical arrangement. The object of this project is that to grind the chilli and convert in chilli powder using manual power. Also the utilization of kinetic energy is completely new one. He concludes that, time saving is much more in machine operated by motor as compared to our pedal operated but there is no use of electricity. Only human power is needed.

The object of this project is that to grind the chilli and convert in chilli powder using manual power. Also the



utilization of kinetic energy is completely new one. He concludes that, time saving is much more in machine operated by motor as compared to our pedal operated but there is no use of electricity. Only human power is needed.

Fig.4 Casing with Blade

Fig.5 Chilli Cutter Blade

The above fig. shows that it is a chilli crushing mill. In this fig. also shows the blade of crushing mill. In mill the blade is mounted on the shaft of crusher and rotated with high speed. The blade not tightly fixed on the hub. The fig. is clearly showing it.

2.2 V-Belt and Pulley

Pulley and V-Belt is used for the transmission purpose. The power from motor to shaft is transmit by the v-belt by using pulley. Here we used composite two pulleys for different operation. i.e. for chilli and grains. Here for chilli, we required more rpm of shaft as compare to operation for grains. Hence here we use two pulleys. So for this some calculation is required as following. [2]

The centrifugal tension, F_{bo},[4]

$$F_{bo} = m_{be} V_{be2} \quad \ldots \quad (1)$$

Where

F_{bo} = centrifugal tension

m_{be} = mass of belt per unit length

V_{be} = linear velocity of belt.

The power transmitted through the belt, P_{be}, [5]

$$P_{be} = (F_{t1} - F_{t2})\, V_{be} \quad \ldots \quad (2)$$

Where

P_{be} = power transmitted

F_{t1} = tension on tight side of belt

F_{t2} = tension on slack side of belt

Fig.6 Composite Pulley

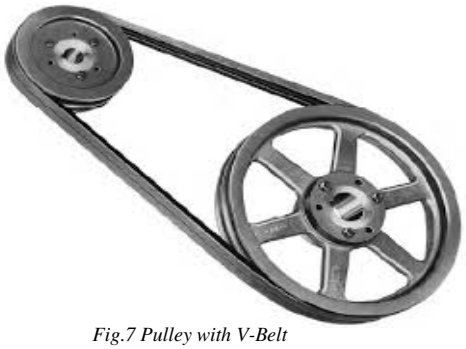


Fig.7 Pulley with V-Belt

The turning moment on the pulley, Mp, is given by [6]

$$M_p = (F_{t1} - F_{t2}) r_p \quad \ldots \quad (3)$$

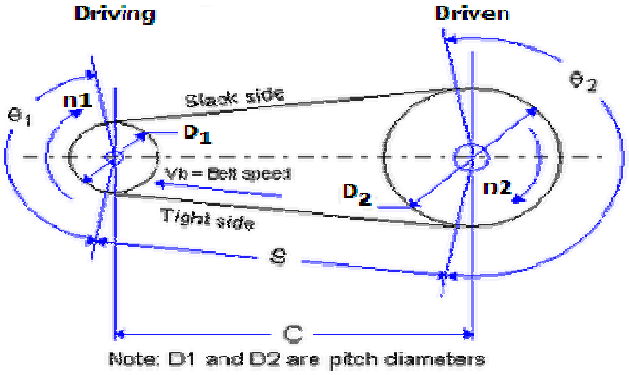
Where

M_p = turning moment

r_p = radius of pulley

Arc of contact ($r_a > r_b$)

$$\theta_a = 180^0 + 2\sin^{-1}\frac{(r_a - r_b)}{L} \quad \ldots\ldots\ldots\ldots\ldots (4a)$$



$$\theta_b = 180^0 - 2\sin^{-1}\frac{(r_a - r_b)}{L} \quad \ldots\ldots\ldots\ldots\ldots (4b)$$

Speed ratio

$$\frac{N_a}{N_b} = \frac{r_b}{r_a}\frac{(100-s)}{100} \quad \ldots\ldots\ldots\ldots\ldots \text{(when pulley b is the driver)} \ldots\ldots\ldots\ldots\ldots (5)$$

Tension ratio for belt about to slip

For pulley 'a' $\frac{F_1}{F_2} = e^{\mu\theta a}$.....(6a)

For pulley 'b' $\frac{F_1}{F_2} = e^{\mu\theta b}$.....(6b)

Where, e= base of natural logarithms (=2.718)

Fig.8 Pulley and V-Belt Dimensions

2.3 Motor and Shaft

Electric motor is the main component of this project. The electricity is used to rotate the electric motor with high speed and high torque. This torque is used to rotate the blade with required high speed. But for different operation on different pulley we required different speed for chilli and grains. That's why we use two different pulleys with different diameter. We here use 1.5HP motor in single phase electric motor.

Following are features of electric motor

1. Enhance durability
2. Auto overload cut-off
3. High effectiveness
4. Following are the technical specification of electric motor
5. 2.5kg container capacity

Air cooled stainless steel grinding chamber

- Heavy body and child safety
- Auto overload cut-off
- Stainless steel cut-off

Single phase electric motor specification

HP	RPM	Cast	Phase	ISI Standard
1.5HP	1440	Iron Body	Single/Three phase	ISI Standard

Fig.9 Electric Motor

Power Required by Machine

The power required by the hammer mill, Phm, [5]

$$P_{hm} = T_{\omega} \quad \ldots \quad (7)$$

Where

P_{hm} = power

T = torque

ω = angular velocity

The Shaft

It is assumed that the shaft is subjected to both axial and tangential forces. The diameter of the shaft, dsh, is determined using the Soderberg criterion and maximum shear stress theory. Thus Hall, et al [7]

$$\frac{\sigma_y}{FS} = \frac{32}{\pi d_{sh}^3}\ [(\frac{K_f \sigma_u M}{\sigma_e})2+T_m^2]1/2 \ \ldots\ldots\ldots\ldots\ldots\ldots(8)$$

Where

FS = factor of safety

K_f = actual stress concentration factor

σ_u = ultimate tensile stress

M = bending moment

σ_e = endurance limit of shaft material

T_m = mean torque

d_{sh} = shaft diameter

III. CONCLUSION

After the literature survey we have conclude that, mainly the pulverising mill is used only for one operation. ie. Either used make pulverising chilli or making the dal. For specific operation, blade design plays an important role. Because of here used different blade for different operation. In this project we make both operations in same mill, that's why this is effective and efficient project. You can use only one machine than to invest money in two machines.

IV. REFERENCE

[1] *Z. Shayfull*, M.Fathullah, N.A. Shuaib, S.M. Nasir, 'Design and Development of Dried Chilies Seed Separating Machine', IJBAS-IJENS Vol: 11 No: 05 ,October 2011*

[2] *Ebunilo P. O., Obanor A. I. And Ariavie G. O, 'Design And Preliminary Testing Of A Hammer Mill With Endsuction Lift Capability Suitable For Commercial Processing Of Grains And Solid Minerals', Irjet-Volume2(6), 2010*

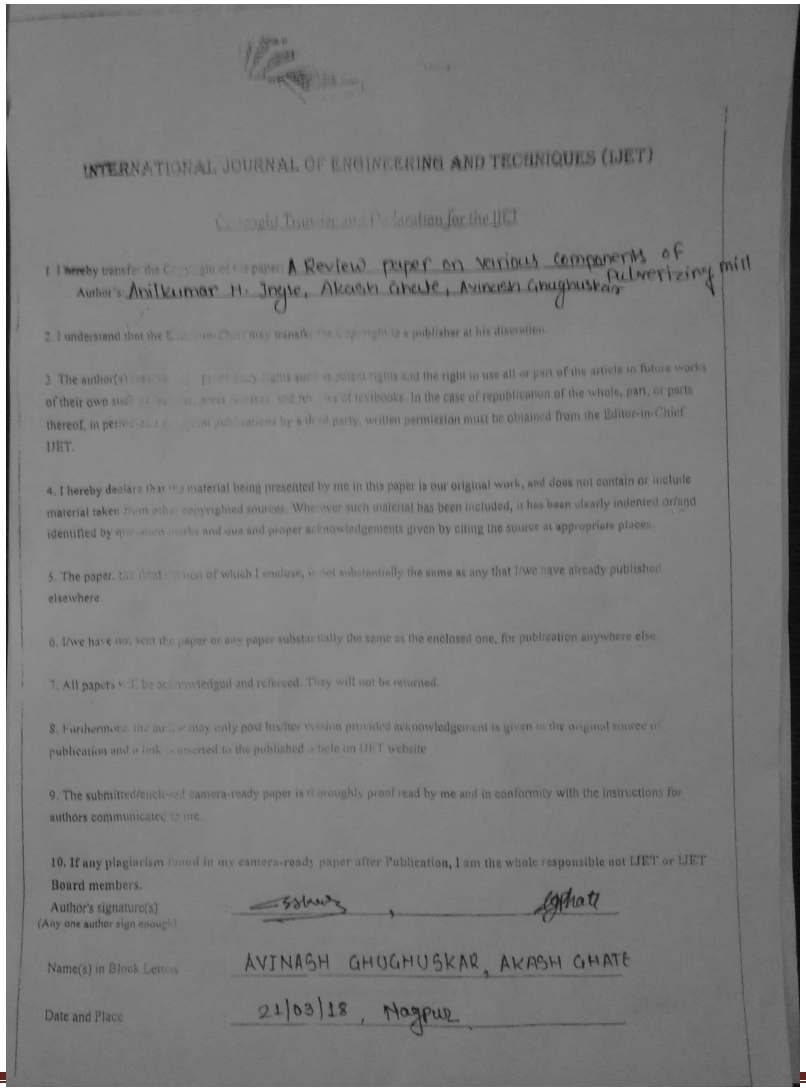
[3] *Mohd. Shahjad Aspak Sheikh, 'Design and Fabrication of Pedal Operated Chilli Crusher Machine', IJRITCC |Volume: 3 Issue: 2, February 2015*

[4] *Morrison, J. and Crossland, B. (2000), "An Introduction to the Mechanics of Machines". Longman Group Ltd (Publishers), Essex, UK, 4th Edition, pp5-192*

[5] *Khurmi, R and Gupta, J. (2008), "A Textbook of Machine Design". Eurasia Publishing House (PVT) Ltd, New Delhi, 1st Edition, pp677-819*

[6] *Hannah, J. and Stephens, R. (2004), "Advanced Theory and Examples in Mechanics of Machines". Edward Arnold (Publishers) Ltd, London; 5th Edition, pp.1-128.*

[7] *Hall, A; Holowenko, A. and Laughlin, H. (2004),"Theory and Problems of Machine Design". Tata McGraw-Hill Publishing Company Ltd, New Delhi. 4th Edition, pp6-89*



INTERNATIONAL JOURNAL OF ENGINEERING AND TECHNIQUES (IJET)

Copyright Transfer and Declaration for the IJET

I hereby transfer the Copyright of the paper A Review paper on various components of pulverizing mill
Author's Anilkumar H. Jogle, Akash Ghate, Avinash Ghughuskar

2. I understand that the Editor-in-Chief may transfer the copyright to a publisher at his discretion.

3. The author(s) retain(s) all proprietary rights such as patent rights and the right to use all or part of the article in future works of their own such as lectures, press releases and reviews of textbooks. In the case of republication of the whole, part, or parts thereof, in periodicals or other publications by a third party, written permission must be obtained from the Editor-in-Chief IJET.

4. I hereby declare that the material being presented by me in this paper is our original work, and does not contain or include material taken from other copyrighted sources. Wherever such material has been included, it has been clearly indented or/and identified by quotation marks and due and proper acknowledgements given by citing the source at appropriate places.

5. The paper, the final version of which I enclose, is not substantially the same as any that I/we have already published elsewhere.

6. I/we have not sent the paper or any paper substantially the same as the enclosed one, for publication anywhere else.

7. All papers will be acknowledged and referenced. They will not be returned.

8. Furthermore, the author may only post his/her version provided acknowledgement is given to the original source of publication and a link is inserted to the published article on IJET website.

9. The submitted/enclosed camera-ready paper is thoroughly proof read by me and in conformity with the instructions for authors communicated to me.

10. If any plagiarism found in my camera-ready paper after Publication, I am the whole responsible not IJET or IJET Board members.

Author's signature(s)
(Any one author sign enough)

Name(s) in Block Letters AVINASH GHUGHUSKAR, AKASH GHATE

Date and Place 21/03/18, Nagpur