

Design and Performance Analysis of Two Chamber Three Stage Pulverizer Machine

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ABSTRACT

A renowned furniture industry is facing a problem of waste produced during production process. Which is great loss for industry as their waste resale cost is less. The waste generated from existing production process is large wooden pieces which industry sells at lower cost. But management thinks that if waste is created in form of small particles rather a powder, they can sell waste at higher cost. The powder form wooden particles is useful to pharmaceutical industry and furniture manufacturing industry. It will be beneficial for organization as waste will generate profit for industry and overall productivity will increase. Thus, A complete wood pulverization machine is designed to create small particles from large wooden particles to increase cost of wastage. After make, industry will able to increase the profit by selling the wooden particles instead of wooden chips at higher cost. The design and fabrication cost of machine is estimated in Rs. 2.5 lakh and rate of return will achieved in very short period of time.

Keywords: *Analysis, investigation, researches*

INTRODUCTION

In bamboo industry bamboo is wide used as a base material for essence stick (round Stick). For making round stick, one need a group of machines :- Bamboo splitter Sizer Knot remover Sliver machine. Round stick machine Polishing machine. Sizer Packing. Bamboo splitter : a 15-20 feet long bamboo is splitted to 6 pieces on the same lengths. Sizer : this machine is nothing but a saw which has a stopper at one end which ensures cutting size. Either 3 feet or 1 feet as per the requirement of manufacturer of round stick. Knot remover: there are compartments in bamboo, once spitted they appear like knot & called as one. They need to remove the knot to process the bamboo. Sliver machine: this machine is used to make

slices of bamboo splits in to pieces of thickness 1.4-1.6mm Round stick machine: this machine makes round sticks from the output of the aforesaid machine. & generated 80 % of waste. Polishing machine: the round sticks then produced are transferred to polisher machine to make them smooth. Sizer: this machine is nothing but a saw which has a stopper at one end which ensures cutting size as per the requirement of Agarbatti maker. Packing: this is a manual process where a bunch of 1 kg of round sticks as per size is made. As per the aforementioned information we came to that in this process the product made is 20% & waste generated is 80 %. This makes the product cost high. To bring it down one need to work on waste management & generate

revenue. In comes the Pulveriser. As the waste generated is useless for most of the industries. But when the same is pulverised in different mesh sizes the cost increases & waste generates the revenue. Pulverised dust is used in dhoop making, pellet making, briquette making, table wares making, vinyl flooring etc.[1-10]

METHODOLOGY[11-15]

Machine to be operate by 5 HP electric motor

- Machine consist of 2 chambers. and 3 rotating blades are present inside each chamber.
- Power transmission to be carried out by V belt drive.
- Each rotating blade will have sharp edge blades over it
- Each chamber will consist 21 liners to collect fine particles and passed it through
- filtration chamber so that fine particles will be collected and then pulverizing process
- will again start in second chamber.
- Bamboo chip dust to be fed into machine with help of in feed belt conveyor through which the material gets into the contact with rotating machine blades at first chamber
- At initial chamber rotating blades will rotate at 1440 rpm and will convert dust into 40 mesh size particles...
- Then the mesh particle will again pass-through rotating blades rotating at 2016 RPM.
- These blades will convert 40 mesh particles into 80 -100 mesh particles which is of better quality and the machine will have conversion accuracy of around 95 %.
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- Machine will convert bamboo chips into fine particles of bamboo
- Machine will recycle bamboo waste and it will make it reusable by converting to 80 mesh size particles.
- Bamboo stick will be produced by one side and another side fine powder can be sale at more rate



Fig. 1: Two Chamber Three Stage Pulverizer.

MODELING AND ANALYSIS

Model and Material which are used is presented in this section. Table and model should be in prescribed format.

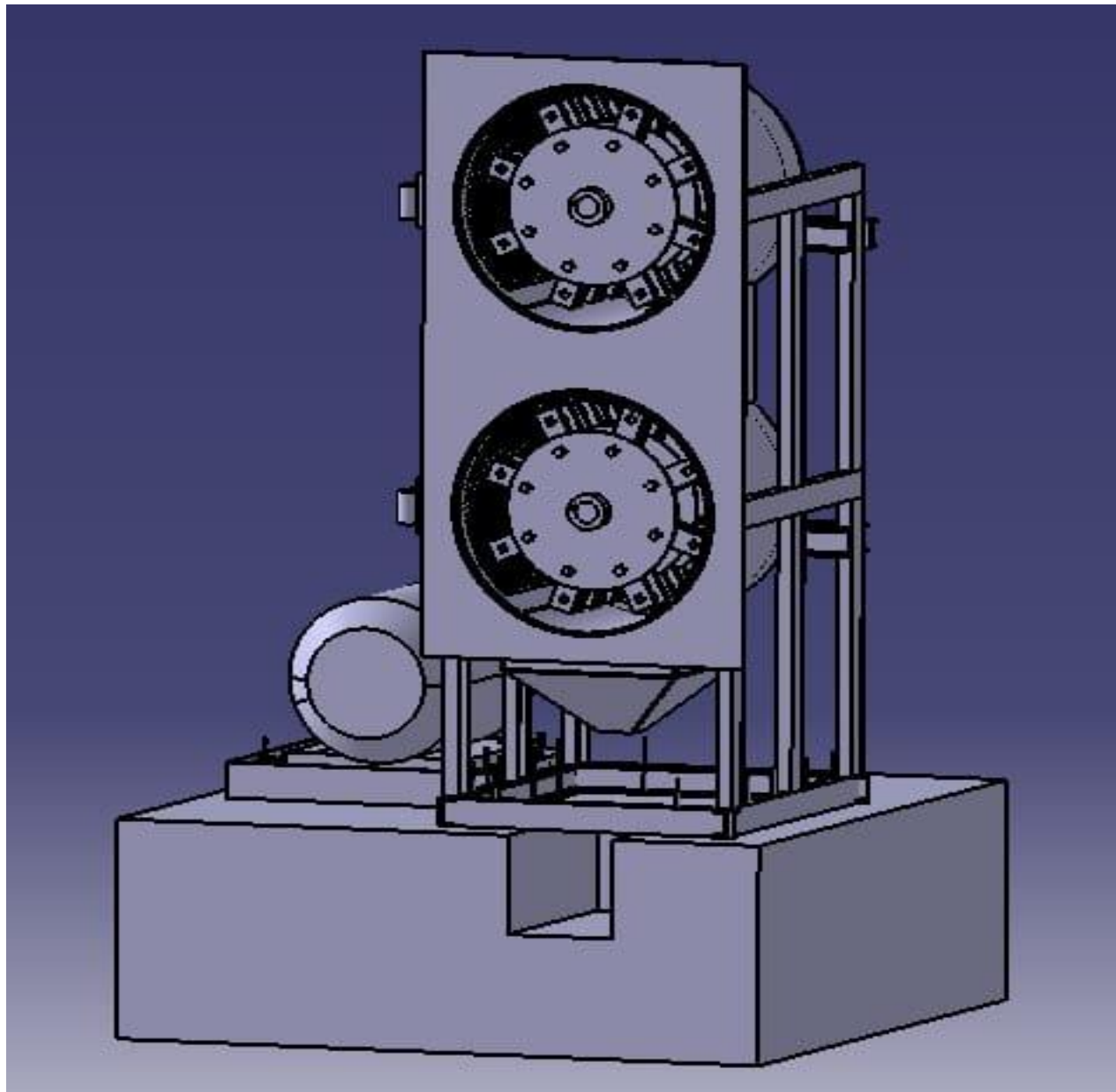


Fig. 2: CAD Model of 2 Chamber 3 stage Pulverizer Machine.

RESULTS AND DISCUSSION

SR	Bamboo Strip Weight	Powder formed Weight	Powder Size	Efficiency
1	4 Kg	3.8 kg	75 Mesh	95%
2	6 kg	5.5 kg	70 Mesh	91.7%

Experimental Analysis

- When 4 kg Bamboo strip is fed to the machine, 3.8 kg fine 75 mesh size

powder is formed with 95% Efficiency.

- When 6 kg Bamboo strip is Fed to machine , 5.5 kg fine 70 mesh size particle is formed with 91.7% Efficiency.

CONCLUSION

This bamboo dust has promising potentials, ranging from the long run economic to the important environmental benefits. This work is one of the few attempts and contributions where such projects could be implemented successfully, in the field of bamboo stick industry. With the increasing improvements in Pulverizer mechanism technologies projects would have more value added and should receive more attention and support as it will reduce wastage of bamboo.

Pulverizer with two chamber and three stage with three rotating blades in each chamber. Hypothesis calculation in terms of productivity for industry are calculated as, Rate of machine is 2.5 lakh RS. Including taxes. The cost of waste bamboo is 1-2 Rs/kg for bamboo industry. If 80 mesh size particles are produced from the waste bamboo chips. Cost of thin bamboo particles is 18-20 Rs/kg. Daily generation of bamboo chips is 50 kg average/day (variation occurs in different weather condition.

If plant is running 300 days per year and bamboo chips is recycled with 95 % accuracy, total revenue generation from resale of waste product will be 2,40,000 RS/Anum more than previous waste resale. The life of machine will be about 10 years, hence rate of return will be achieved in 16 months if the sum of machine operating cost, maintenance cost and to be taken into account 60000 RS/Anum. Pulverized dust is used in Dhoop making, pellet making, briquette making, table wares making, vinyl flooring etc.

REFERENCES

1. Ghavami, K. (2005). Bamboo as reinforcement in structural concrete elements. *Cement and concrete composites*, 27(6), 637-649.
2. Rajulu, A. V., Devi, R. R., & Devi, L. G. (2005). Thermal degradation parameters of bamboo fiber reinforcement. *Journal of reinforced plastics and composites*, 24(13), 1407-1411.
3. Swamy, R. N. (1975). Fibre reinforcement of cement and concrete. *Matériaux et Construction*, 8, 235-254.
4. Lima, H. C., Willrich, F. L., Barbosa, N. P., Rosa, M. A., & Cunha, B. S. (2008). Durability analysis of bamboo as concrete reinforcement. *Materials and Structures*, 41, 981-989.
5. Lima, H. C., Willrich, F. L., Barbosa, N. P., Rosa, M. A., & Cunha, B. S. (2008). Durability analysis of bamboo as concrete reinforcement. *Materials and Structures*, 41, 981-989.
6. Leelatanon, S., Srivaro, S., & Matan, N. (2010). Compressive strength and ductility of short concrete columns reinforced by bamboo. *Sonklanakarinn Journal of Science and Technology*, 32(4), 419.
7. Sinha, A., Way, D., & Mlasko, S. (2014). Structural performance of glued laminated bamboo beams. *Journal of Structural Engineering*, 140(1), 04013021.
8. Sevalia, J. K., Siddhpura, N. B., Agrawal, C. S., Shah, D. B., & Kapadia, J. V. (2013). Study on bamboo as reinforcement in cement concrete. *Civil Engineering Department, Sarvajani College of Engineering & Technology, Surat, Gujarat, India*.
9. Varma, M. B. An attempt to test suitability of bamboo strip as a structural material. *Journal os*

- structural engineering and management, ISSN, 2393-8773.*
10. Varma, D. (2015). Properties of bamboo strip Reinforced concrete. *International Journal of Engineering Research And*, 4(10), 1-4.
 11. Varma, M. B. (2016). State of the art: bamboo as a structural material. *International journal of engineering Research*, 5(1), 300-303.
 12. Varma, D. M. (2017). Properties of Cement Concrete Reinforced With Bamboo-Strip-Mat. *IOSR Journal of Mechanical and Civil Engineering*, 14(01), 47-59.
 13. Varma, M. B. (2017). Properties of cement concrete reinforced with whole bamboo culm section. *research gate, December.*
 16. *Engineering".*
 14. Simanová, L. (2019). The application of modern methods of change management to optimize processes in wood processing industry. *DIGITALISATION AND CIRCULAR ECONOMY*, 201.
 15. Džubáková, M., & Čyras, G. (2019, April). Evolution of management system certification after "Big Revision". In *International Scientific Conference „Contemporary Issues in Business, Management and Economics*