

Design and Development of Coconut Husk Pallet Making Machine

Gopaldas Waghmare¹, Amit Khapekar², Vaibhao Surpam³, Riya Chavhan⁴, Akash Rathod⁵

^{1, 2,3,4,5}Deptt. of Mechanical Engineering, Yeshwantrao Chavan College of Engineering, Nagpur

Abstract

A Coconut pallet can be defined as a type of pallet which is made of waste coconut husk and used in transporting heavy materials and also it helps companies for one ways export pallets from Asia. Coconut pallets are widely used for transport materials and keeping heavy materials in the industries such as iron, copper, tin. However, the design of coconut pallet and hydraulic press machine is complicated by the large number of geometries. According to Michael Vos, coconut pallet is natural and bio degradable and recycled which can be used for transporting material instead of using wooden pallets. In this study, the focus is on the research and study of pallets of coconut and wooden especially waste coconut husk. For this purpose, the simulation Solid Work is used. The results show that the Coconut pallet is the best performing pallet that can be used in companies.

Keywords: Coconut Husk; Wood, Pallets; Hydraulic press machine; Coconut pallet;

1. Introduction

Over 1.7 billion pallets are used to transport goods from Asia to the rest of the world every year. Almost 170 million trees are felled to make these single-use or one-way export pallets. Meanwhile, 7.4 billion coconuts have been harvested all over the world. The undesired hairy coconut shells are either burned or tossed in the ocean after consumption, resulting in approximately 60 billion Kg of garbage every year. By turning waste coconut husks into shipping pallets, SURFACES REPORTER (SR) introduces a unique eco-friendly approach to put them to new use and benefit us both economically and environmentally.

A pallet is an equipment or a type of storing container which is used for storing heavy materials such as iron, rod, copper. It is a facility used for heavy materials in Industries. It is made of waste coconut husk. They are the integral part of coconut, used to support pallets which provide the services such as shipping, storing. To minimize the need of wooden pallets, coconut pallets are the key for the sustainable transporting material.

Coco Pallets are fully bio-based and they contain natural fibres and lignin, while ordinary pressed wood pallets, in addition to being more expensive, contain synthetic resins. They also don't require any glue because the coconut husk has its own natural glue called lignin. This natural glue is activated when they grind the coconut husk and press them together at high temperatures. Coco Pallets have important advantages for the transport of goods

because they are stronger and lighter, they are fire retardant, and thanks to an adjusted design, also easier to stack, so they take up less space. Above all, they are cheaper, and a lower price is always the best sales argument for a sustainable product.



Fig: Coconut Pallet

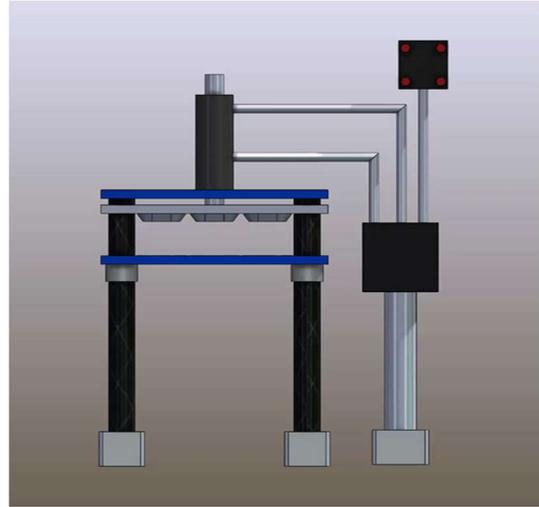


Fig: Hydraulic Press Machine

2. Working Procedure

- **Crushing process in coconut shell pellet line**

Due to the quite hardness of the coconut shell, the coconut shell needs to be crushed from big chunks to small pieces by a special coconut shell crusher.

- **Drying process in coconut shell pellet processing line**

For containing certain moisture, crushed coconut shells enter the drying machine through conveyor and feeding machine. The coconut shell dryer can dry off the excess moisture to improve the pellet strength after pelletizing.

- **Second crushing process in coconut shell pellet making line**

After drying, the coconut shell pieces need to be crushed again into small fibrous pieces for better pelletizing.

- **Pelletizing process in coconut shell pellet production line**

After entering the coconut shell pellet maker through a belt conveyor and feeding machine, the fibrous coconut shell pieces are pelletized into regular pellets by high strength extruding of the coconut shell pellet forming machine.

- **Cooling and packing process in coconut shell pellet plant**

Pelletized coconut shell has a certain temperature, so it needs to be cooled by a coconut shell pellet cooling machine after being conveyed by a belt conveyor. After cooling, the high-quality biomass pellet is packed by the automatic packing machine.

All the above processes are equipped with a dust collector, which makes the whole coconut shell pellet manufacturing process no dust pollution.

3. Results and Discussion

In this work the 4-Column hydraulic press machine is Designed and Analyzed with standard. This machine is used for compressive pressing operation in sheet metal industries where the deformation of the press should be permissible. To maintain close tolerance and increase productivity pressing accuracy plays an important role. It is a multi-purpose machine which is used for performing pressing and forging tasks. By changing the die different operations like sheet metal, blanking, bending etc. can be performed on a hydraulic press machine.

Thus, here a hydraulic system is used to develop a press, it will be useful for production of Pallets. This may increase the productivity and accuracy of the production. One can automate the feeding of the workpiece and make the complete Blanking machine. If we buy water coconut then we can remove water from coconut and make tetra pack of coconut water, then extract milk and make milk tetra pack, and coconut husk for pallets, in this way we can use full coconut and utilize everything.

4. Conclusions

- The hydraulic press was used in this project. Standards-based design and analysis. The greatest strains created in the hydraulic press's four columns.
- Further material reduction may have an impact on the design, resulting in excessive deformation and stresses, which are not appropriate for the machine, as it is utilized in the sheet metal industry for compressive pressing operations where the press deforms.
- It ought to be permissible. Pressing precision is critical for maintaining tight tolerances and increasing production. The highest distortion detected, according to the analysis, is less than 1 mm, which is acceptable for hydraulic pressing activities.
- It is a multi-purpose equipment that performs pressing and forging operations. Changing the die results in a different procedure.
- Blanking, sheet metal, and bending can all be done.

References

1. Dynamic Behaviour of the Hydraulic Press for Free Forging, Karel Raz, Vaclav Kubec, and Milan Cechura, 2014.
2. Computer Aided Design and Analysis of Power, D. Ravi, Power Press, 2014.
3. Bent Hollow Channel Punching Using Hydraulic Compact Press, S. Ajaya Kumar and K. Gopi Krishna, 2016.
4. Stress analysis of a Frame of a Bush pressing Machine for pumps AMIT KALEKAR 2015.
5. <https://www.cocopallet.com>
6. <https://www.ideassonline.org/public/pdf/CocoPallet-ENG.pdf>
7. <https://www.wageningenur.nl/en/biobased-economy>
8. <https://www.bioplasticnews.com>
9. <https://www.pellet-richi.com/wood-pellet-machine/coconut-shell-pellet-machine.html>
10. <http://www.arsinmachine.com/wp-content/uploads/Hydraulic-Press-tonnage-calculation.pdf>