



Research Paper

BAMBOO STRIPPING MACHINE USING PNEUMATIC PRESSURE

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In present Bamboo stripping process number of steps are involve to make Strips are: (1) Bamboo Cross Cutting, (2) Bamboo Splitting, (3) Bamboo Slicing. So the basic aim of this approach is to make a unique machine which can perform all the above processes. This can be done by pneumatic cylinder arrangement which reciprocates the bamboo holder, so that when air compress expand in the pneumatic cylinder it allow bamboo holder to reciprocates on the Horizontal blade which strips the bamboo into small pieces around 15 cm long and 1 cm to 2 cm wide and around 1 to 2 mm thick. Here bamboo holder is rectangular shape box which contains bamboo, spring pressure arrangement at the top of bamboo holder is provided. As the bamboo strikes on horizontal blade, the bottom portion of the bamboo comes in contact with the horizontal blade and the strip is obtained, the spring expands from the top with the amount equal to the thickness of strip obtained which pushes the remaining bamboo downward to obtain further stripping.

Keywords: Bamboo, Stripping and strikes

INTRODUCTION

Bamboo, commonly known as “cradle to coffin” timber is closely associated with life and livelihood of human being. Nearly one thousand five hundred uses of bamboo have been documented so far. The diversified uses of bamboo ranges from farm equipments to storage device, from dolls to measuring tools, from furniture to decorative items. The credit

of this varied utilization of bamboo goes to the bamboo artisans, who since centuries have been engaged in shaping the bamboo strips into such varied uses. Though the number of bamboo arti-sans in Orissa enumerated is about 30,000 in the year 2003 as quoted by Director of Handicraft and Cottage industry, in actual the number is fairly big and expected to cross one lakh if thoroughly surveyed. Apart

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from this, quite a large number of population eke out their livelihood from bamboo cutting operation in the state.

Domestic Use: Since time immemorial, bamboo products are extensively used in the rural households in form of bhogai, tukli, kulei, koola, dala, pedi, binchana, etc. Bamboo made artifacts; containers, etc., are indispensable in some of the Hindu ceremonies. Bamboo products are the prerequisites in marriage ceremonies of many tribes and castes in Orissa. The population of the neighbouring state of Jharkhand and Bihar also include bamboo products during many of their rituals. Bamboo has remained part and parcel of the cultural practices in the region. Moreover, the forest produce has also aided livelihood practices like agriculture. The agricultural sector still remains the largest consumer of bamboo products. Right from sowing to stocking of grains, bamboo articles find wide usage. Baskets, containers, ploughs, planks, winnowers and range of other articles are used in all the operations in agriculture.

In rural households, it is used in construction of houses and fences. Even it serves as a food item in most part of the country. Bamboo can be seen in the urban homes as decoration pieces, as furniture or handicrafts and is an essential feature in any celebration that requires a structure—be it marriage or religious festivities.

Commercial Use: The rich bamboo forests of the state had been a big attraction for paper industries since long. The use of bamboo in the state took a turn when in the year 1936-37 Messrs Heilgers and Company first started drawing its raw material for paper and pulp

manufacturing from Orissa. From then onwards a major portion of bamboo was consumed by the paper industries. Soon the Orient Paper Mills became operational in 1939 and the department finalized long-term leases of bamboo forests in their favour. Since then many mills were established, closed and revived. Keeping the convenience of paper mills to access raw materials in consideration, they had been permitted to operate in areas nearer to dense bamboo forest patches. Four mills held prominence in the state industrial scenario namely JK Paper Mills, Rayagada, Orient Paper Mills, Brajaraj Nagar, TPM (Now BILT), Choudwar and BILT (SEWA), Jeypore. Presently JK Paper Mills and BILT (SEWA) are operational. At one time, 80% of the total annual production was consumed by these paper industries, which decline over the years with the closure of the units in the state. The system continued for six decades successfully till it suffered a setback with the back out of the paper industries.

Existing Bamboo Processing Machine:

The initial processes to be done on a bamboo to make it as a useful product is called as bamboo processing. The initial processes include splitting, external and internal knot removing, slicing, bamboo sticking making, stick length setting, stick polishing. Bamboo and bamboo splits are used as the fencing material and for making various types of tool handles, ladders and scaffolding. In its natural form, bamboo as a construction material is traditionally associated with the cultures of South Asia, East Asia and the South Pacific, to some extent in Central and South America. Bamboo sticks are used for various purposes like building construction. Splits as well as

slivers are used to make a wide range of products such as baskets, the core of incense-sticks, kites and toys, flutes and a large number of handicraft items. They are also used to make cages for poultry, drying, packaging and transport of grains. Bamboo splits are woven into mats and used to manufacture mat boards.

Problem Identification and Research

Methodology: Traditionally the bamboo is processed in different steps and for each step a different machine is required which is time consuming and costlier. So there is a need of manufacturing a machine which can perform a number of operations. So here the main aim is to develop a bamboo stripping machine to reduce the number of steps and also to reduce the number of machines required to do the stripping operation. The first skeleton of the machine is developed which contains two basic requirements of the machine.

- There must be reciprocating motion of bamboo against a blade. This is achieved by designing a bamboo holder. There is a C-shape cavity in the bamboo holder which carries a bamboo. The bamboo holder should be reciprocating which can be done by a pneumatic cylinder arrangement. The compression and expansion of air in the cylinder allows the bamboo holder to reciprocate on the blade and bamboo strips are obtained.
- The second requirement is that, when the first bamboo strip is obtained, the remaining bamboo should move down against the horizontal blade. This can be done by a spring action provided on the top of the bamboo holder which tightens or loosens by a nut and bolt once the bamboo is fixed in the bamboo holder

cavity nut is firmly tight the spring, so after every stripping the bamboo moves down with the amount equal to the thickness of the strip obtained.

Description of important parts of the bamboo stripping machine.

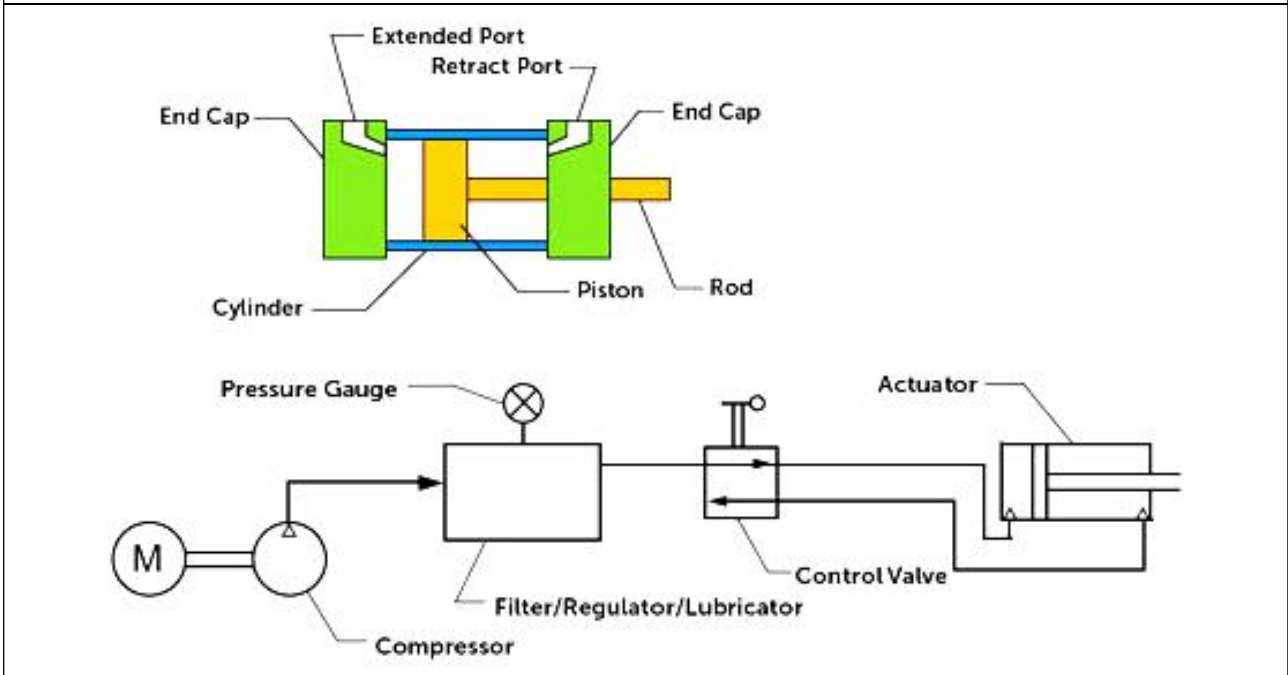
Pneumatic Cylinder: (Sometimes known as air cylinders) are mechanical devices which use the power of compressed air to produce a force in a reciprocating linear motion.

We prefer to use pneumatics, because they are quieter, cleaner, and do not require large amounts of space for fluid storage. Because the operating fluid is air, leakage from a pneumatic cylinder will not drip out and contaminate the surroundings, making pneumatics more desirable where cleanliness is a requirement.

Working of Pneumatic Cylinder: A pneumatic cylinder uses the pressure of air to perform work. Air can be easily taken in and compressed to refill pneumatic systems. There are different types of pneumatic cylinders. The single acting cylinder and the double acting cylinder. In the first cylinder a piston-oriented system is used to force compressed air out, into the back of the piston. The compressed air seeks its way out and thus exerts a large amount of pressure on the piston surface. When it is pushed the piston is pushed out and the air exits through the escape valve. The piston then falls back to its original place as shown in Figure 1.

Bamboo Holder: Based on the selected pneumatic cylinder for the bamboo stripping machine, the main part of the machine that is the bamboo holder is designed. It is a rectangular shape box which contains bamboo, the holder

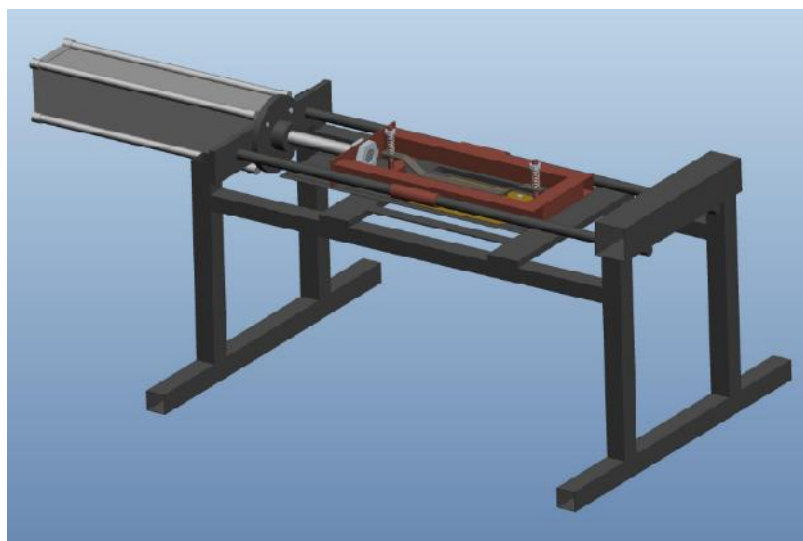
Figure 1: Working of Pneumatic Cylinder



is of C type shape, so that bamboo firmly fixed in the C clamp and does not strike out during reciprocation of bamboo holder. Horizontal blade is mounted on the bottom on the bamboo holder which is fixed at bottom by nut and bolt. Bamboo is initially pull down 1 mm to 2 mm

below the blade this gap can be increase or decrease by tightening the nut. So when bamboo reciprocates on the horizontal blade, bamboo slice into small pieces as per the required thickness. bamboo stripping machine is shown in Figure 2.

Figure 2: Bamboo Stripping Machine



Spring Arrangement: On the top of bamboo holder spring arrangement is provided on two side with spring is fixed inside the bolt and nut can be tighten from the top of the spring so that spring can be firmly tight by the nut, so that when the bamboo gets slice into pieces after very slice bamboo should pull down by 1 mm to 2 mm. Arrangement of spring is shown in Figure 3.

Horizontal Blade: The material for horizontal blade is High Speed Steel (HSS). The thickness of cutting edge of the blade is Approx 1mm . It is firmly fixed below the bamboo holder on two side by 6 Nuts and Bolts

The horizontal Blade is shown in Figure 4.

Input and Out Put from the Machine: Input for the machine is the bamboo. Bamboo is a

Figure 3: Different Parts of Bamboo Striping Machine

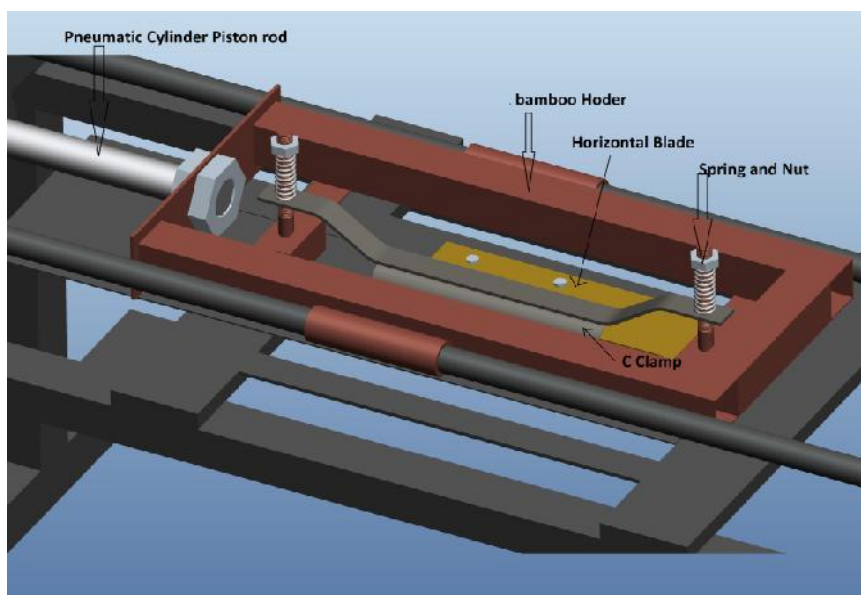


Figure 4: Horizontal Blade

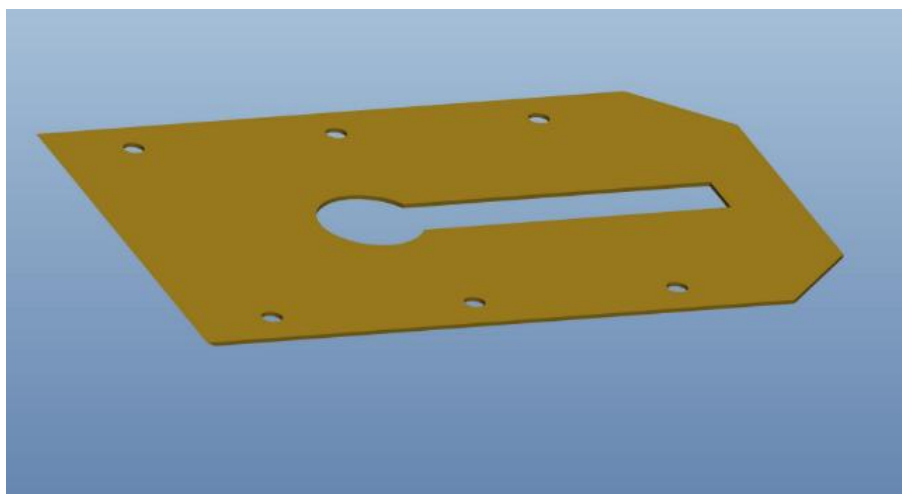


Figure 5: Bamboo Tree



true grass as shown in Figure 5. Approximately 1,500 species of bamboo exist around the world. They range in size from several inches all the way up to 100 feet.

In this machine first of all we have to cut the bamboo into pieces of around 15 cm length. so that it can firmly fixed on the C clamp. There is no limitation for diameter of the bamboo any diameter of bamboo can be Strips in this machine.

Out put from the machine is the bamboo strips. The length of strips cutting out from the machine is same as the length of bamboo fitted in the C clamp. While the thickness varies from 1 mm to 2 mm.

CONCLUSION

The minimum pressure at which the bamboo cuts into strips is around 4 bar (depends upon the type of bamboo selected). This minimum pressure is obtain after several experimental results. This strips can be further cut into small

diameter sticks required to make incense sticks. Here the length of strips cutting out from the machine is limited to 15 cm only and one bamboo can place at a time. This limitation can be overcome by Further modification in the machine by making such arrangement that more than one bamboo can be place at a time and length of C clamp can also be increase. 🌀

REFERENCES

1. Azmy Mohamed, Wan Razali Wan Mohd and Fauzidah Ahmad (1991), "Characteristics and Volume Weight Relationship of Four Malaysian Bamboo", *Journal of Tropical Forest Science*, Vol. 4, No. 1, pp. 87-93.
2. Jenner V G and Md Selim Reza (2010), "Agarbattis: A Sustainable Bamboo Cluster Based Rural Enterprise Development in Northeast Region of India Through P4 Approach" (The author is the Director of Industry & Commerce and Additional Secretary cum State Bamboo Mission Coordinator Government of Tripura, Gurkhabasti, Agartala Tripura, India).
3. Md. Arshad and Selim Reza (2012), "Socio-Economic Benefits Derived by Poor Rural Producers from Bamboo Value Chain Up-gradation: A Study of Tripura, Northeast India", *Indian Streams Research Journal*, Vol. 2, No. IV, pp. 1-4, ISSN: 2230-7850.
4. Mehar P G and Vanalkar A V (2012), "Development of Experimental Set Up of Improved Hydraulic Bamboo Processing Machine", *International Journal of Engineering Research and Applications*

(IJERA), Vol. 2, No. 4, pp. 1572-1576,
ISSN: 2248-9622, www.ijera.com

5. Mehar P G, Vanalkar A V and Khandare S S (2012), "Experimentation on Various Dies for Slicing on Improved Hydraulic Bamboo Processing Machine", *International Journal of Engineering*

Research and Applications (IJERA),
Vol. 2, No. 6, pp. 162-166, ISSN: 2248-
9622, www.ijera.com

6. Vana Samrakshana Samithis (2006), "Agarbatti Stick Production Under Andhra Pradesh Community Forest Management Project", Forest Department, Government of Andhra Pradesh.