

Experimentation on various dies for slicing on improved hydraulic Bamboo processing machine.

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Abstract

The present work shows the experimentation on various dies on improved bamboo processing machine for slicing of split bamboos. The details of different components, construction and working are explained in this paper. The force required to slice the bamboo in 4 pieces is also included in this paper. This paper also includes the traditional process of slicing the split bamboo.

Key Words:- Bamboo, Splitting, slicing, knot removing, Slicing force estimation.

Introduction

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 use to make cages for poultry, drying, packaging and transport of grains. Bamboo splits are woven into mats and use to manufacture mat boards. Traditionally the bamboo is processed in different steps and for each step a different machine is required, the main aim behind this development of experimental set up of improved bamboo processing machine is to reduce the number of steps and also to reduce the number of machines required to do the desired work. So an improved bamboo processing machine is fabricated which can perform splitting and slicing on a single machine. The design involves a new concept of making a special purpose of die for splitting and slicing, the concept behind this project is that, the machine is kept common for both the operations; only the die for splitting and slicing is different. This will eliminate the use of special

machine for slicing which is to be done after splitting the bamboo. In this research, different types of dies are fabricated used for slicing purpose which includes used of different type of cutting material i.e. cutter, different types for tool positioning for slicing purpose.

Literature Review:-

In the year 2003, International Workshop on Bamboo Industrial Utilization titled "International Network for Bamboo and Rattan" took place which was hosted by Hubei Provincial Government & Xianning Municipal Government which clearly shows although several types of bamboo processing devices have been developed, detailed in Chapter Production Process & Equipment for Bamboo Daily Products by Liu Kekun. The proposed machine in this investigation is not reported in the literature. Similarly, the proceedings of 7th World Bamboo Congress which took place in New Delhi in Feb., 2004 and shows that so far no attempt is taken in designing a machine for processing a bamboo which can perform multiple operations with a single unit. Hence, development of such type of machine is the main aim of this project. Obviously, when several operations can take place in one machine. It is bound to be commercially suitable.

Concept of Research:-

Traditionally bamboo slicing is done manually, or by using a manually operated machine, there was always a need of hydraulically operated bamboo slicing machine, so this brings us the idea of manufacturing different types of dies for slicing of bamboo on improved bamboo processing machine. The different options available with us were to change the tool for cutting or change the tool position for slicing purpose. The two tool materials available with us are HSS and O2; these are the two available tool materials which we can use. The other option available is to fabricate the die using different tool positions; the first option was to keep the tools straight one after the another and in the other die tools were kept in such a way that three tools were fixer parallel to each other and the other tool were fixed beneath them and in between the

above three tools. The figures of all the dies are shown below.

Traditional Bamboo splitting machine:-



Fig 1: Traditional bamboo splitting machine



Fig 2: Traditional hand operated bamboo splitting machine

A simple hand-operated slicer that can slice bamboo splits in thick slivers used in manufacturing fine basketry and novelty items.

This die consists of four tools having a length of 40 mm height of 25 mm and the end thickness of 2.5mm. These tools are placed parallel to each other and having a clearance of 2 mm so that we get the slices of about 1.5 mm. These tools are fitted between two flat plates having a thickness of 4 mm. The splitted bamboo pieces are forced by using hydraulic force on to the slicing cutters in such a way that the splitted bamboo piece gets sliced in four pieces of 1.5 mm to 2 mm. The actual slicing die and CAD model of the same is also showed in figure no 3.



Fig no 3: Slicing Die no 1



Fig 4: Slicing die no 2



Fig 5: Slicing Die no 3



Fig 6: Slicing die no 4

A number of experiments were conducted to study the effects of various machining parameters on bamboo processing operations. These studies have been undertaken to investigate the effects of various sizes of bamboo, speed, cutters and other machine parameters on torque, energy and time required in processing operations. During experimentation various variety and sizes of bamboo samples are collected and processed at three different speeds. For splitting operation different diameter of bamboos were taken in to consideration for obtaining cutting force required to split bamboos of different diameters. The result of the same is shown below. In the next step the already splitted bamboo pieces are forced on to the slicing tool and it gets sliced in four pieces, the actual slices are also shown in figure no 8.



Fig 6: Split bamboo pieces



Fig 7: Slicing Die



Fig 8 : Bamboo Slices alongwith slicing die.

Conclusion:-

After conducting a number of experiments on different dies for producing slices from bamboo splits, we estimated the power required to produce slices from different dies, the quality of slices and time required to produce slices out of each split

Comparison of different dies.

Di e	Position of Tools	Size of slic e	Performanc e	Remark
Di e no 1	Combine d	2	Failure	Failed because of non availabilit y of space for slices to flow out
Di e no 2	Straight	1.5	Acceptable	Smooth in working
Di e no 3	Inverted	2.2	Not acceptable	Quality of slices produced are not up to the mark
Di e no 4	Straight with HSS tools	2.4	Not acceptable	The size of slices is much thicker than required.

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