

Design and Fabrication of Wood Chopping Machine

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ABSTRACT

In both the chemical and mechanical pulping process, the logs are cut into wood chips by a cone shaped tool before fiber separation. To make the wood chopping process more efficient, one have to investigate in detail the coupling between process parameters and the quality of the chips. One objective of thesis was to obtain an understanding of the fundamental mechanisms behind the creation of wood chips. Another objective with the thesis was to investigate whether it was possible to, in a way tailor the chopping process so as to reduce the energy consumption in a following mechanical refining process. Both experimental & analytical/numerical approaches have been taken in this work. The first part of the experimental investigations, were performed with developed chopping tool. The results from the experimental investigation showed that the friction between log and chopping tool is probably one crucial factor for the chip formation. Further more it was found that indentation process is approximately self-similar, and that the stress field over the entire crack-plane is critical for cutting the chop wood. The developed analytical model products the normal and shear strain distribution and to be more specific, the model can predict the compressive stresses parallel to the fiber direction for an assumed linear elastic & Orthotropic material.

Keywords : Wood, Chop, Machine.

I. INTRODUCTION

Wood differs from other construction materials because it is produced in a living tree. As a result, wood possesses material properties that may be significantly different from other materials normally encountered in structural design. Although it is not necessary to have an in-depth knowledge of wood anatomy and properties, it is necessary for the engineer to have a general understanding of the properties and characteristics that affect the strength and performance of wood in bridge applications.

This includes not only the anatomical, physical, and mechanical properties of wood as a material, but also the standards and practices related to the manufacture

of structural wood products, such as sawn lumber and glulam. The axe is an example of a simple machine, as it is a type of wedge, or dual inclined plane. This reduces the effort needed by the wood chopper. It splits the wood into two parts by the pressure concentration at the blade. The handle of the axe also acts as a lever

allowing the user to increase the force at the cutting edge not using the full length of the handle is known as choking the axe. For fine chopping using a side axe this sometimes is a positive effect, but for felling with a double bitted axe it reduces efficiency.

Selecting a piece of wood and place it squarely on your chopping block, so that it won't fall over. In most cases, wood splits more easily if you go from the "top". The reason wood splits more easily from the top because of grain tension. Take a look at the end grain of the piece of wood. The end grain is the inner parts of the log where you are able to count the growth rings probably see at least one "check", or "crack". You want to take advantage of where the wood has checked. If there is more than one, choose the widest and longest check. Face the wood, line up your swing by placing the blade. Over the check, keep your back straight, raise your splitting maul directly over your head and pull the splitting manual downwards thrusting it into the wood, bending at the knees and using your legs to generate power as shown in fig. 1.

- Get ready.
- Find and position chopping block.
- Position wood.
- Face the wood and chopping block.
- Grip axe correctly.
- Observe the grain of the wood.
- Prepare swing.
- Swing the axe.



Figure 1: Wood chopping by Axe

After studying various methods of wood chopping methods, the aim of this work is to come up with a wood chopping machine that can chop considerable size of wooden log into smaller pieces with less effort.

II. OBJECTIVE OF PROJECT

Wood is one among the ancient fuel human being using since many centuries. Commercially available wood will be in the forms of logs and measures nearly 10 feet each. Chopping the wood logs by manual method really takes time and effort. Many of the manual methods uses different types of axe's to chop the logs, but depending upon the effort by the person who chops in a proper way which requires a skill. Keeping in the mind the machine for chopping, the objective of this project is to come up with a wood chopping machine that can chop considerable size of wooden log into smaller pieces with less effort.

III. METHODOLOGY

Methodology is a way to systematically solve the problem. It may be understood as a science of studying how research is done scientifically. In it we study the various steps that are generally adopted by a researcher in studying his research problem along with the logic behind them. It is necessary for the researcher to know not only the methods/techniques but also the

methodology. Researchers not only need to know how to develop certain tests, how to calculate the variables, how to apply particular techniques, but they also need to know which of these methods or techniques, are relevant and which are not, and what would they mean and indicate and why, so proper methodology was set for the present project as given below.

1. **Problem Definition:** Currently wood chopping is done by conventional method domestically. It requires more time, labor and also lack of safety.
2. **Problem Analysis:** Considering the problems faced in conventional methods like time consumption labor cost, efforts and human hazards and analyzing them.
3. **Literature Survey:** The survey of existing methods and the scope of the existing methods. Identifying the requirements of existing methods, advantages and drawbacks.
4. **Feasible Idea Selection:** Considering the problems definition, problem analysis and literature survey, identifying a feasible solution for the problem.
5. **Design:** Designing the physical structure of the prototype by considering all parameters.
6. **Fabrication:** Manufacturing of actual physical model according to the design.
7. **Testing and Evaluation:** Working of machine and its parameter are tested and evaluated considering machine variables.

IV. DESIGN AND FABRICATION OF CHOPPING MACHINE

The Old traditional method used to cut the wood manually. I.e. sawing the wood manually took up a lot of time & effort. The idea of fabricating a manual device that would cut wood without using electricity or any other fuel.

Our idea is to chop a particular wood manually without much human effort; there by with applying minimal effect one can chop the wood easily & it is cost effective. The Frame is designed with Mild Steel, and arrangement is provided for jack to lift the wood to particular height. Using the above mechanism one can chop the wood easily, fig 2. Shows the isometric view of the wood chopping machine.

The Main components involved in wood Chopping machine are:

1. Frame
2. Hydraulic Jack
3. Cutter

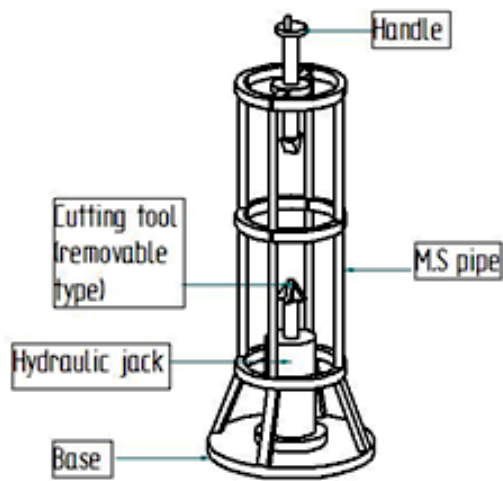


Figure 2. Wood Chopping Machine

Working of Wood Chopping Machine: From the sketch, first the wood is placed inside the frame facing the bottom to the cutting tool which is connected to hydraulic jack. Then at the top, the handle is moved towards the wood so as to support the wood. Once the wood is positioned, the hydraulic jack is activated and the cutting tool pierces the wood, thereby chopping the wood into pieces.

V. CONCLUSIONS

Various methods are being followed to chop wood using different tools, in the present work, successfully the design and fabrication of wood chopping machine was achieved. The following are the conclusions that were drawn after its evaluation.

- Reduced the time required for wood chopping when compared with manual method.
- Reduced the effort required for wood chopping.
- Eliminated the improper way of chopping wood.
- Safe chopping of wood.
- Increased the efficiency of wood chopping.
- Eliminated injuries that may occur during wood chopping.
- Minimize the time and effort required for wood chopping by using fixture and accessory.
- Reduced the labor cost for wood chopping.

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