

Design and Fabrication of Human Powered Wood Cutting machine

Asst. Prof. Zueb Khan
Department Of Mechanical Engineering
VDCET, Mouda
Nagpur, India
Khan.sohail47@gmail.com

Mr.Sushil Dopekar
Department Of Mechanical Engineering
VDCET, Mouda
Nagpur, India
sushildhopekar@gmail.com

Abstract— Science is basically "passive" observation of the universe, as it exists to generate knowledge. Engineering is making use of that knowledge to meet human needs by creating machine, systems, process and technologies that have not previously existed. Design and manufacturing are the synthetic part of engineering practice. Manufacturer has received a lot of attention recently for very good economic reasons.

This is improved design of the human powered wood cutting machine which gives the less efforts of man and commonly used in rural areas where there is no power supply. The design ensures a smooth operation during the cutting process. The cutting force is provided by means of chain drive, gear assembly and other kinematic mechanism and all the parameter need to be optimized to get maximum cutting force. This machine is used for heavy duty wood cutting process for multiple operations like furniture, farm equipment's, workshop and construction areas etc. It is light in weight and portable machine.

Keywords-cutting process, wood, human powered.

I. INTRODUCTION

The human operated wood cutting machine is used to cut wood in small scales. It's working on rotary mechanism. Fabricate and experimentally investigate the working of bicycle driven wood cutter. This machine used it help to obtain a less effort uniform cutting. It can be used in places where electricity is not available.(1) He main parts of manually operated wood cutting machine are rotary cutter chain drive and v-belt & bevel gear & cycle pedal.

Ever since the arrival of fossil fuels and electricity, human powered tools and machines have been viewed as an obsolete technology. This makes it easy to forget that there has been a great deal of progress in their design, largely improving their productivity. (7) The most efficient mechanism to harvest human energy appeared in the late 19th century: pedaling. Stationary pedal powered machines went through a boom at the turn of the 20th century, but the arrival of cheap electricity and fossil fuels abruptly stopped all further development. The historical importance of pedal powered machines can be easily overlooked by people who grew accustomed to fossil fuels and ubiquitous electricity.(8) Therefore, it cannot be stressed enough how much of an improvement pedal power was in the light of thousands of years of human drudgery. Pedals and cranks make use of human power in a near-optimum way. A rotary cutter is a tool generally used by quilters to cut fabric. It consists of a handle with a circular blade that rotates, thus the tool's name.

Foot The circular pedaling motion mainly activates the thigh muscles or quadriceps which is the largest and most powerful muscles in the human body. Furthermore, using the appropriate gearing, pedals and cranks make use of these muscles at an optimal speed: about 60 to 90 revolutions per minute. Research in the twentieth century has shown that muscles develop maximum power when they are contracting quickly against a small resistance. (7)

Historically, the motions used to harvest human muscle power used inappropriate muscles moving

against resistances which were too large at speeds which were too low. While human powered capstans and tread wheels were much more efficient, their use was limited because of their sheer size (and especially in the case of tread wheels, their high costs). (8)

In the 1977 book *Pedal Power in Work, Leisure and Transportation*, David Wilson explains three ways in which the application of human muscle power could fall short of the optimum:

"First, the wrong muscles could be involved. We find time and time again that people were called upon to produce maximum power output, for instance in pumping or lifting water from a well or ditch, using only their arm and back muscles. Second, the speed of the muscle motion was usually far too low. (7) People were required to heave and shove with all their might, gaining an occasional inch or two. A modern parallel would be to force bicyclists to pedal up the steepest hills in the highest gears, or to require oarsmen to row boats with very long oars having very short inboard handles. (8) Third, the type of motion itself, even if carried out at the best speed using the leg muscles, could be no optimum in a rather abstruse way". (8)

II. BICYCLE POWER

Pedal power is the transfer of energy from a human source through the use of a foot pedal and crank system. This technology is most commonly used for transportation and has been used to propel bicycles for over a hundred years. Less commonly pedal power is used to power agricultural and hand tools and even to generate electricity. (4)

Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. The articles on this page are about the many wonderful applications for pedal power technology. (4)

There has been major corporate competition to lower the weight of racing bikes.

Wheels are available with comparatively lower friction bearings and other features to lower resistance; however in measured tests these components have almost no effect on cycling performance when riding on flat ground. The UCI sets a limit on the minimum weight of bicycles to be used in sanctioned races, to discourage making structures so thin that they become unsafe. For these reasons recent designs have concentrated on lowering wind resistance by using aerodynamically shaped tubing, flat spokes on the wheels, and handlebars that position the rider's torso and arms for minimal drag. These changes can impact performance dramatically, cutting minutes off a time trial. Less weight results in larger time savings on uphill terrain.

III. CONSTRUCTION

A. Cutter Design

A rotary cutter is a tool generally used by quilters to cut fabric. It consists of a handle with a circular blade that rotates, thus the tool's name. Rotary cutter blades are very sharp, can be sharpened, and are available in different sizes: usually smaller blades are used to cut small curves, while larger blades are used to cut to straight lines and broad curves. Several layers of fabric can be cut simultaneously with a sharp blade, making it easier to cut out patchwork pieces of the same shape and size than with scissors. (2)

The first rotary cutter was introduced by the Olfa Company in 1979 for garment making; however, it was quickly adopted by quilters. Prior to the invention of the rotary cutter, quilters traced handmade templates of the necessary shapes onto the wrong side of fabric and added 1/4-inch seam allowances all around. (3) Templates were often handmade of cardboard and the pencil wore down the edges with repeated tracings, rendering them inaccurate; new templates would be made several times until all the patchwork pieces were cut. Pieces were usually cut one at a time with dressmaking scissors, which were often heavy and had long blades that were designed for cutting large pieces for garments but were cumbersome to use for cutting small pieces for patchwork



Figure 1. Cutter

B. Design and Kinematics Synthesis

This machine made from bicycle, pedal, flywheel, v-belt, operating table. Rotary cutter, bevel gear, chain sprocket. In this machine bevel gear use for increasing rpm. The pedal powered rotary coter set up, has a simple mechanism operate with chain and sprocket arrangement. (3) Bearing is provided between the Centre of the wheel or pedal and to delivers a smooth running of the rotary cutter in to and fro motion during pedaling

In view of the simple structure and low costs of this system

1. Left-hand bicycle cranks
2. Right-hand bicycle crank
3. 2 -Bicycle pedals
4. 2 -Spoke flanges (hubs)
5. 2 -Bicycle saddles Dimension of rotary cutter
6. Wood Cutting Saw Blade with 1/8" hole for rotary tool
7. Diameter: 2"
8. Thickness: 0.046"
9. Can be used up to 8,000 RPM
10. for use with Dremel or other high speed rotary tools



Figure 2. Human Powered Wood Cutting Machine

IV. WORKING

(Refer fig no.2) The pedal powered rotary coter set up, has a simple mechanism operate with chain and sprocket arrangement. The chain is placed on the teeth of the wheel and pinion. Pedal and connecting rod are interconnected to each other with the help of bolts. Bearing is provided between the Centre of the wheel or pedal and to delivers a smooth running of the rotary cutter in to and fro motion during pedaling the bevel gear is connected to the end of a rod. (6) As by pedaling the wheel, the flywheel connected nearer to the pinion also rotates and to reduce the fluctuation of speed and also provide a uniform cutting. The work piece is placed on the work piece holder, which is to prevent the movement of work piece during cutting. The size and shape of this setup is similar to cycle. Here for reducing the power, loss chain mechanism is use. (5)

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Some applications include pedal powered laptops, pedal powered grinders and pedal powered water wells. Some third world development projects currently transform used bicycles into pedal powered tools for sustainable development. The articles on this page are about the many wonderful applications for pedal power technology. (6) Every machine is constructed for the purpose of performing certain mechanical operations, each of which supposes the existence of two other things besides the machine in question, namely, a moving power, and an object subject to the operation, which may be termed the work to be done. Machines, in fact, are

interposed between the power and the work, for the purpose of adapting the one to the other

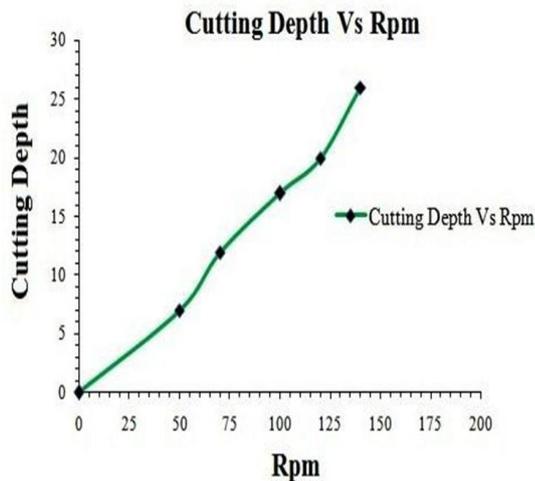


Figure 3. Cutting Depth Vs RPM Curve

Show the variation of cutting depth with rpm. It is observed that the cutting depth increases with the pedal rpm. Experimental result shows cutting depth of about 17 mm can be obtained in one cycle of strokes for around 100rpm. The variation in the obtained plot is due to errors in observation and due to power transmission losses.

V. CONCLUSION

Experimental result shows cutting depth of about 17 mm can be obtained in one cycle of strokes for around 100rpm. Pedal driven rotter saw helps to obtain less effort uniform cutting. The results indicate that it had given better, accurate and faster cuts when compared with hand hacksaw at different rpm.

It can be used in remote places where electricity is not available. It is designed as a portable one which can be used for cutting in various places. The ply wood can be cut without any external energy like fuel or current. Since it uses no electric power and fuel, this is very cheap and best.

VI. REFERENCES

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