Fabrication of Solar Powered Wood and Metal Cutting Hacksaw Machine

J Nagarjun¹, Balu Maloth², NV Srinivasulu³

¹,² Department of Mechanical Engineering, CMR Technical Campus, Hyderabad, India
³ Department of Mechanical Engineering, Chaitanya Bharathi Institute of Technology, Hyderabad, India

1. INTRODUCTION

A hacksaw consists of toothed blade for cutting various metals and wood. By There are two types hacksaws will be there one will be handsaw and other will power hack saw. Generally hacksaws will have a C-shaped frame which holds a blade rigidly. According to the blade sizes the frame can be adjusted. A screw mechanism will be used to hold the blade firmly and rigidly. Now Power tools like jigsaws, and angle grinder used cutting long sheet metals. In hacksaws mostly frame saw, the blade is mounted with the teeth facing outwards the handle. The cutting action is done in both the push and pull stroke. While cutting vertically downwards direction the work is kept in the bench vice and the hacksaw blades is set to be facing forwards. In some frame saws, like Piercing Saws the blades are set to be facing the handle because they are used to cut in the pulled down direction against the horizontal surface. In multi-operation machine at research areas, there are motivated by many question related production. The hacksaw machine completely changed the cutting operation of hand saw hacksaw. The direction of cutting plays the major role for quick cutting. The perfect cutting dimension is achieved by the machining operation. Consider a large work piece is to cut with less power than we go for solar hacksaw machine. The main solar renewable energy is converted in to electrical energy and then to mechanical energy is utilized for cutting operation.

This machine is use at the hill stations where the regular power supply is not available. This machine is compact in structure and easy movable from place to place. The solar hacksaw machine solves many of the limitations in regular cutting machines.

Abstract- The hacksaw is a metal cutting machine tool designed to cut metal by applying motor pressure. The machine is exclusively used for the purpose of continuous production and it can cut the metal more efficiently. Hacksaws are used to cut metal and wood. The operation of the unit is simplified to a few simple operations involving the DC motor and reciprocating motion arrangement. There are so many types of cutting machines are used in engineering field, which can fulfill the requirements. We are interested to introduce solar operated hacksaw. Solar energy can be used to charge the battery and it also a renewable form. We collect energy from the sun and stored in the battery. This energy is used to work the hacksaw.

Keywords: Hacksaw, Solar Energy, Cutting machines, Tool design

2. SOLAR PANEL

Solar panels are used for collecting the solar energy. And we will have a photovoltaic cell which will be used to convert the light energy into electrical energy. These cells are assembled to form a big unit for producing the required power to run the motor. It’s better to use terrestrial grade cells because their cost is to low and performance was better.

Specifications
Model Type=KL010,
Peak power $P_{max}=10W$,
Peak current $I_{max}=0.59A$,
Max power voltage $V_{mp}=17.1V$,
Open Circuit Voltage $V_{oc}=21.5V$,
Short Circuit Current $I_{sc}=0.65A$. 

Fig. 1 CAD Drawing of the Solar Powered Hacksaw

Fig. 2 Picture of the Fabricated Solar Powered Hacksaw
3. BLADES

The distance between successive teeth can be said as pitch of the teeth. The number of teeth on the blade depends on the length of the teeth. Mostly the number of teeth may be up to thirty two. The blades are taken in terms of inches. The thickness of the blade varies based on the material of the work to cut. As hacksaw teeth are so small, they are set in WAVE set. The other saws are arranged from side by side to provide clearance while sawing. The set of hacksaw changes accordingly tooth to tooth with a smooth curve. Hacksaw blades are generally brittle, so we need to take care of the fractures because of the brittleness. Generally blades are made of carbon steel. They also called as low alloy blades as they are soft and brittle. Blades wore out quickly. Cost plays the major role in quality of the material of the blade. At present the high speed steel material of the blade is used for cutting the strong material and improved the life of teeth. The blades are available in hard and they are brittle. The work piece is fixed to the bench vice and the cutting operation is performed. The work piece is firmly clamped in the bench vice and the blade with hacksaw is placed over the cutting point. The cost of the blade is dropped and the usage of the blades has increased all over the world. The blades are generally available in 12inch.

There are two holes observed at the two ends of the blade. Those holes are used for fixing the blade to the frame. The dimension of 12inch represents the center distance between the holes on the blade. Blade is hold tightly with screws. There is easy possibility of changing the blades after its got damaged. The quality blades will break immediately without any plastic deformation. The screws are used to tighten the blade and keep it in tension. The teeth of the blade will be facing either towards or away from the handle. A slight crack point is created on the work piece for initial cutting of the work. The cutting of the work piece is done in the forward direction if the teeth are facing away of the handle. In the return stroke there will not be any cutting action. It will just make the work piece free of next cutting stroke. By this continuous stroke of the blade over the work piece leads to cutting of the work piece in to parts. In forward stroke the blade cracks the work piece every time and increases the crack. This will make to cut the work piece easier and faster. If the cutting action is carried in pull stroke leads to good control over the cut and the blade life also increases.

4. SCOTCH YOKE MECHANISM

The Scotch yoke is a mechanism is used for converting rotational motion into linear motion vice versa. By using this mechanism we can convert the rotational motion of motor to the linear motion of the blade.
5. COST ANALYSIS

The following cost analysis points are considered while doing the analysis.

Material cost: 4260 INR
Overhead cost: 500 INR
Prime cost = (material cost + overhead cost)
= 4260+500 = 4760 INR
Labor cost: 3500 INR
Total cost = (prime cost + labor cost)
= 4760+3500
= 8260 INR

6. ADVANTAGES AND APPLICATIONS

The advantages and applications of the fabrication of solar powered wood and metal cutting hacksaw machine are following,

- High torque output with a small cylinder size
- Fewer moving parts
- Smoother operation
- It is easy to operate
- One time investment
- Construction is simple
- It can easily operate ordinary skill person
- No need to be current supply
- Mainly use for tool rooms
- Educational institution
- Small scale industries
- Workshops
- Rolling mills, etc...

7. CONCLUSION

After completion of this project we gained lot of practical knowledge regarding purchasing and assembling and we also had real time industrial experience. We feel that the project work is a good solution for industries to save the energy and solar energy is also pollution less energy. The “SOLAR HACKSAW” is working fine. We have also studied the difficulties in maintaining the tolerances and quality.

Thus we have developed a “SOLAR HACKSAW” which helps to know how to achieve low cost automation. The operating principle of this system is very easy to understand, less skilled person can also operate this machines. By using more techniques, we can modify it according to the applications.

REFERENCES