

# Solar Operated Hacksaw Machine

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**Abstract:** This project is on the design and construction of a solar power hacksaw machine for cutting of metal to different size and length with the help of solar hacksaw. The objective of this project is to save manpower and time, energy in cutting metals in order to achieve high productivity. It is a cutting machine with teeth on its blade used specially for cutting material. The power to the hacksaw is provided by the Solar Energy. The motor drives the flywheel connected to the shaft of the motor. The flywheel is connected through a link that transmits the required force for cutting the work piece. Finally connecting rod is connected to the vertical arm connected to the horizontal arm. Rotary motion of the shaft is converted into reciprocating motion of the hacksaw with the help of crank and connecting rod. Work piece of desired length can be cut by feeding it to hacksaw by holding it into bench vice. The various component of the machine was designed and constructed. Test was carried out on the machine using different metals.

**Keywords:** Solar Panel, DC Motor, Battery, Hacksaw Blade, Scotch yoke mechanism.

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## 1. INTRODUCTION

A hacksaw is a handheld tool used to cut through materials like plastic tubing and metal pipes. Its cutting mechanism is provided by removable blades which feature sharp teeth along their outer edge. In most cases, a hacksaw consists of a metal frame that resembles a downward-facing. A handle of plastic, wood, or metal is typically affixed to one end of the frame. The frame's ends feature adjustable pegs that can be tightened to secure a blade in place, and loosened to remove it. Hacksaw blades are long, thin strips of hardened steel that feature a row of teeth along their cutting edge. Each end of the blade is punched with a small hole that fits onto the saw frame's pegs. Most blades range in length from ten to 12 inches (25.4 to 30.48 cm), although six-inch (15.24 cm) blades can be purchased to fit smaller hacksaw models. A device that applies force, changes the direction of a force, or changes the strength of a force, in order to perform a task, generally involving work done on a load. Machines are often designed to yield a high mechanical advantage to reduce the effort needed to do that work. A simple machine is a wheel, a lever or an inclined plane. All other machines can be built using combinations of these simple machines. Example: A drill uses a combination of gears (wheels) to drive helical inclined planes (the drill bit) to split a material and carve a hole in it.

## 2. SCOPE OF THE PROJECT

1. The machine can solve the problem of time consumption.
2. Waste of resources in face of labour cost is reduced.
3. The machine can be used in the industry where it is manufactured, at the packaging sector.

4. It is used as hardware in large quantity like in fabrication machine.
5. It provides alternative for industries aiming toward reducing human effort.
6. It generates sustainable and practical solutions for the future industrial development.

## 3. OBJECTIVE OF THE PROJECT

1. To cater to the issue of competition in mechanical industry
2. The need for solar energy is assessed by all the industry.
3. Identify the key policy avenues considered to be appropriate to meet the challenge of sustainable manufacturing and packaging industry for the future.
4. To provide alternative for industries aiming toward reducing human effort.
5. Sustainable and practical solutions for the future industrial environment

## 4. PCM MATERIAL

**RT35:** - RUBITHERM RT35 is a pure PCM, this heat storage material utilising the processes of phase change between solid and liquid (melting and congealing) to store and release large quantities of thermal energy at nearly constant temperature. The RUBITHERM RT35 phase change materials (PCM's) provide a very effective means for storing heat and cold, even when limited volumes and low differences in operating temperature are applicable.

Specification of RT35

Melting Area.....27-29c

Congealing Area.....29-27c

Heat storage capacity....250 KJ/KG

Specific heat capacity...2 KJ/KG. K

Heat conductivity.....0,2 W/ (m.k)  
Max operating tem.....50c

## 5. LITERATURE REVIEW

### **Anna Mickiewicz, Dominika Knera, Dariusz Heim**

The aim of this investigation is to determine the transition temperature of PCM layer that allows avoiding rapid temperature fluctuations on the PV back surface. To meet the stated goal, dynamic simulations of thermal and electrical performance of PV/PCM panels were carried out using ESP-r software. Based on the obtained results, it can be concluded that additional PCM layer on the back side of PV panel can effectively increase the efficiency of electricity production with PCM transition temperature about 20 °C.

### **Rok Stopnik, Uros Stritih**

The article presents how to increase electrical efficiency and power output of photovoltaic (PV) panel with the use of a phase change material (PCM). The focus of the work is in experimental setup and simulation heat extraction from the PV panel with the use of TRNSYS software. A modification of PV panel Canadian Solar CS6P-M was made with a phase change material RT28HC.

### **Pascal Henry Biwole, Pierre Eclache, Frederic Kaznik**

This paper investigates the use of phase-change materials (PCM) to maintain the temperature of the panels close to ambient. The main focus of the study is the computational fluid dynamics (CFD) modeling of heat and mass transfers in a system composed of an impure phase change material situated in the back of a solar panel (SP).

### **Nam Gyu Park**

Perovskite solar cells based on organometal halides represent an emerging photovoltaic technology. Perovskite solar cells stem from dye-sensitized solar cells. In a liquid-based dye-sensitized solar cell structure, the adsorption of methylammonium lead halide perovskite on a nanocrystalline TiO<sub>2</sub> surface produces a photocurrent with a power conversion efficiency (PCE) of around 3–4%, as first discovered in 2009.

### **Kshirsagar Prashant, Rathod Nayan, Rahate Prashant**

This paper proposes the model of multi-way hacksaw machine which is able to cut four pieces simultaneously without any jerk and minimum vibrations. The model implies conversion of rotary motion into the reciprocating motion for proper working of hacksaw.

### **Bijay Lipcha, Amar Kadam, Sachin Gadakh**

The research work is on the rectification of a power hacksaw machine for cutting of metal to different size and

length with the help of a hacksaw and a coolant. It is a cutting machine with blades used specially for cutting metals and driven by 2hp and 1440 rpm electric motor. The aim of this research is to save man power and time in cutting metals in order to achieve high productivity

### **Dipak Patil, Swapnil Raut, Shrikant Jadhav**

The main objective of this work is to perform cutting operations with the help of motor. For a developing industry the operation performed and the parts (or) components produced should have its minimum possible production cost, and then only industry runs profitability

### **Essam Ali Al Bahkali, Adel Taha Abbas**

The aim of study is the Failure analysis in mechanical components has been investigated in many studies in the last few years. Failure analysis and prevention are important functions in all engineering disciplines. Materials engineers are often the lead role in the analysis of failures, where a component or product fails in service or if a failure occurs during manufacturing or production processing

### **Marta Kuta, Tadeusz M Wojcik**

The aim of research is Phase change materials (PCMs) have been applying in many areas. One of them is energy field. PCMs are interesting for the energy sector because their use enables thermal stabilization and storage of large amount of heat. It is major issue for safety of electronic devices, thermal control of buildings and vehicles, solar power and many others energy domains. This paper contains preliminary results of research on solid-solid phase change materials designed for thermal stabilization of electronic devices.

### **Kondakkagari Dharma Reddy, Pathi Venkataramaiah**

The usage of phase change materials (PCM) to store the heat in the form of latent heat is increased, because large quantity of thermal energy is stored in smaller volumes. In the present experimental investigation, sodium sulphate pentahydrate is employed as phase change material and it is stored in stainless steel capsules. These capsules are kept in fabricated tank and hot water is supplied into it. The experimental design is prepared by considering the parameters: flow rate, heat transfer fluid inlet temperature and PCM capsule shape.

## 6. CONCLUSIONS

It is the need of time to replace conventional power hacksaw machine by solar powered hacksaw. Solar powered hacksaw is energy efficient as well as eco-friendly in comparison to conventional hacksaw being used. The major advantage of this machine is that it requires no exhaustible source of energy for its operation. In this rapid emerging industrial

section, the use of power Hacksaw is wide and requires lots of energy for its operation. This can be overcome by using solar powered hacksaw. This machine can be made use of at any of the industries like pump manufacturing industries that involve bulk amount of shafts that have to be cut frequently. Various range of size of work-piece can be cut. Currently, the machine uses 12-inch blade for cutting of shafts of various sizes. This machine is light in weight and thus easily portable. An advancement that can be implemented in solar powered hacksaw is that the user can also make it automated using required mechanism and sensors. This is possible with the help of an advanced microcontroller, which should have programmable memory. This machine has a wider application in remote areas which lacks supply of electricity. Cutting operation is performed by each and every manufacturing industry. So in near future if there would be development of micro-batteries which would supply the required power then this hacksaw machine could be made even more compact.

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