A

Project Report On

“FOUR-WAY HACKSAW MACHINE”

Submitted To

Dharampeth Education Society's
DHARAMPETH POLYTECHNIC

In partial fulfillment of requirement for the diploma in
Mechanical Engineering.

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CERTIFICATE

This is to certify that the thesis entitled
"FOUR-WAY HACKSAW MACHINE"

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DECLARATION

We the undersigned declare that the thesis entitled "Design and analysis of modified hybrid solar system using Nano Fluids" submitted by us for the award of diploma in Mechanical Engineering is a record of bonfire research work carried out by us. We have worked under the guidance of Prof. S.C.Joshi and fulfilled the requirement for the submission of this thesis during the session 2020-21.

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Lastly, we express word of gratitude those who have shown interest in our work and helped us directly or indirectly in completion of project work.

With Regards,

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ABSTRACT

In this project work and effort has been made to develop a modernized four-way hacksaw cutting machine and less stress full operation for cutting metal and other materials. The aim of this work is to develop a hacksaw machine that will use a less effort to produce uniform cutting of metals. It is also done to show the performance difference between hand driven, pedal drive and four-way hacksaw machine. This model implies a conversion of rotary motion of crank to reciprocating motion of hacksaw blades, which is done by using Scotch Yoke Mechanism. This motion is used for hacksaw machine; in this model, we can operate four hacksaws at same time. This model will overcome the traditional hacksaw machine which done material cutting of single piece at particular times interval and also fulfills the need of more material cutting accounts to mass production. This machine works significantly with minimum vibrations and jerks. This machine will also do cutting of different materials; hence the purposed model of hacksaw machines will be welcomed by many industries due to compactness and efficiency. To achieve this goal, the four-way hacksaw machine is developed

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Chapter 1

INTRODUCTION

INTRODUCTION

A hacksaw is a handheld tool used to cut materials like metal pipes and rods. 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 on the saw frame's pegs. Most blades range in length from ten to 12inches (25.4 to 30.48 cm), although Twelve inch (30.48cm) blades can be purchased to fit hacksaw machine. 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 machines a wheel, a lever or an inclined plane. All other machines can be built using combinationsof these simple machines.

WORKING PRINCIPLE

This machine is based on Scotch Yoke Mechanism. Scotch yoke is a mechanism for converting the linear motion of a slider into rotational motion or vice-versa. The piston or other reciprocating part is directly coupled to a sliding yoke with a slot that engages a pin on the rotating part. The shape of the motion of the piston is a pure sine wave over time given a constant rotational speed.

The Scotch Yoke mechanism is best for this machine because it provides less vibration as compared to slider crank mechanism (which convert reciprocating motion into sliding motion or vice versa).

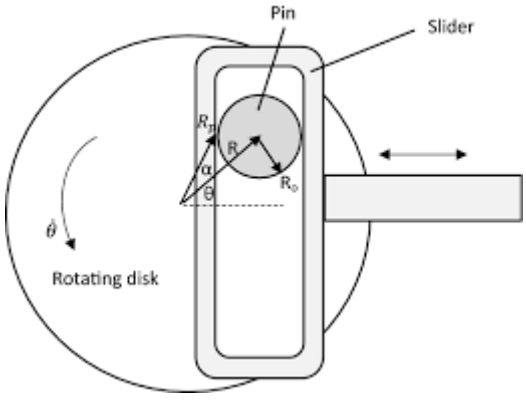


Fig- SCOTCH YOKE MECHANISM

Chapter 2

LITERATUREREVIEW

2.1-LITERATURE REVIEW

After the study of many literatures about design, construction and working of automatic power hacksaw machine, some of them describe the methodology of automatic power hacksaw. Lots of factor have been considering for the design, construction and working of automatic power hacksaw machine such as cutting speed, cutting material, cutting time, power, efficiency etc. So, lots of literatures have been found which gives the relevance information and methodology of constructing an automatic power hacksaw machine.

2.2-Historical Background

The problem of cutting-off material to size is common to practically every industry. Often, sawing is the first operation carried out on bar stock. Therefore, it is surprising that so little work has been done to understand the problems of this common operation. Many reasons have been given for this such as lack of interest, it is a routine operation and that there is no need to consider better methods. Often the foreman will assign a new trainee to a sawing task, on the principle that it is easy to learn and difficult to foul up. Furthermore, cut-off machines are frequently housed in stores away from the main production areas and the operation of the sewing machines appears to be simple.

The fact remains that cutting-off operation scan account for a significant part of the cost per piece (Remmerswaa and Matheson, 1961).

The reason for carrying out the present work is the growing realization on the part of manufacturers of both blades and machines, that the factors which control the mechanics and economics of power hack sawing are complex. Also, power hack sawing has been receiving increased competition from other cutting off processes, such as band and circular sawing. Whilst the British Standard BS 1919: 1974 gives specifications for hacksaw blades regarding dimensions etc. the standard relates to testing of hacksaw blades for hand use only and does not include power hacksaw blade testing. Thus, both manufacturers of hacksaw blades andusershaveexperiencedconsiderabledifficultyinestablishings tandardtestingproceduresandin obtaining consistency in test data using power hacksaw machines. Preliminary investigations by the author have revealed that existing blade testing methods were not independent of the machine characteristics, which could contribute to one of the reasons for the inconsistency in the test data. Hence, there has been requirement to identify the machine characteristics undernormalworkingconditionsandtoinvestigatethemechanics ofthesawingprocessandthe variables affecting metal removal rate. Most of the early published work on cutting-off has been primarily concerned with circular and band sawing and cost comparisons between al ternative processes. Whilst these alternative processes are frequently, quicker than power hacksawing, their costs are in many applications higher.

Whilst the impact of these alternative processes on the application of power hacksawing cannot be denied there remains a significant field of application for power hacksawing which is likely to remain unchallenged. A factor of prime interest to manufacturers is that, if the costs of power hacksawing can be reduced by developing the blade and the saw machine, the potential field of application will be widened. During the past fifty years, very little attention has been devoted to developing the geometry of the hacksaw blade or the machine, although, some improvements in the blade material ,together with methods of applying the load and mechanized work handling, have been achieved(Nelson,1965).

Sawing

If all raw stock was delivered in ready-to-machine shape sand sizes, there would be no need for sawing machines in a metal working shop. Machine operators could merely go over to the stock, select the suitable work piece, and perform the necessary finishing operations. Such situation rarely exists, due to the fact that the majority of the stock requires to be cutting someway prior to starting am a chining schedule. The alternative to his primary operation of sawing is to buy-in prepare lengths and shapes; this introduces a service which the company has to pay for and, in the majority of the cases, it is simpler and more economical to carry out the basic cutting to-size operation in house.

One of the major advantages of sawing over all other kinds of machining is the narrowness of cut op. Most sawingmachines perform the cut-off operation, where a piece of stock is cut to a workable length prior to subsequent machining operations .Machines that accomplish this job include hacksaws band saw sand circularsaws.

Power Hacksawing

The simple back-and-forth motion of the blade made the hacksaw one of the first types of sawing machines designed for power. The simplicity in the blade motion has kept the price of the saw machine relatively cheaper than other types of sawing machines. The low initial cost coupled with the flexibility and adaptability, has enabled the hacksaw to remain popular in industry. Hack sawing, a single blade is tensioned in the how, and reciprocated back and for the over the work piece. The cutting action is achieved only during half of the cycle of operation During the second half of the cycle, the return stroke, the blade is lifted clear of the work piece, giving a discontinuous cutting action, which is considered to be one of the drawbacks of the operation. Despite this dis-advantage, as compared to the continuous –cutting action of the band saw, hacksaws remain equally or even more popular alternative machines. As with many other basic processes, hack sawing is a tried and tested method, reliable, consistently accurate, quick and easy to repair, is less dependent on correct blade tension and less likely to run-out. Furthermore, power hacksaws can be left unattended for long periods when cutting large diameter bar and require minimum operator skill.

Types of Hack sawing Machines

For a given blade and work piece the material removal rates achieved by hydraulic and gravity fed machines are controlled solely by the thrust loads developed. Therefore, hack sawing maybe said to be a process in which the material removal rate is force controlled, unlike most other material removal processes. The machines available can be divided into two broad categories, according to the method used to develop the load between the blade and the work piece, namely gravity feed machines and hydraulic machines. A third, but not common machine is the positive displacement machine .Power hacksaw machines are used mainly for cutting off operations.

Gravity Feed Machines

In this type of machine, which is usually of light construction for general duty, the thrust load is developed by the gravity feed of the saw how. In many of these machines the magnitude of the thrust load is fixed, although some machines are provided with adjustable masses on the over arm for thrust load adjustment. The thrust, load varies throughout the cutting stroke due to the reciprocating displacement of the over arm mass and the action of the cam operated lift-off device which acts at the beginning and the end of the stroke. This type of machine generally has a work piece capacity between 150 - 200 mm (6 and 8 inches) diameter and is ideal for the small workshop where the cutting requirement is only occasional

and the configuration of work pieces to be cut ranges from mild steel flat complex shaped sections and tubular section sup to6 inches' diameter. Due to the light construction and gravity feed the applications for this type of machine are limit.

Hydraulic Machines

The thrust force between the blade and the work piece in this type of machine is developed by a hydraulic device. Pressure maybe developed in the load cylinder by either a restricted back-flow system, or the pressure may be supplied from a separate pump. In some of these machines, greater flexibility of control has been introduced by means of an arc cutting action combined with a universally controlled hydraulic system which allows better performance from the saw blade. The advanced types of heavy duty electro-hydraulic hacksaws have a very wide range of operation and are available in semi-automatic or fully automatic form, with provisions for automatic feeding of bar stock, cutting-off to predetermined sizes and unloading etc. The feature of power down-feed to the saw how incorporated in these machines makes the machine suitable for cutting the tougher steels and alloys. These machines are the most common and develop greater thrust loads than machines of other type and have a reputation for sawing without problems and requiring minimum operator skill.

Positive Displacement Machines

Whilst these machines are not as popular as the gravity feed or hydraulic machines, a few machines are available where the feed rate of the blade and hence, the metal removal rate is directly controlled by a mechanical screw device, giving a positive feed. This type of machine can lead to over loading of the blade giving premature blade failure particularly when the blade is worn. Positive displacement machines are not prone to variation in thrust loads during the cutting stroke-since the thrust loads directly arise as a result of the constant rate of penetration of the blade teeth.

Circular Sawing

Circular saws have a continuous cutting action, use blades having many teeth, and a large range of rotational speeds. This operation is similar to a milling operation. Themachines available range from the earlier, inexpensive, hand-loaded models to the very large, power loaded type and incorporate material handling devices for semi and then fully automatic operations. Modern production circular saws are built with several alternate basic feed mechanisms i.e. horizontal, vertical, rocking head and variations of these. The choice of the most suitable type of machine depends on the particular application and the size and shape of component. With vertical feed, the rotating blade travels downwards in a straight line to engage the work piece. On machines designed

for horizontal feed the blade is fed into the work piece from the back. A third basic feeding arrangement is a pivot motion or rocking-head system, this is as efficient as a vertical feed system. The bencher floor mounted manual-feed circular saw, when installed together with a general duty band saw or hack sawing a small workshop, provides a complete cutting facility for the small fabricator. Fully automatic circular saws, having features such as dial-in component length, in process gauging, choice of loading magazines, etc. are widely used where high quality production is required and often present the production engineer with a difficult choice to make between circular sawing and band sawing.

Features of Modern Hacksaw

The simplicity of design and operation, coupled with the low initial cost, has made the hacksaw grow in popularity. Its limitations are due to its mode of operation, i.e. cutting only on half of the stroke, the slow cutting speed, and the fact that not all the length of the blade is utilized. Some of the features in a modern hacksaw which achieve improved performance are:

i. Arrange of cutting speeds, uniform over the cutting stroke and a fast return smoke.
ii. Mean store monitor the cutting pressure.
iii. Adjustable smoke.
iv. Automatic relief of the blade on the return stroke.
v. Some means of indicating and correcting blade tension.
vi. Automatic stopping device when the cut is complete.

Chapter 3

Scope of project

Scope of the project

1. The machine can solve the problem of time consumption.

2. Waste of resources in face of labor 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 of machine.

5. It provides alternative for industries aiming toward reducing human effort.

6. It generates sustainable and practical automation solutions for the future industrial development.

Chapter 4

METHODOLOGY

METHODOLOGY

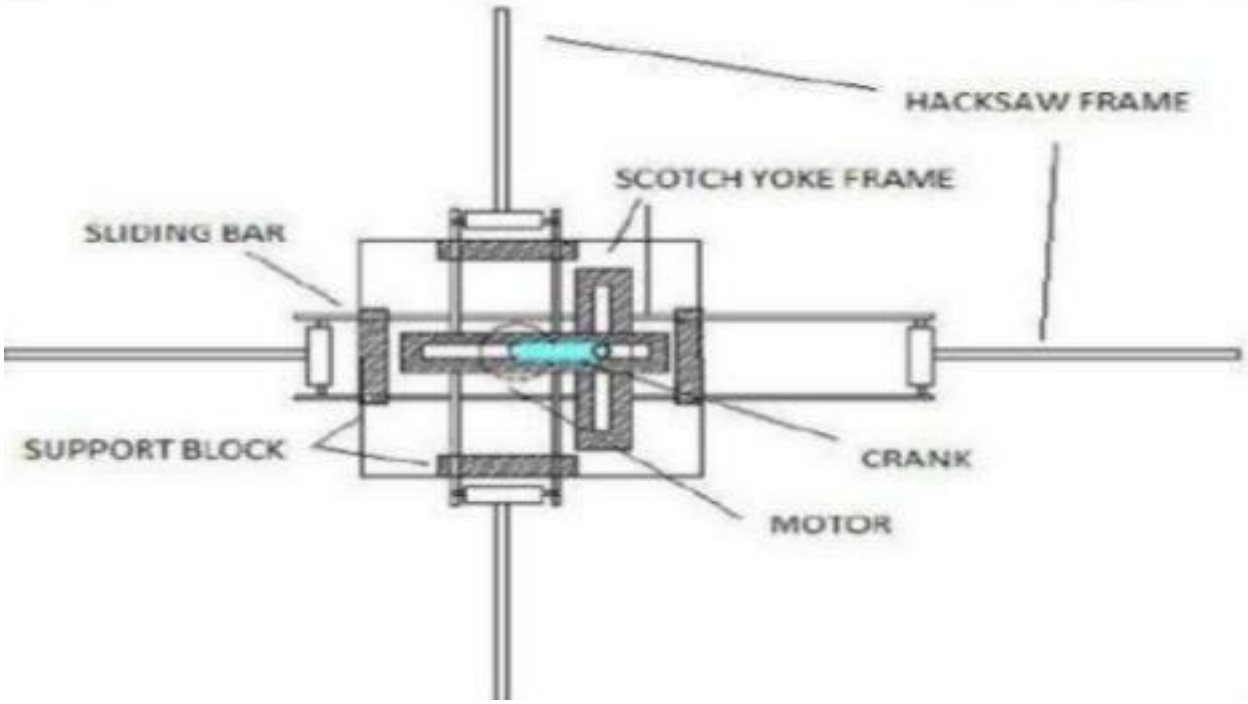
Automatic four-way hacksaw cutting machine are used to cut large sections of metal shafts and rods. Therefore, an automatic four-way hacksaw cutting machine is used to carry out the difficult and time consuming work. This Automatic four-way hacksaw machine is considered as an automatic machine because the operator need not be there toprovidetherereciprocatingmotionanddownwardforceonthew ork-pieceinordertocutit.Onlathe operator has fed the work-piece till the required length in to the machine and starts the machine, then the machine will cut until the work-piece has been completely cut in to two pieces. The Automatic four-way hacksaw machine though being able to cut the shaft or rod without requiring any human effort to cut, it does require a human intervention to feed thework-piece many times with measurements being taken each time before feeding.

Chapter 5

DETAILS OF DESIGNS, WORKING AND PROCESSES

DETAILS OF DESIGN, WORKING & PROCESS

The design of an automatic four-way hacksaw cutting machine involves the initial stages of concept design and their purposes. Different concepts of an automatic four-way hacksaw cutting machine, use of study and research were decided and finally a specific one was chosen after evaluating them on the basis of complexity, ease of fabrication and simplicity. Then, a detailed design of the same was presented which includes individual features, specifications and CAD model presentation.



PART DESIGN

BASE FRAME

It is a balance structure made of mild steel of size 650mm x 650mm x 350mm. We take 650mm in base length because; we want to give stability our model of automatic four-way hacksaw cutting machine not get lot of vibration when the machine in running condition. A rectangular hollow pipe is used for making the frame because it provides good strength as compared to solid rectangular bar. The cross-section of the hollow pipe is 25x55mm with pipe thickness of 3 mm.

DISC

A circular disc is used for converting rotary motion into reciprocating motion. This disc is made of mild steel of diameter300mmwith of thickness 10mm.A groove of size (l6mm xl00mm)is provided on the disc for supporting the slotted bar with the help of pin. A hole of diameter20mm is drilled in the center of disc. A cast iron block of diameter 20mm is fitted eccentrically to the disc center for holding the shaft. This cast iron block is fitted on this disc with help of four bolts.It is act as a flywheel which stores energy during the period when the supply of energy is more than the requirement and releases it during the period when the requirement of energy is more than supply. Fly wheels have a significant moment of inertia and thus resist changes in rotational speed. The amount of energy stored in a flywheel is proportional to the square of its rotational speed. Energy is transferred to a flywheel by applying torque to it, there byincreasing rotational speed, and hence its stored energy. Conversely, a flywheel releases stored energy by applying torque to a mechanical load, thereby decreasing the fly wheel's rotational speed.

SLOTTED BAR/ SLIDER

It is the most important part of the machine. Slotted bar converts rotary motion of disc in to reciprocating motion. It is made of mild steel of size300mmx55mmwithofthickness5mmA rectangular groove of size (15mmx250mm) is provided in center of the bar. This groove cutis generally used for supporting a pin.

CONNECTING ROD

It is circular drawn rod, made of mild steel of 14mm diameter and of length 44mm. This is used for transferring reciprocating motion of the slotted bar to hacksaw.

CONNECTING PIN

It is a circular pin, made of mild steel. It is used for connecting the slotted bar and disc. With the help of pin, motion is transmitted from disc to slotted bar. It consists of two parts. Lower part of the pin is hold on the disc with the help of nut and attached with the lower slotted bar. Upper part of the pin is attached with the upper slotted bar.

SHAFT

A shaft is a rotating machine element which is used to transmit power from one place to another. The power is delivered to the shaft by some tangential force and the resultant torque (or twisting moment) set up within the shaft permits the power to be transferred to various machines linked up to the shaft. In order to transfer the power from one shaft to another, the various members such as pulleys, gears etc., are mounted on it. These members along with the forces exerted upon them causes the shaft to bending. In other words, we may say that a shaft is used for the transmission of torque and

bending moment. The various members are mounted on the shaft by means of keys or splines.

A shaft of diameter 20mm with of length 42mm is used in this cutting machine.

The material used for shafts should have the following properties:

1. It should have high strength.
2. It should have good mach-inability.
3. It should have low notch sensitivity factor.
4. It should have good heat treatment properties.
5. It should have high wear resistant properties

MANUFACTURING OF SHAFTS

Shafts are generally manufactured by hot rolling and finished to size by cold drawing or turning and grinding. The cold rolled shafts are stronger than hot rolled shafts but with higher residual stresses.

The residual stresses may cause distortion of the shaft when it is machined, especially when slots or Keyways are cut. Shafts of larger diameter are usually forged and turned to size in a lathe.

DESIGN OF SHAFTS

The shafts may be designed on the basis of:

1) Strength
2) Rigidity
3) Stiffness

In designing shafts on the basis of strength, the following cases may be considered:

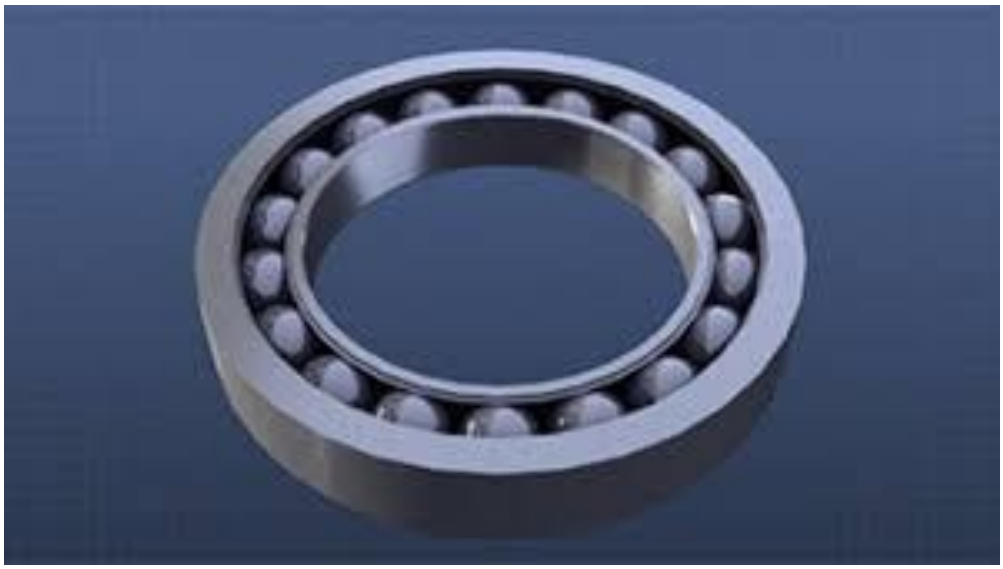
1. Shafts subjected to twisting movement or torque only.
2. Shafts subjected to bending moment only.
3. Shafts subjected to combined twisting and bending moments.
4. Shafts subjected to axial loads in addition to combined torsional and bending loads.

ROLLING CONTACT BEARING

A Plumber block is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads. It achieves this by using at least two races to contain the ball sand transmit the loads through the balls. In most applications, one race is stationary and the other is attached to the rotating assembly (e.g., a hub or shaft). As one of the bearing races rotate sit causes the balls to rotate a swell. Because the balls are rolling they have a much lower coefficient of friction than if two flat surfaces were sliding again each other. Ball bearing tend to have lower load capacity for their size than other kinds of rolling-element

Bearings due to the smaller contact area between the balls and races. However, they can tolerate some misalignment of the inner and outer races.

In rolling contact bearings, the contact between the bearing surfaces is rolling instead of sliding as in sliding contact bearings. Ordinary sliding contact bearing starts from rest with practically metal-to-metal contact and has a high coefficient of friction. It is an outstanding advantage of a rolling contact bearing over a sliding contact bearing that it has a low starting friction. Due to this low friction offered by rolling contact bearings, the sea recalled antifriction bearings. A Plumber block of diameter 20 misused for holding the shaft in this cutting machine.



ADVANTAGES OF ROLLING CONTACT BEARINGS:

1. Low starting and running friction except at very high speeds.
2. Ability to withstand momentary shock loads.
3. Accuracy of shaft alignment.
4. Low cost of maintenance, as no lubrication is required while in service.
5. Small overall dimensions.
6. Reliability of service.
7. Easy to mount and erect.
8. Cleanliness.

Disadvantages of rolling contact bearing:

1. Noisier at very high speeds.
2. Low resistance to shock loading.
3. More initial cost.
4. Design of bearing housing is complicated.

PULLEY

A pulley is a wheel on an axle or shaft that is designed to support movement and change of direction of a cable or belt along its circumference. Pulleys are used in a variety of way a pulley may also be called a sheave or drum and may have a groove between two flanges around its circumference. The drive element of a pulley system can be a rope, cable, belt, or chain that runs over the pulley inside the grooves to lift loads, apply forces, and to transmit power. We have used two pulley of size3-inch and 10 inch.

The application of pulleys can be for many different functions; lifting loads, applying forces or transmitting power. For simple, single fixed pulleys, the load is attached to one end of the rope while the wheel is secured at a higher position with the rope running through it and the force being applied to one end of the rope to lift the load on the other end. This is one of the simplest models of a pulley system demonstrating

how it works. There are several different ,more complex models of pulley systems that work in different ways to serve different functions. The wheel can be secured at the top in some pulley systems and can be movable in some. It is easier to lift a load when the wheel is secured at the top and the rope is pulled downwards to lift the load rather than having to pull the rope upwards to lift a load in some movable pulley systems. The output force or work done by a pulley system can be calculated by multiplying the effort required to pull the rope to lift a load with the distance the that the rope moves. Some pulley systems can make use of more than one or more pulleys which are linked. The advantage of using such systems is that they reduce the amount of effort required to get work done.

There are three types of pulleys:-

The simplest type of pulleys is the fixed pulley systems. These pulleys are the only pulleysystems though which, if used individually, require an equal amount of effort to the load to lift it off the ground. In this system, the wheel is secured at a fixed place and does not move. What this system does is that it changes the direction of the force in order to complete a task. The advantage with this is that one does not have to push or pull a load to be able to move the load as it allows for easy displacement of the load. The disadvantage being that more effort Is required to move the load as compared to the pulley systems.

Unlike a fixed pulley system, in the movable pulley systems, the wheel used in the pulley moves along with the load that is

being displaced. This function of the pulleys allows it to use lesser effort to be able to move the load. Unlike fixed pulley systems that exert only as much force on the load as that of which is applied on the rope, movable pulleys systems are able to multiply the force that a user applies to the machine to carry out a task, in turn making the job seem easier. This way, lesser force is required by the user to carry out the same task if using a fixed pulley system. This pulley also acts as a second-class lever, where by the load is placed in between the fulcrum and the effort. The disadvantage with these systems is that one has to pull or push to displace a load and the main advantage is tha tit requires lesser effort to be able to move the load. The third type of pulley systems present today is the compound pulley systems. These are a combination of fixed and movable pulleys. These systems have the advantages of the the fixed and movable pulley systems as one would not require pushing andpullingaloadtobeableto transferit.

HACKSAW

A hacksaw is a fine-tooth saw with a blade under tension in a frame, used for cutting materials such as metal. Hand-held hacksaws consist of a metal frame with a handle, and pins for attaching a narrow disposable blade. A screw or other mechanism is used to put the thin blade under tension.

A power hacksaw (or electric hacksaw) is a type of hacksaw that is powered by electric motor. Most power hacksaws are stationary machines but some portable models do exist.

Stationary models usually have a mechanism to lift up the saw blade on the return stroke and some have a coolant pump to prevent the saw blade from overheating.

Hacksaw blades (both hand & power hacksaw) are generally made up of carbon on steel or high speed steel strip rolls. The blank of required size is obtained by fixing the strip rolls on the stand of semi-automatic strip cutting machine and punched a hole at their both ends. Then, teeth are being made on the blank by milling or hobbling process. Once teeth are being cut, the hacksaw blades are heat treated and tempered for the required hardness. The last step in the manufacturing process is surface cleaning, painting, printing and packing of the hacksaw blades for market supply.

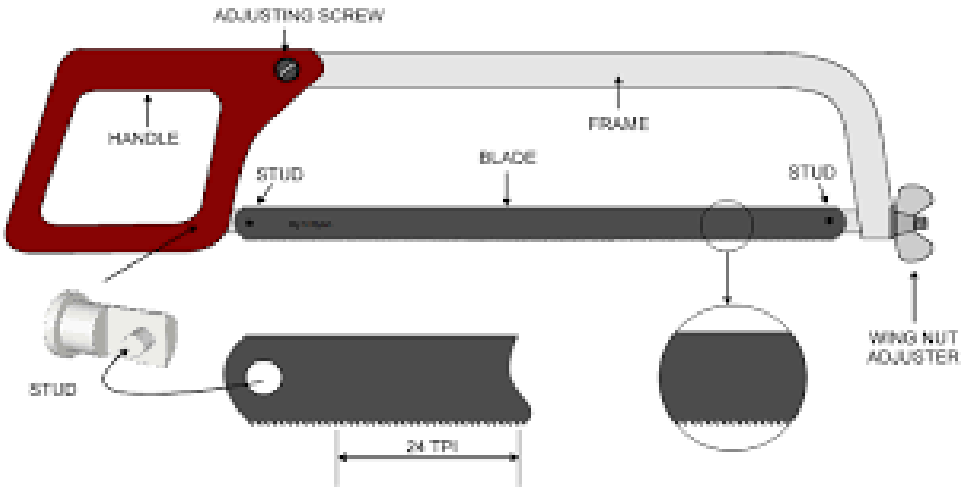
Features of Hacksaw Machine

1. Power efficiency.
2. High productivity.
3. Superb performance.
4. High operational fluency.
5. Sturdy and robust design.

Hacksaw blade

The hacksaw blade consists of different parts:

1. 2 pin holes
2. Centerline
3. Side
4. Back edge



Characteristics of Hacksaw Blade

The hacksaw blade has 2 main characteristics:

1. **Teeth pitch** which is the number of teeth per 25mm
2. **Blade length** which is the length between the centers of its pinholes.

TEETH PER INCH (25mm)	SUITABLE FOR CUTTING
14 TPI	LARGE SIZES, ALUMINIUM AND OTHER SOFT METALS.
18 TPI	SUITABLE FOR GENERAL WORKSHOP CUTTING.
24 TPI	FOR CUTTING STEEL PLATE UP TO 5/6mm.
32 TPI	FOR CUTTING HOLLOW SECTIONS AND TUBING.

V-BELT

The belts or ropes are used to transmit power from one shaft to another by means of pulleys which rotate at the same speed or at different speeds.

The amount of power transmitted depends upon the following factors:

1. The velocity of the belt.
2. The tension under which the belt is placed on the pulleys.
3. The arc of contact between the belt and the smaller pulley.
4. The condition sunder which the belt is used.

It may be noted that:

1. The shafts should be properly inline insure uniform tension across the belt section.
2. The pulleys should not be too close together, in order that the arc of contact on the smaller pulley may be as large as possible.

3. The pulleys should not be so far apart as to cause the belt to weigh heavily on the shafts, thus increasing the friction load on the bearings.
4. Along belt tends to swing from side to side, causing the belt to run out of the pulleys, which in turn develops crooked spots in the belt.
5. The tight side of the belt should be at the bottom, so that whatever bag is present on the loose side will increase the arc of contact at the pulleys.
6. In order to obtain good results with flat belts, the maximum distance between the shafts should not exceed 10 meters and the minimum should not be less than 3.5 times the diameter of the larger pulley.

V belts are the basic belt for power transmission. They provide the best combination of traction, speed of movement, load of the bearings, and long service life. They are generally endless, and their general cross-section shape is trapezoidal hence the name "V". The "V" shape of the belt tracks in a mating groove in the pulley (or sheave), with the result that the belt cannot slip off. The belt also tends to wedge into the groove as the load increases—the greater the load, the greater the wedging action—improving torque transmission and making the V-belt an effective solution, needing less width and tension than flat belts. V-belts trump flat belts with their small centre distances and high reduction ratio. The preferred center distance is larger than the larger pulley diameter, 'but less than three times the sum of both pulleys. Optimal speed range is 1,000—7,000 in(300—2,130m/min.). V-belts need larger pulleys for their thicker close-section than flat belts. V-belts may be homogeneously rubber: or polymer throughout or there may be fibers embedded in the rubber or polymer for strength hand reinforcement. The fibers may be of text lie such as cotton, polyamide (such as Nylon) of polyester or, for greatest strength, of steel or aramid.

BUSH

Bush is the mechanical element that provides smooth motion between two parts. It also guides the sliding or reciprocating parts. It may be made of many materials such as copper, brass, cast iron etc. but in this machine a mild steel bush is used. The connecting rod passes through the bushes and holds the hacksaw.

MOTOR

An AC motor is an electric motor driven by an alternating Current (AC). The AC motor commonly consists of two basic parts, an outside stationary stator having coils supplied with alternating current to produce a rotating magnetic field, and an inside rotor attached to the output shaft producing second rotating magnetic field. The rotor magnetic field may be produced by permanent magnets reluctance saliency DC or AC electrical windings. There are reciprocating motion of the Hacksaw blade, because of which the cutting process takes

place, is produced with the help of an AC motor, which operates by a simple crank mechanism to convert rotary motion of crank into reciprocating motion hacksaw blade blade. The AC motor is tumed on alter the work-piece has been finally fit the pneumatic chuck The Torque of motor is increased by transmission of power to a pulley by a belt transmission.

The torque of the AC motor must be increased so as to bring about the necessary power for cutting of work-pieces efficiently. This is achieved by coupling the rotor of the AC motor to a pulley by a belt drive. So, this will reduce the rotating speed while increasing the torque. The pulley is coupled to the reciprocating mechanism.

Note-Motor specification-(singlephase 1 HP, 1440rpm

ACmotor).

BENCH VICE

Vice is a mechanical apparatus used to secure an object to allow work to be performed on it. Vices have two parallel jaws, one fixed and the other movable, threaded in and out by a screw and lever. Vices are of various types, we have used an engineer's vice, also known as a metal working vice or fitter vice, is used to clamp metal. It is typically made of cast steel or malleable cast iron. Cheaper vises may be made of brittle cast iron. The jaws are often separateand replaceable, usually engraved with serrated or diamond teeth. Soft jaw covers made of aluminum, lead, or plastic may be used to protect delicate work.

An engineer's vice is bolted on to the top surface of a work bench, with the face of the fixed jaws just forward of its front edge. The vice may include other features such as a small anvil on the back of its body.

Bolt and Nuts

A screw thread is formed by cutting a continuous helical groove on a cylindrical surface. A screw made by cutting a single helical groove on the cylinder is known as single threaded (or single-start) screw and if a second thread is cut in the space between the grooves of the first, a double threaded (or double-start) screw is formed. Similarly, triple and quadruple (i.e. multiple start) threads maybe formed. The helical grooves maybe cut either right hand or left-hand. A screwed joint is mainly composed of two elements i.e. a bolt and nut. The screwed joints are widely used where the machine parts are required to be readily connected or disconnected without damage to the machine or the fastening. This may be for the purpose of holding or adjustment in assembly or service inspection, repair, or replacement or it may be for the manufacturing or assembly reasons. The parts may be rigidly connected or provisions may be made for predetermining.

Advantages and Disadvantages of Screwed Joints:

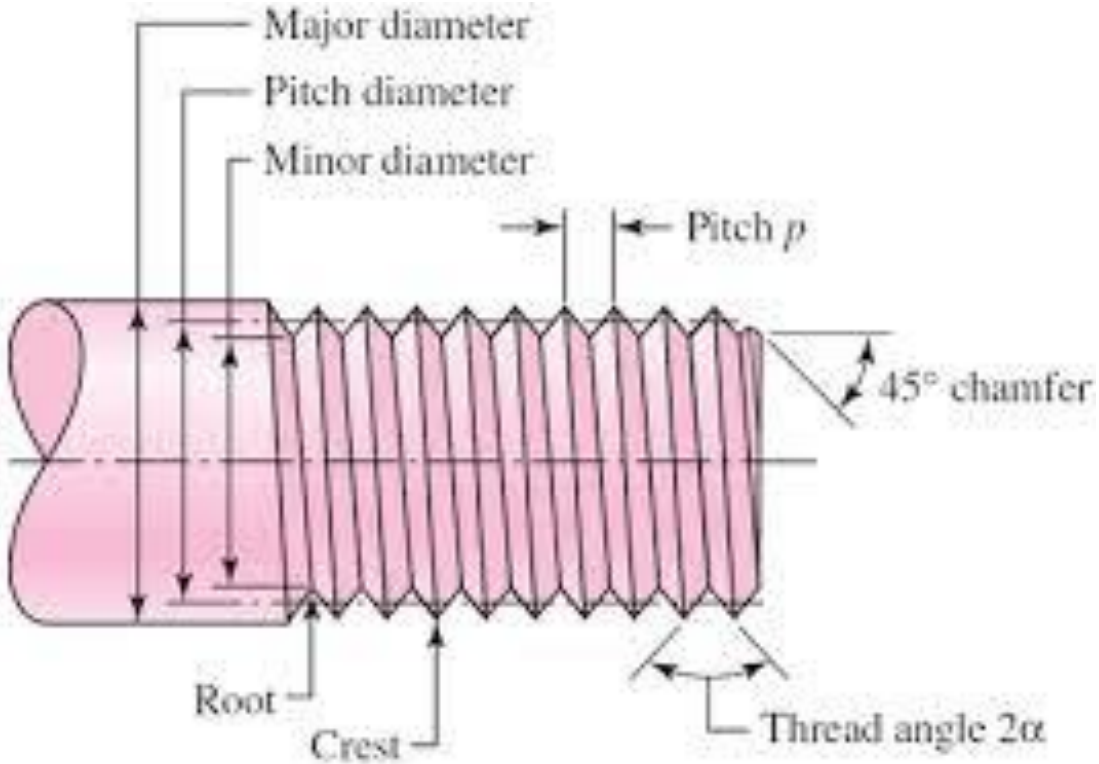
1. Screwed joints are highly reliable in operation.
2. Screwed joints are convenient to assemble and disassemble.
3. Awiderangeofscrewedjointsmaybeadaptedtovariousoperatingconditions.
4. Screwsarerelativelycheaptoproduceduetostandardizationandhighlyefficientmanufacturingprocesses.

Disadvantage of Screwed Joints:

1. The main disadvantage of the screwed joints is the stress concentration in the threaded portions which are vulnerable points under variable load conditions.

IMPORTANT TERMS USED IN SCREW THREADS

The following terms used in screw threads are important from the subject point of view.



1) Major diameter-It is the largest diameter of an external or internal screw thread.
2) Minor diameter-It is the smallest diameter of an external or internal screw thread. It is also known as core or root diameter.
3) Pitch diameter- It is the diameter of an imaginary cylinder, on a cylindrical screw thread, the surface of which would pass through the thread at such points as to make equal the width of the thread and the width of the spaces between the threads. It is also called an effective diameter.
4) In a nut and bolt assembly, it is the diameter at which the ridges on the bolt are in complete touch with the ridges of the corresponding nut.
5) Pitch- It is the distance from a point on one thread to the corresponding point on the next. This is measured in an axial direction between corresponding points in the same axial plane.
6) Lead-It is the distance between two corresponding points on the same helix. It may also be defined as the distance which a screw thread advances axially in one rotation of the nut. Lead is equal to the pitch in case of single start threads; it is twice the pitch in double start, thrice the pitch in triple start and soon.
7) Crest-It is the top surface of the thread.
8) Root-It is the bottom surface created by the two adjacent flanks of the thread.
9) Depth of thread-It is the perpendicular distance between the crest and root.
10) Flank-It is the surface joining the crest an root.
11) Angle of thread-It is the angle included by the flank soft he threads.
12) Slope-It is half the pitch of the thread.

Chapter 6

RESULT & APPLICATION

RESULTS

As per the above discussion we conclude that to overcome problems in conventional hacksaw machine due to high efficiency, easy to operate. The proposed model of multi way hacksaw is helpful and complete all the expectations needed in the mini industries. As a result benefits would be achieved such as longer tool life, easy chip flow and higher machining quality in the machining process.

The selection of cutting fluid should be carefully carried out to obtain optimum result in machining process. Various factors are affecting the selection of cutting fluid type in machining operation such a type of work puce and the method of machining process.

APPLICATIONS

- **These types of motorized high speed four way hack saw machines have a wide range of applications in the fields like, in all industries.**
- **Small scale industries.**
- **All manufacturing plants. Highly suitable for production industries and workshops**

CHAPTER 7

CONCLUSION & FUTURE SCOPE

CONCLUSION

It is known that conventional hacksaw machine can be replaced with an automatic four-way cutting hacksaw machine. Automatic four-way hacksaw machine gives high productivity in short time period in comparison with the conventional hacksaw machines. The major advantage of this machine is that intervention of labor is reduced to maximum level. In this rapid emerging industrial era, the use of automatic four-way Hacksaw machine is wide. Time and labor plays a major role in production process this can be overcome by using this type of automatic machines. The automatic four-way hacksaw machine can be made use of at any of the industries like pump manufacturing industries that involve bulk number of shafts that have to be cut frequently. The range of size of work-pieces that can be cut using the automatic four-way hacksaw machine can be varied by changing the blade size. Currently, the machine uses12- inch blade for cutting.

FUTURE SCOPE

The machine can be fully automated by using Micro-controller. In fully automated machine the operator need not measure the length of the work-piece that is to be cut and to load and unload the work-piece each time after a piece has been cut. The operator need to only enter the two in put namely the number of pieces to be cut and the length of each piece that is required to be cut. The inputs can be given by the operator with the help of a keypad and an LCD display, which will help the user to verify the data given by him. After acquiring the two inputs from the operator, the machine will automatically feed the given length of work-piece and start to cut till the give number of work-pieces will he cut.

Automatic lifting up mechanism for frame when cutting operation is finished to introduce next portion of bar for cutting.

CHAPTER 8

REFERENCE

REFERENCE

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2. International Journal of Industrial Engineering. (vol. 8, Issue 2).