International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Automatic Pneumatic Jack

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Abstract

This device the **automatic pneumatic jack** for light vehicle garages has been developed to later the needs of small and medium automobile garages. In most of the garages the vehicles are lifted by using screw jack. This needs high man power and skilled labors. In order to avoid all such disadvantages, this **automatic pneumatic Jack** has been designed in such a way that it can be used to lift the vehicle very smoothly without any impact force. The operation is made be simple that even any person can handled, by just pressing the button.

The main objective of our project is to perform various machine operations using machine with the help of pneumatic sources. For a developing industry the operation performed and the parts (or) components produced should have it minimum possible production cost, and then only industry runs profitability.

NEED FOR AUTOMATION:

Automation can be achieved through computers, hydraulics, pneumatics, robotics, etc., of these sources, pneumatics form an attractive medium for low cost automation.

The main advantages of all pneumatic systems are economy and simplicity. Automation plays an important role in mass production.

Nowadays almost all the manufacturing process is being atomized in order to deliver the products at a faster rate. The manufacturing operation is being atomized for the following reasons.

- To achieve mass production
- To reduce man power
- To increase the efficiency of the plant
- To reduce the work load
- To reduce the production cost
- To reduce the production time
- To reduce the material handling
- To reduce the fatigue of workers
- To achieve good product quality
- Less maintenance.

CHAPTER-2
LITERATUREREVIEW

2.1 SAFETY SYSTEM:

The aim is to design and develop a control system based on pneumatic breaking system of an intelligent electronically controlled automotive braking system. Based on this model, control strategies such as an 'antilock braking system' (ABS) and improved maneuverability via individual wheel braking are to be developed and evaluated.

There have been considerable advances in modern vehicle braking systems in recent years. For example, electronically controlled ABS for emergency braking, electronically controlled hydraulically actuated individual brake-by-wire (BBW) systems for saloon cars and electronically controlled pneumatically actuated systems for heavy goods vehicles. The work of recent years shall form the basis of a system design approach to be implemented. The novelty of the proposed research programmed shall lie in the design and evaluation of control systems for achieving individual wheel motion control facilitated by BBW. In the case of BBW the brake pedal is detached from the hydraulic system and replaced by a 'brake pedal simulator'. The simulator provides an electrical signal for the electronic control system.

Preliminary modeling and simulation work considers a quarter cars initially followed by a natural progression to the half car and full four wheel station cases. The model is to be constructed in modular form thus allowing the replacement / interchange of the various blocks and their associated technologies.

Upon completion of the full vehicle braking model, sensitivity analyses will be carried out. Once the preliminary simulation model has been thoroughly benchmarked and existing control system strategies evaluated, an audit of the technology used is to take place and this will provide a basis for comparison of iterative technologies / techniques.

The final phase of the new modern vehicle shall include:

- Development of improved ABS control systems
- Development and assessment of an electro-hydraulic-BBW (EH-BBW)system
- Individual wheel braking combined with traction control
- Assessing sensor failure and fault tolerant control system design
- Preliminary studies into an electrically actuated system
- Re-engineering using simplified models.

2.2 PNEUMATICS:

The word ‘pneumatic’ comes from Greek and means breather wind. The word pneumatics is the study of air movement and its phenomena is derived from the word pneumatic.

Today pneumatics is mainly understood to means the application of air as a working medium in industry especially the driving and controlling of machines and equipment.

Pneumatics has for some considerable time between used for carrying outthe simplest mechanical tasks in more recent times has played a more important role in the development of pneumatic technology for automation.

Pneumatic systems operate on a supply of compressed air which must be made available in sufficient quantity and at a pressure to suit the capacity of the system. When the pneumatic system is being adopted for the first time, howeverit wills indeed the necessary to deal with the question of compressed air supply.

The key part of any facility for supply of compressed air is by means using reciprocating

compressor. A compressor is a machine that takes in air, gasat a certain pressure and delivered the air at a high pressure.

Compressor capacity is the actual quantity of air compressed and delivered and the volume expressed is that of the air at intake conditions namely at atmosphere pressure and normal ambient temperature.

The compressibility of the air was first investigated by Robert Boyle in 1962 and that found that the product of pressure and volume of a particular quantity of gas.

The usual written as

$PV = C$ (or) $P_1V_1 = P2V2$

In this equation the pressure is the absolute pressured which for free is about 14.7 Psi and is of courage capable of maintaining a column of mercury, nearly 30 inches high in an ordinary barometer.

Any gas can be used in pneumatic system but air is the mostly used system now a days.

3.1 PNEUMATIC CYLINDER

All the strange names and terms around pneumatics have evolved through about 100 years of their use in manufacturing. Double acting, four way, quick connect are all terms that were invented to describe (as best as could be) the difference between the parts. Don't let the names discourage you. They're just names. I've used quite colorful terms myself when working with pneumatics, most of which i won't use here...

The first thing to remember is: Pneumatics are easy... really! Its all the different names and parts that seem to be overwhelming. But enough about that... on to the fun stuff.

NOTE:

This isn't the place to discuss every different kind of part that's available - it would take hundreds of pages. But what I'd like to cover is the basic things for ahaunter to keep in mind when 'playing' with pneumatics.

3.1.1 AIR CYLINDERS:

There are only two main kinds of air cylinders: Double acting, and single acting. They come in *all* variations, shapes and sizes. Both kinds are useful for haunt work. Double acting cylinders are useful when you need to push in both directions, and single acting cylinders are useful when only a push in one direction is needed. And, sometimes 'in a pinch', you can adapt a double to act as a single, and a single to act as a double.

Air cylinders are measured by three main values: "pressure rating", the "bore", and "stroke"

Pressure	This is the maximum pressure the air cylinder can safely handle.
Bore	The interior diameter of the cylinder.
Stroke	The range of movement of the air cylinder's rod.

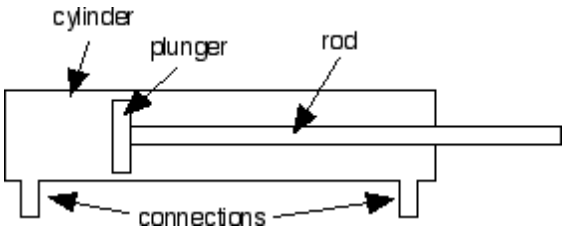
There are lots of calculations to accurately figure the power of a cylinder, but most haunt pop-up applications can be handled by air cylinders in the range of 3/4" to 1-1/2" bore, and 3" to 8" stroke.

Power measurements primarily take into account the air pressure (the higher the pressure, the more power); and the bore (the larger the bore - the more power). The power ratings are usually only quoted at maximum pressure. So if a cylinder produces180 pounds of 'push', it will only deliver that at the maximum pressure (usually 250 psi for commerical cylinders).

Haunters should work their props to work and much, much lower pressures. A good goal is not to exceed 60-70psi for working props. Going much higher causes more stress on the prop and all parts in the air system, and make your compressor run more often. Even at lower pressures, air cylinders can still move very fast and deliver quite a lot push, so always be very careful around pneumatics!

Double Acting means the air cylinder rod is 'pushed' out, and 'pushed' in.

A typical double acting air cylinder



Every double acting air cylinder has these basic parts. A cylinder to hold everything together, a 'plunger' that the air pushes against, two connections to get the air in and out, and a rod that goes in and out. That's it. Here's a simple animation to illustrate the motion...

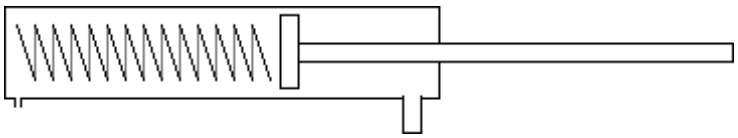
As air is sent into the left connection (pressure is shown in yellow), it pushes against the plunger and the rod goes out. At the same time, air isreleased out of the right connection. To reverse the motion, air is sent into the right connection, pushing against the plunger on the other side and the rod is forced back in.

The trick to the double acting cylinder is that you have to let air OUT of the other side! This is an important feature of the double acting cylinder, and an advantage that gives you great control over the motion of the rod (but, more on that later!).

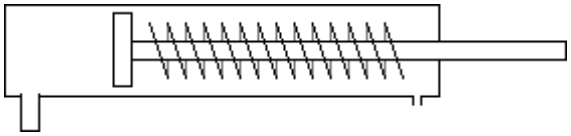
TIP: the most useful double acting cylinder I've found is one with 1/4" connections, 6"-8" stroke, 1" bore, and end clevis mounts. Of course, most any cylinder can be adapted for haunt use!

3.2.2 SINGLE ACTING CYLINDER

Single Acting means the air cylinder rod is ONLY pushed in a single direction, either out or in. There is only one connection for air, and a little hole in the other end to let air in and out. A spring is used to push the rod in the opposite direction after air pressure is removed.



Single Acting Air Cylinder, with the rod normally out without pressure



Single Acting Air Cylinder, with the rod normally in without pressure

As air is pushed into the connection, the plunger begins to move and compress the spring. Exhaust air exits out the exhaust hole on the other end. When air is released, it exits out the connection, and air is sucked into the exhaust hole as the spring pushes the plunger back to its resting position. Basically, the spring is 'push' needed to return the plunger and rod back to their starting position.
When selecting a cylinder for an application, remember that a double acting cylinder pushes in both directions, while a single acting cylinder only pushes in one direction.

3.1.3 MOUNTING

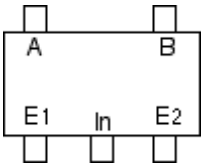
There are about as many ways to mount an air cylinder as there are different types of air cylinders. Again, this is because of all the uses. My personal favorite is the clevis mount. (see photo below) Clevis mounts give the greatest amount of movement, flexibility, and ease of mounting over other mounts.

3.2 SOLENOID VALVES:

Here's the most confusing part of dealing with pneumatics - solenoids. Just like air cylinders, they come in all sizes, styles, shapes, sizes, and combinations. There's literally something for everyone when it comes to solenoids.
TIP: Don't worry about what the solenoid looks like, just what it can do.

The whole 'four port', 'five port', 'two way', 'three way', naming came from the action of the air as it moves through the solenoid. Again, the names aren't as important as what it does. The best combination of flexibility and use for double acting cylinders is what's called a "five port, four way" solenoid (they're also called 'valves').

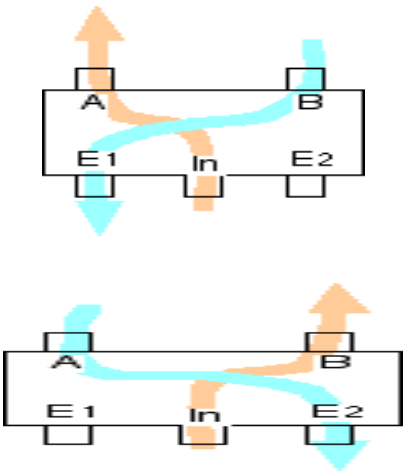
3.2.1 FIVE PORT, FOUR WAY SOLENOID



Five port, four way solenoid

A five port solenoid has just that - five connections called ports. Usually, they are labeled A, B, E1, E2, and In. There are variations of this too. In most cases, any pair of ports that have a label that has an 'A &

B', '1 & 2', 'A1 & A2' - that's the ports that connect to the air cylinder. Exhaust ports almost always have an 'E' in the name. There is almost always a single 'In'. Notice he phrase 'almost always' - that's because there are cases where solenoids have several setsof in's and out's to fill a particular application. Ok, that's the 'five port' part...



The 'four way' term describes the paths that air can take when the solenoid is in operation. Use the drawing to follow this description. When a four way solenoidis 'off' or 'de-energized', air will flow through from the In to the A port (that's one way), and also let out of port B through port E1 (two ways). So air goes in through the In port, and out the A port to push the cylinder, and it lets air out of port B (through E1).

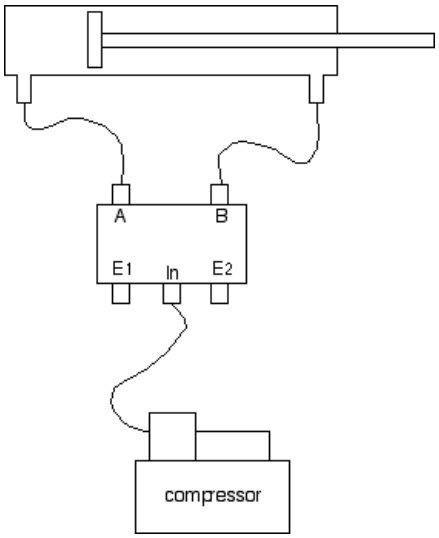
And when the solenoid is 'on', (energized), air pressure from the In port flows tothe B port (the third way), and exhaust air is let out of port A through port E2 (the fourth way).

An important characteristic of the 5 port, 4way solenoid is called "orifice" size. This is the size of the internal air paths through the solenoid. Its usually quoted is diameter. An orifice of at least 1/8" is recommended, with a size of 1/4" preferred. The orifice size directly affect the solenoids air flow. The more air it can move, the faster an air cylinder can move.

REMEMBER: Remember that in a 5 port, 4 way solenoid, full pressure air is always being sent out of one of the two air cylinder ports. There isn't a position where the air cylinder does not have air going to it. So be sure everything's connected before applying air. TIP: The most flexible solenoid for double actingcylinders is a 5 port, 4 way solenoid with a 1/4" orifice. Solenoids come with different voltage ratings also. The most popular voltage is 24 volt DC because that's what most manufacturing plants use, so you'll see lots of them on the surplus market. A 24 volt plug in power supply will easily drive several solenoids.

Four Port, Four WayA variation of the five port, four way combines the two exhaust ports into one single exhaust. So its called a four port.

How It Connects The 'plumbing' is fairly straightforward. The air compressor supplies the air pressure. The solenoid directs which side of the air cylinder getsthe air pressure. The air cylinder moves the rod. Here's a couple of examples:



Double acting air cylinder connected to 5 Port, 4 Way solenoid

3.2.2 FITTINGS

There are two very useful fittings: Push-in (or Push-on), and quick-connect. The quick-connect are the standard fittings seen mostly at a gas station. They are extremely useful to 'quickly' connect and disconnect air to props. The Push-in connectors are very useful to connect solenoids to air cylinders. Both of these connector types are highly recommended.

3.2.3.REGULATORS AND FILTERS

Most air systems include air regulators, particle filters, water filters, and manual valves to deliver 'good' air to the solenoids and air cylinders.

The most important of these is the air regulator. This unit sets the overall pressure for your air system. A good starting pressure to run a few popups is 60 psi or less. If you're supporting a large air system with lots of popups and long air lines, 70-80 psi is not excessive. However, pressures beyond 80 psi will begin to 'stress' the entire system, and show itself in small leaks around fittings, wear and tear of popup mechanisms, and long running times for the compressor.

You may also consider having several regulators in your air system. This gives you the option of optimizing just the right amount of air to each place. For example, a jumper popup may only need 30psi to work. Running it on your 60 psi system will eventually wear it out. Placing a regulator just before the jumper's solenoid lets you reduce air pressure and just give the jumper what it needs to run.

Particle and water filters are useful items to use to keep your air lines free from debris and moisture. Debris will clog air lines, solenoids and cause erratic or intermittent operation. Moisture in the air line will cause rust to form.

There are also lubricators that add a small amount of oil to the air to keep the mechanics working smoothly.

If you decide on any of these filters, please take some time to read up on them,because just like all the other air parts, there are hundreds of different kinds!

Use your judgment here, and always lean towards safety!

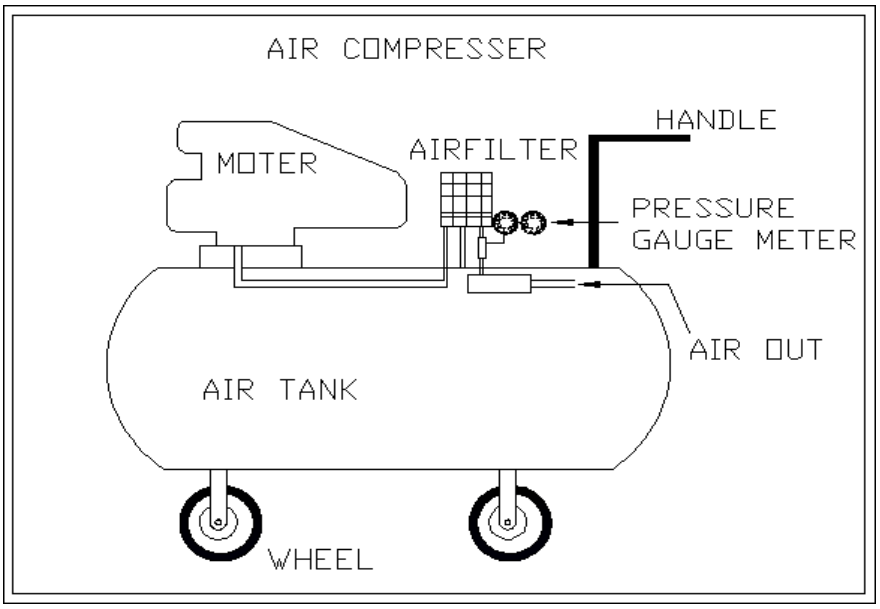
3.3 AIR COMPRESSOR:

Compressor is the air producing machine. They collect the airs from the atmosphere are in the running of machine are engine. Air compressors are utilized to raise the pressure of a volume of air. Air compressors are available in many configurations and will operate over a very wide range of flow rates and pressures. Compressed air was expelled by primitive man to give glowing embers sufficient oxygen to allow them to flare up into a fire. During the compression process, the temperature increases as the pressure increases. This is known as polytypic compression. The amount of compression power also increases as the temperature increases. Compressors are staged thereby reducing the temperature rise and improving the compression efficiency. The temperature of the air leaving each stage is cooled prior to entering the next stage. This cooling process is called intercooling. Volumetric efficiency also increases with multi-stage compression since the pressure ratio over the first stage will be decreased.

Selection of the air compressor is only the first step in designing an efficient and reliable compressed air system. The air exiting the compressor is saturated with moisture and will have compressor lubricants (lubricated compressors only). Other chemicals that may have been drawn into the compressor intake may also be present. This contamination is harmful to many processes, pneumatic tools, instruments and equipment. Air purification equipment, filters, air dryers, breathing air purifiers, monitoring equipment, used alone or in combination will remove these contaminants. Selection and purchase of the compressor

and necessary purification equipment can be easily

done on the Compressed air site. Our application engineers are ready to answer all of your questions and to assist you in placing your order. And it work in the process of rotating the fan and the piston movement with the help of current supply.



3.4 JACKY:

Jack is a mechanical weight lifting device. it is used to lift heavy loads or apply great forces it is mainly using for automobile. This is lift to the vehicles so that maintenance can be performed. More power full jacks use pneumatic jack more lift over greater distance in our requirement. Jacks are lifted to the maximum capacity. Jacky is used to lift loads and are commonly used to lift automobiles for their servicing. It is consists of a piston which is operated by means of a handle. The upward movement for the piston sucks the air or oil form the compressor through the suction valve. When the piston is operated for several times the load is lifted to the required height. The lower load, the lowering screw is opened, thus oil from ram cylinder enter into reservoir causing the ram to move down.

3.5 WHEEL:

A wheel is a circular device that is capable of rotating on its axis, facilitating movement or transportation or performing labour in machines. A wheel together with an axle overcomes friction by facilitating motion by rolling.In order for wheels to rotate a moment needs to be applied to the wheel about itsaxis, either by way of gravity or by application of another external force.Common examples are found in transport applications. More generally the term is also used for other circular objects that rotate or turn, such as a Ship's wheel and flywheel. The wheel most likely originated in ancient

The wheel is a device that enables efficient movement of an object across a surface where there is a force pressing the object to the surface. Common examples are a cart drawn by a horse, and the rollers on an aircraft flap mechanism.

The wheel is not a machine, and should not be confused with the wheel and axle, one of the simple machines. A driven wheel is a special case, that is a wheel and axle. Wheels are used in conjunction with axles, either the wheelturns on the axle or the axle turns in the object body. The mechanics are the same in

either case. The normal force at the sliding interface is the same. The sliding distance is reduced for a given distance of travel. The coefficient of friction at the interface is usually lower.

3.6 SHAFT:

A shaft is rotating the wheel or gear. The axle may be fixed in position with a bearing or bushing sitting inside the hole in the wheel or gear to allowthe wheel or gear to rotate around the axle. In other cases the wheel or gear may be fixed to the axle, with bearings or bushings provided at the mountingpoints where the axle is supported.

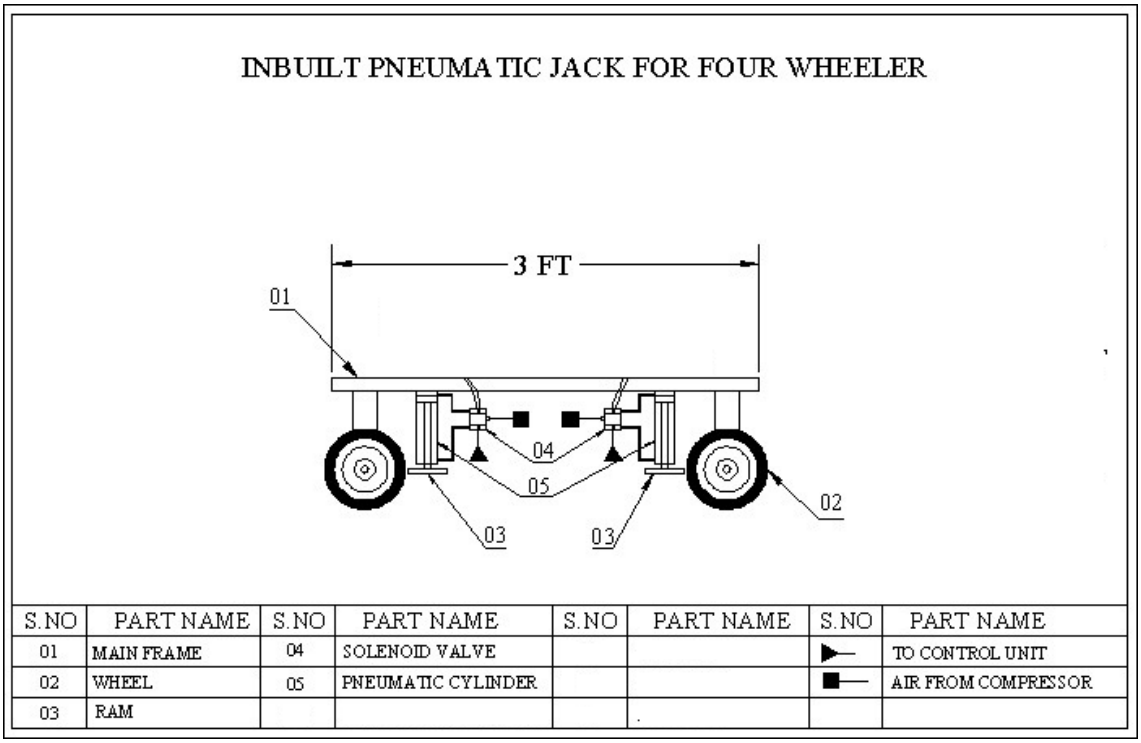
CHAPTER-4 BLOCK DIAGRAM

4.1 COMPONENTS AND ITS SPECIFICATION

The fabrication pneumatic jack consists of the following components tofull fill the requirements of complete operation of the machine.

1. Double acting pneumatic cylinder
2. Solenoid vale
3. Air compressor4 Jacky

DRAWING FOR AUTOMATIC PNEUMATIC JACK FOR LIGHTVEHICLE



S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME	S.NO	PART NAME
01	MAIN FRAME	04	SOLENOID VALVE			▶—	TO CONTROL UNIT
02	WHEEL	05	PNEUMATIC CYLINDER			■—	AIR FROM COMPRESSOR
03	RAM						

CHAPTER-5 WORKING PRINCIPLE:

This pressurized air is saved inside the tank. The outlet of tank consists offour valves which are used to supply the air to other pneumatic applications. In our project the pneumatic operated jack is attached and it is operated by compressed air from the tank.

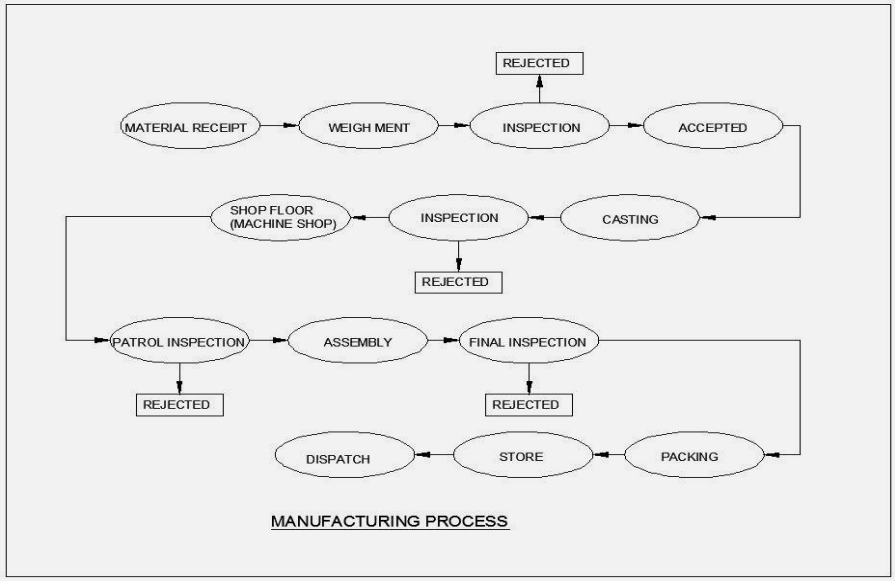
Initially the compressor supplies the air to the solenoid valve to certain pressure. This solenoid valve is used to control the direction of flow of air to thecylinder.

When the air enters into the cylinder automatically the pneumatic rod actuates the jack which is attached at the end of the piston rod. This jack is placed in the vehicle chase. This will operated at the time of requirement.

CHAPTER-6 MANUFACTURING PROCESS

6.1.1 MANUFACTURING PROCESSES:

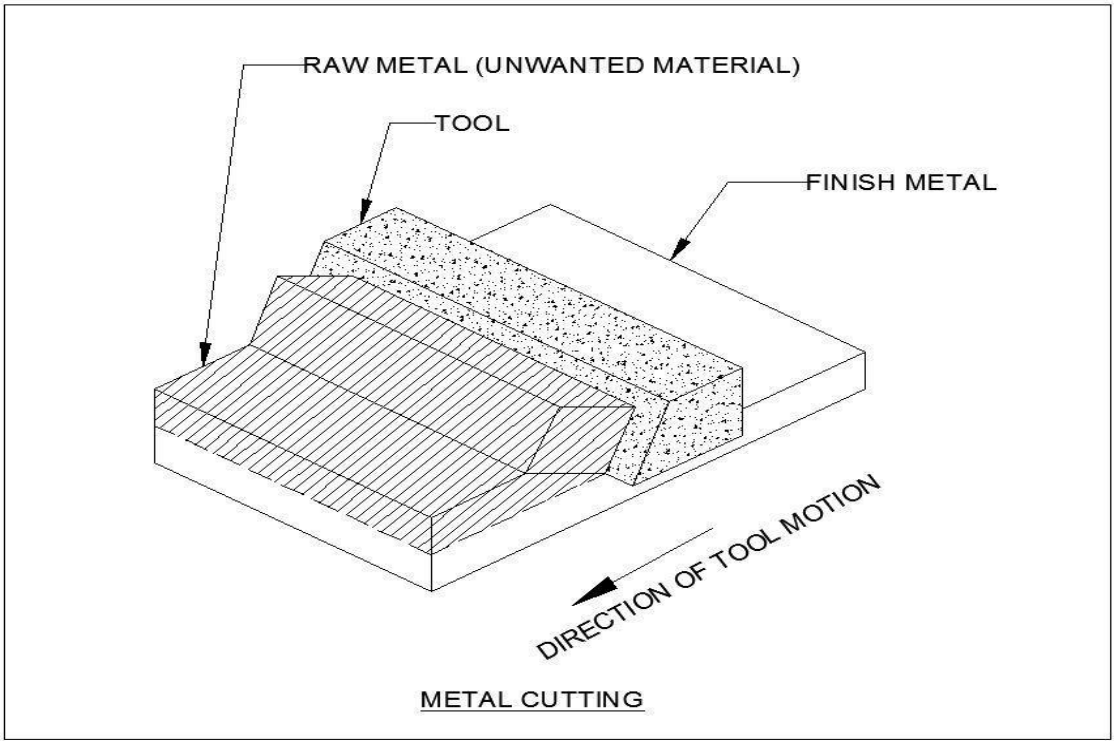
The steps through which raw materials are transformed into a final product. The manufacturing process begins with the creation of the materials from which the design is made. These materials are then modified through manufacturing processes to become the required part. Manufacturing processes can include treating (such as heat treating or coating), machining, or reshaping the material. The manufacturing process also includes tests and checks for quality assurance during or after the manufacturing, and planning the production process prior to manufacturing.



Manufacturing processes

6.1.2 METAL CUTTING:

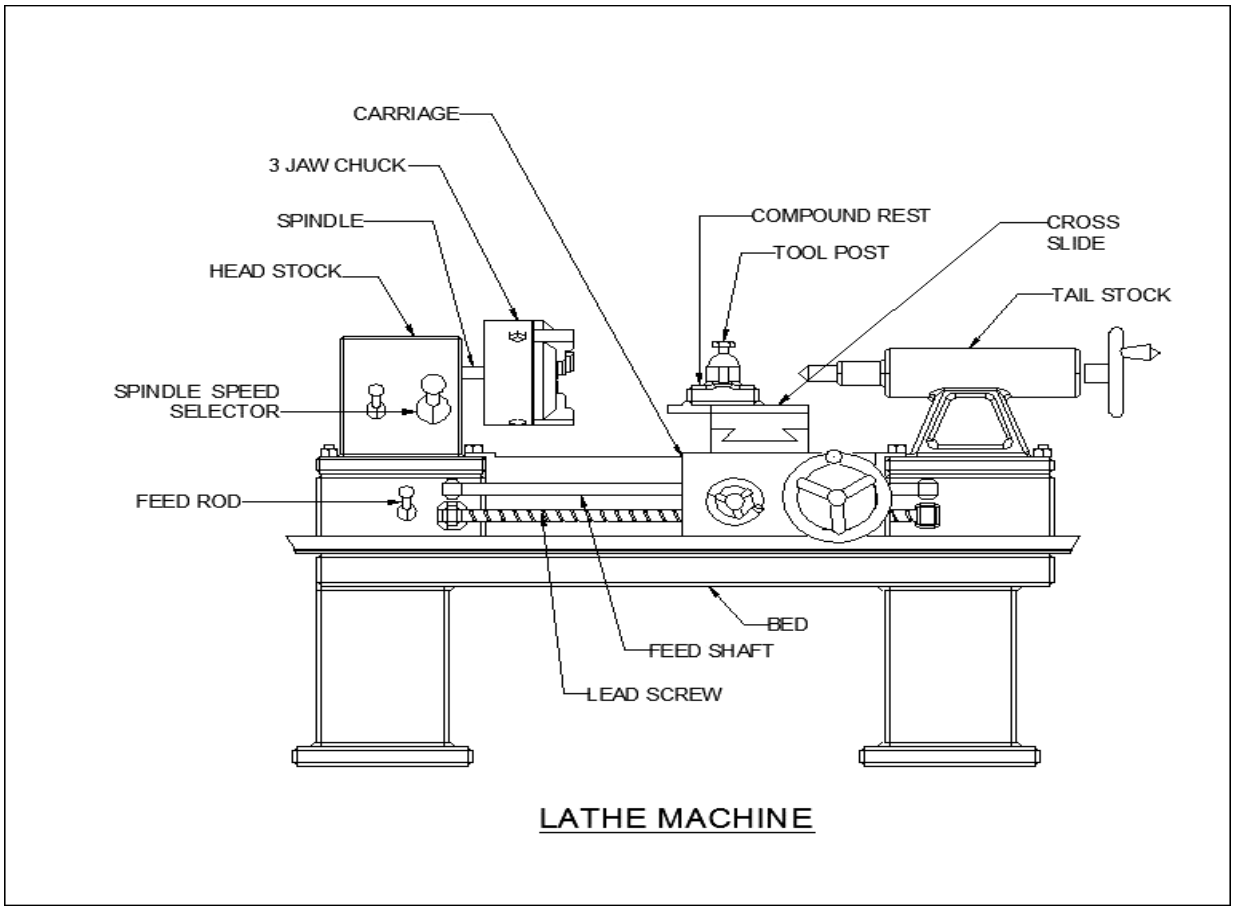
Metal cutting or machining is the process of by removing unwanted material from a block of metal in the form of chips.



Metal cutting

Cutting processes work by causing fracture of the material that is processed. Usually, the portion that is fractured away is in small sized pieces, called chips. Common cutting processes include sawing, shaping (or planning), broaching, drilling, grinding, turning and milling.

Although the actual machines, tools and processes for cutting look very different from each other, the basic mechanism for causing the fracture can be understood by just a simple model called for orthogonal cutting.



LATHE MACHINE

Lathe Metal cutting

In all machining processes, the work piece is a shape that can entirely cover the final part shape. The objective is to cut away the excess material and obtain the final part. This cutting usually requires to be completed in several steps – in each step, the part is held in a fixture, and the exposed portion can be accessed by the tool to machine in that portion. Common fixtures include vise, clamps, 3-jaw or 4-jaw chucks, etc. Each position of holding the part is called a setup. One or more cutting operation may be performed, using one or more cutting tools, in each setup. To switch from one setup to the next, we must release the part from the previous fixture, change the fixture on the machine, clamp the part in the new position on the new fixture, set the coordinates of the machine tool with respect to the new location of the part, and finally start the machining operations for this setup.

Therefore, setup changes are time-consuming and expensive, and so we should try to do the entire cutting process in a minimum number of setups; the task of determining the sequence of the individual operations, grouping them into (a minimum number of) setups, and determination of the fixture used for each setup, is called process planning.

These notes will be organized in three sections:

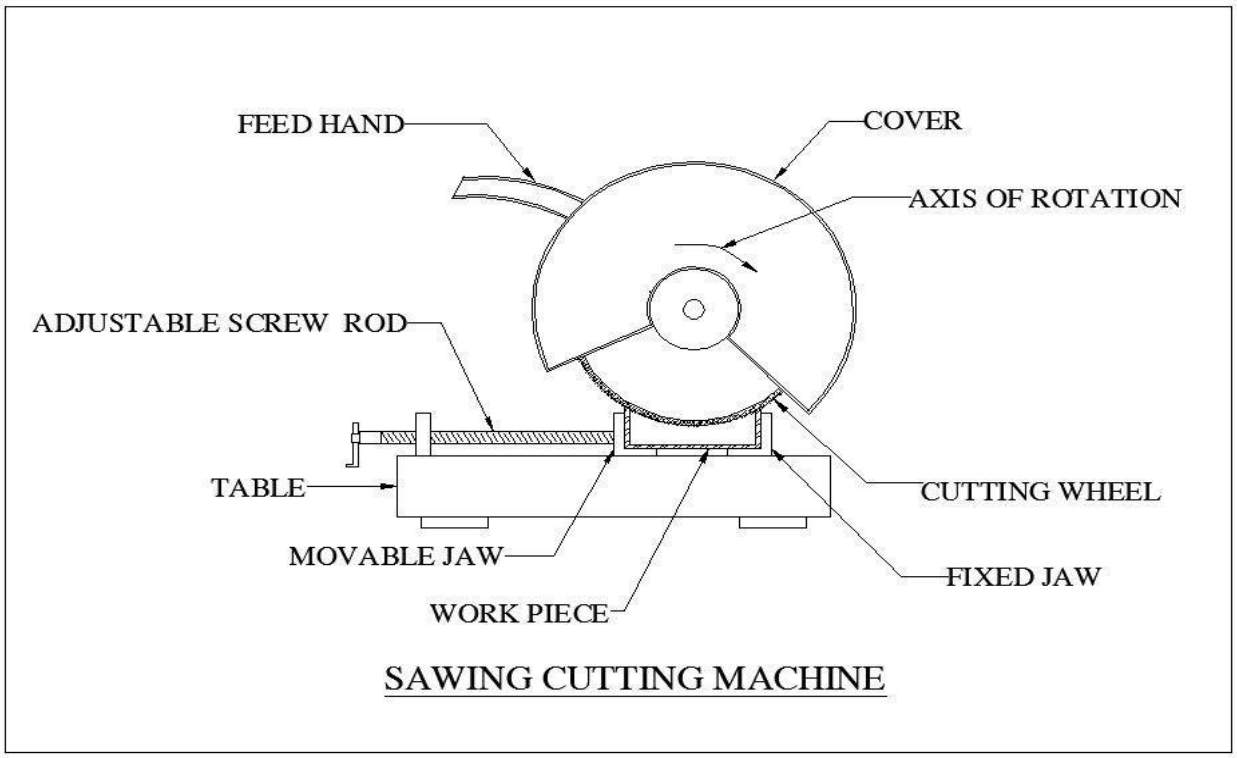
(i) Introduction to the processes,

(ii) The orthogonal cutting model and tool life optimization and

(iii) Process planning and machining planning for milling.

6.1.3 SAWING:

Cold saws are saws that make use of a circular saw blade to cut through various types of metal, including sheet metal. The name of the saw has to do with the action that takes place during the cutting process, which manages to keep both the metal and the blade from becoming too hot. A cold saw is powered with electricity and is usually a stationary type of saw machine rather than a portable type of saw.



SAWING CUTTING MACHINE

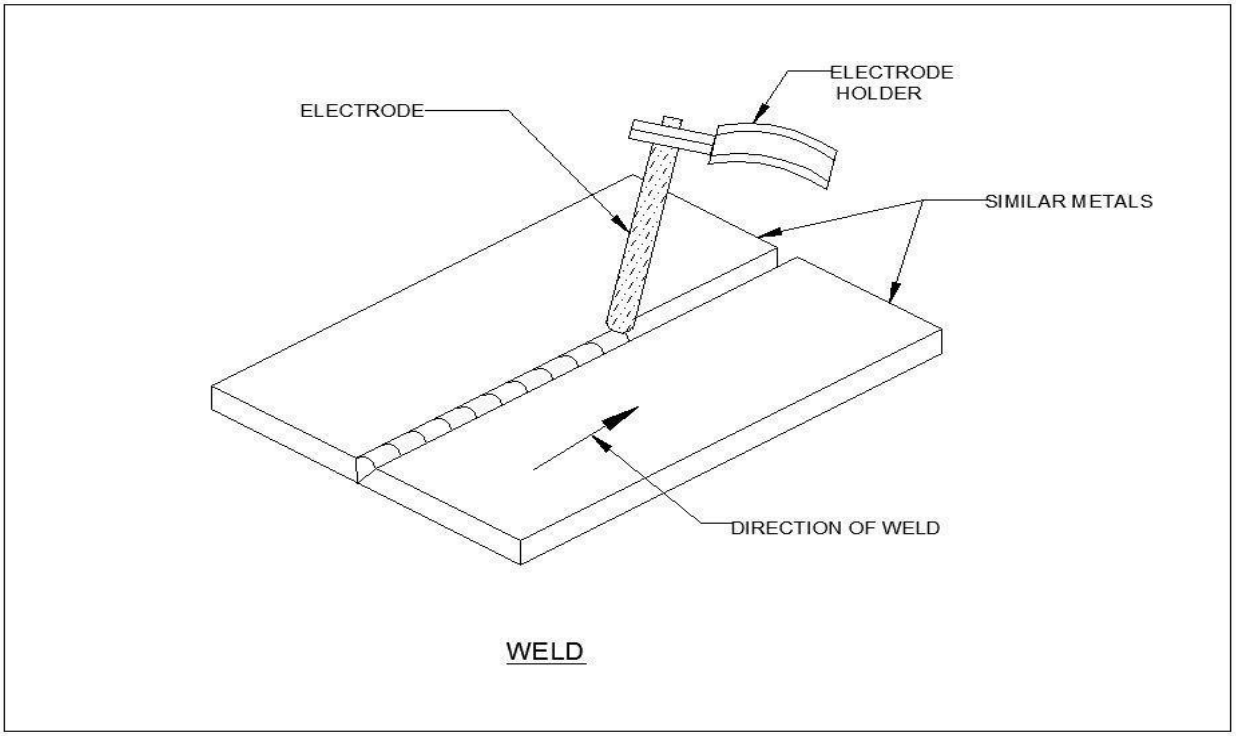
saws cutting

The circular saw blades used with a cold saw are often constructed of highspeed steel. Steel blades of this type are resistant to wear even under daily usage. The end result is that it is possible to complete a number of cutting projects before there is a need to replace the blade. High speed steel blades are especially useful when the saws are used for cutting through thicker sections of metal.

Along with the high speed steel blades, a cold saw may also be equipped with a blade that is tipped with tungsten carbide. This type of blade construction also helps to resist wear and tear. One major difference is that tungsten tipped blades can be re-sharpened from time to time, extending the life of the blade. This type of blade is a good fit for use with sheet metal and other metallic components that are relatively thin in design.

6.1.4 WELDING:

Welding is a process for joining similar metals. Welding joins metals by melting and fusing 1, the base metals being joined and 2, the filler metal applied. Welding employs pinpointed, localized heat input. Most welding involves ferrous-based metals such as steel and stainless steel.Weld joints are usually stronger than or as strong as the base metals being joined.

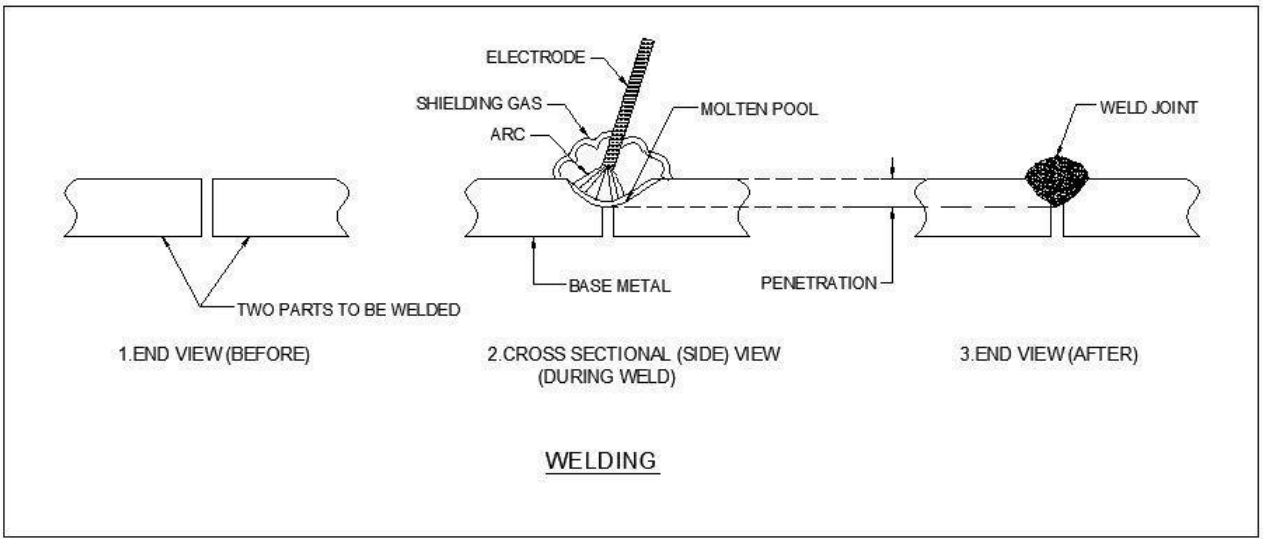


Welding process

Welding is used for making permanent joints. It is used in the manufacture of automobile bodies, aircraft frames, railway wagons, machine frames, structural works, tanks, furniture, boilers, general repair work and ship building.

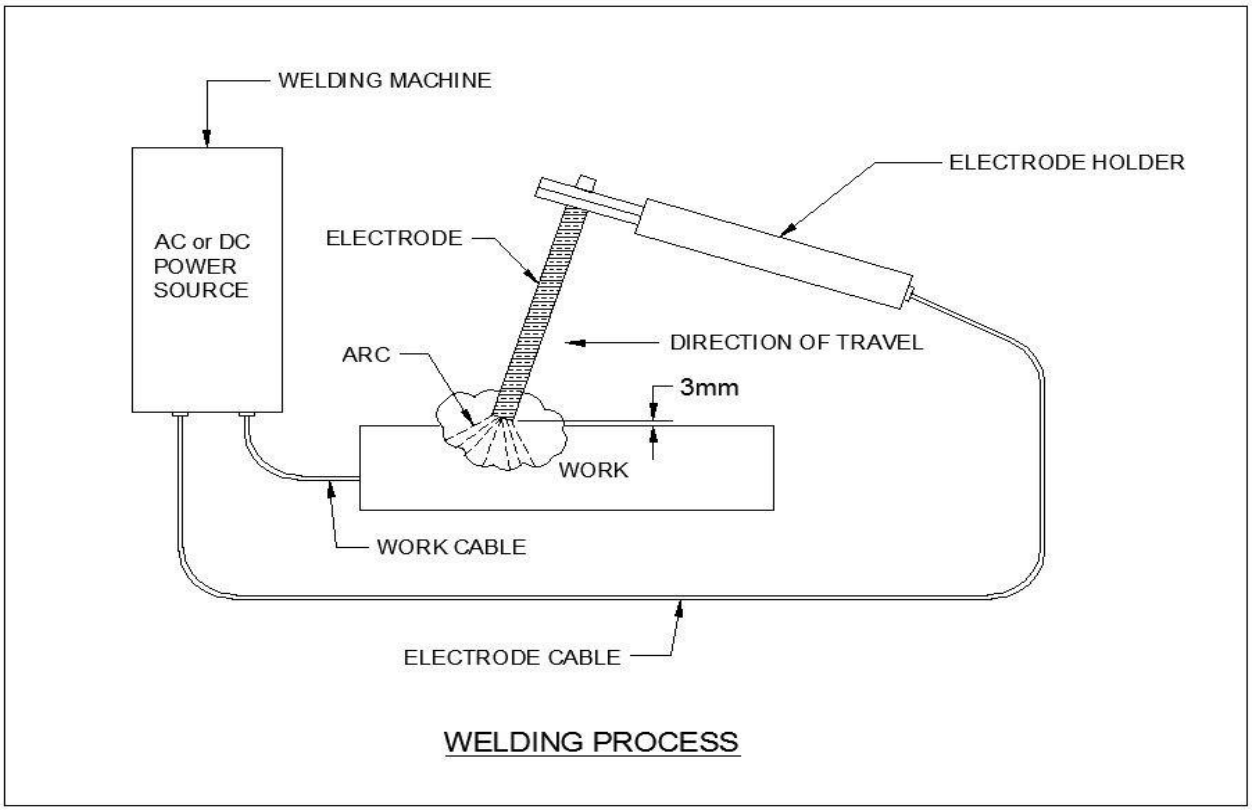
6.1.4.1. OPERATION:

Several welding processes are based on heating with an electric arc, only a few are considered here, starting with the oldest, simple arc welding, alsoknown as shielded metal arc welding (SMAW) or stick welding. In this process an electrical machine (which may be DC or AC, but nowadays is usually AC) supplies current to an electrode holder which carries an electrode which is normally coated with a mixture of chemicals or flux. An earth cable connects the work piece to the welding machine to provide a return path for the current. The weld is initiated by tapping ('striking') the tip of the electrode against the work piece which initiates an electric arc. The high temperature generated (about 6000^{o}C) almost instantly produces a molten pool and the endof the electrode continuously melts into this pool and forms the joint.



Types of Welding view

The operator needs to control the gap between the electrode tip and thework piece while moving the electrode along the joint.



Arc Welding process

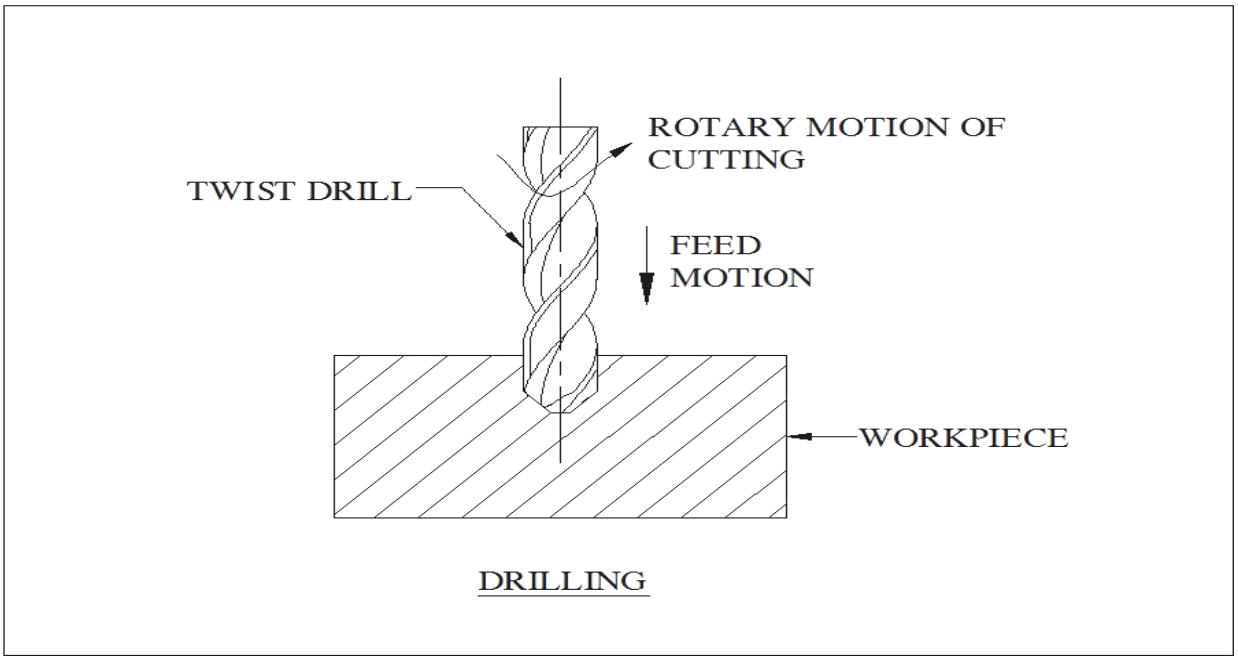
In the shielded metal arc welding process (SMAW) the 'stick' electrode is covered with an extruded coating of flux. The heat of the arc melts the flux which generates a gaseous shield to keep air away from the molten pool and also flux ingredients react with unwanted impurities such as surface oxides, creating a slag which floats to the surface of the weld pool. This forms a crust which protects the weld while it is cooling. When the weld is cold the slag is chipped off.

The SMAW process cannot be used on steel thinner than about 3mm and being a discontinuous

process it is only suitable for manual operation. It is very widely used in jobbing shops and for onsite steel construction work. A wide range of electrode materials and coatings are available enabling the process to be applied to most steels, heat resisting alloys and many types of cast iron.

6.1.5 DRILLNG:

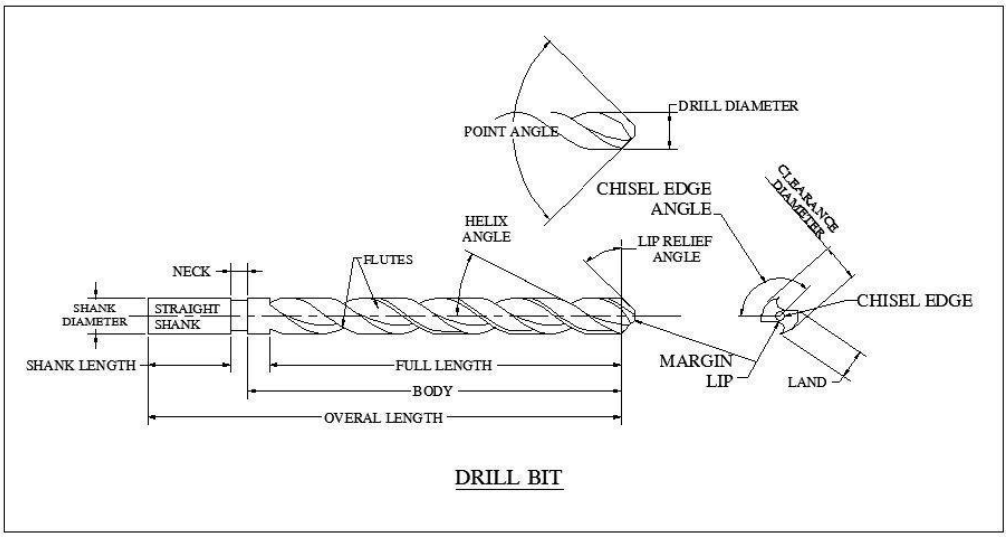
Drilling is a cutting process that uses a drill bit to cut or enlarge a hole of circular cross-section in solid materials. The drill bit is a rotary cutting tool, often multipoint. The bit is pressed against the workpiece and rotated at rates from hundreds to thousands of revolutions per minute. This forces the cutting edge againstthe workpiece, cutting off chips (swarf) from the hole as it is drilled.



DRILLING

6.1.5.1. OPERATION:

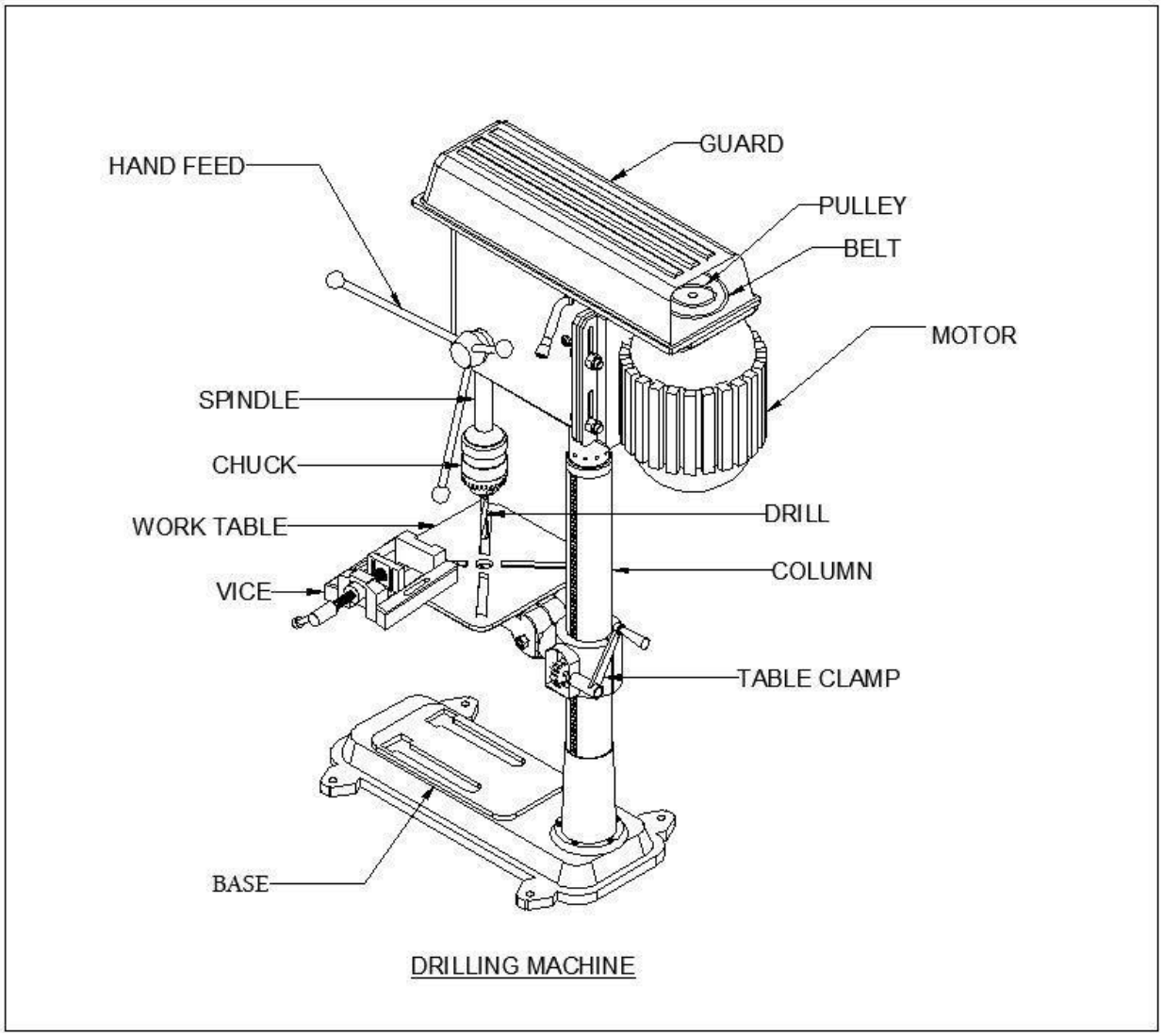
The geometry of the common twist drill tool (called drill bit) is complex; it has straight cutting teeth at the bottom – these teeth do most of the metal cutting, and it has curved cutting teeth along its cylindrical surface. The grooves created by the helical teeth are called flutes, and are useful in pushing the chips out from the hole as it is being machined. Clearly, the velocity of the tip of the drill is zero, and so this region of the tool cannot do much cutting. Therefore itis common to machine a small hole in the material, called a center-hole, before utilizing the drill. Center-holes are made by special drills called center-drills; they also provide a good way for the drill bit to get aligned with the location of the center of the hole. There are hundreds of different types of drill shapes and sizes; here, we will only restrict ourselves to some general facts about drills.



Common drill bit materials include hardened steel (High Speed Steel, Titanium Nitride coated steel); for cutting harder materials, drills with hard inserts, e.g. carbide or CBN inserts, are used;

In general, drills for cutting softer materials have smaller point angle, while those for cutting hard and brittle materials have larger point angle;

If the Length/Diameter ratio of the hole to be machined is large, then we need a special guiding support for the drill, which itself has to be very long; such operations are called gun-drilling. This process is used for holes with diameter of few mm or more, and L/D ratio up to 300. These are used for making barrels of guns;



Figer No 6.1.5.3 Radial Drilling Machine

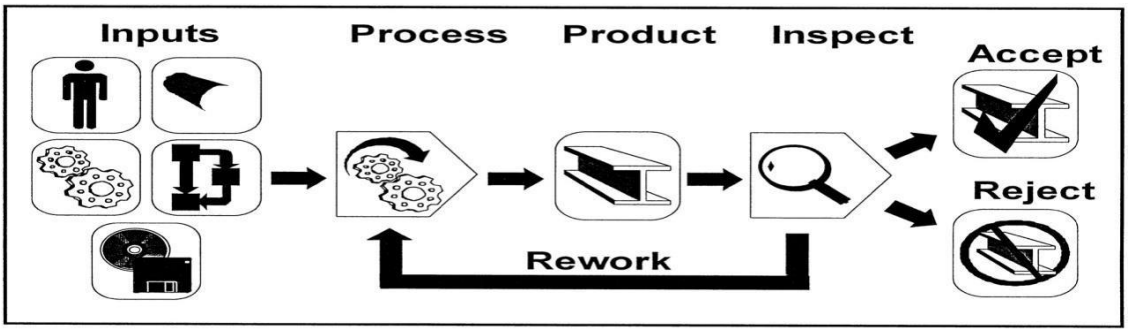
Drilling is not useful for very small diameter holes (e.g. < 0.5 mm), sincethe tool may break and get stuck in the work piece; - Usually, the size of the hole made by a drill is slightly larger than the measured diameter of the drill – this is mainly because of vibration of the tool spindle as it rotates, possible misalignment of the drill with the spindle axis, and some other factors;

For tight dimension control on hole diameter, we first drill a hole that is slightly smaller than required size (e.g. 0.25 mm smaller), and then use a specialtype of drill called a reamer. Reaming has very low material removal rate, low depth of cut, but gives good dimension accuracy.

6.1.6. INSPECTION

Critical appraisal involving examination, measurement, testing, gauging, and comparison of materials or items. An inspection determines if the material or item is in proper quantity and condition, and if it conforms to the applicable or specified requirements. Inspection is generally divided into three categories:

(1) Receiving inspection, (2) In-process inspection, and (3) Final inspection. In quality control (which is guided by the principle that "Quality cannot be inspected into a product") the role of inspection is to verify and validate the variancedata; it does not involve separating the good from the bad.



Figer No 6.1.6. Inspection process

6.1.7 ASSEMBLY:

An assembly line is a manufacturing process (most of the time calleda progressive assembly) in which parts (usually interchangeable parts) are added as the semi-finished assembly moves from work station to work station where the parts are added in sequence until the final assembly is produced. By mechanically moving the parts to the assembly work and moving the semi- finished assembly from work station to work station, a finished product can be assembled much faster and with much less labor than by having workers carry parts to a stationary piece for assembly.

CHAPTER-7 LIST OF MATERIAL
FACTORS DETERMINING THE CHOICE OF MATERIALS:

The various factors which determine the choice of material are discussed below.

7.1. PROPERTIES:

The material selected must posses the necessary properties for the proposed application. The various requirements to be satisfied can be weight, surface finish, rigidity, ability to withstand environmental attack from chemicals, service life, reliability etc.The following four types of principle properties of materials decisively affect their selection

1. Physical
2. Mechanical
3. From manufacturing point of view
4. Chemical

The various physical properties concerned are melting point, thermal Conductivity, specific heat, coefficient of thermal expansion, specific gravity, electrical conductivity, magnetic purposes etc.

The various Mechanical properties Concerned are strength in tensile,Compressive shear, bending, torsional and buckling load, fatigue resistance, impact resistance, eleastic limit, endurance limit, and modulus of elasticity, hardness, wear resistance and sliding properties.

The various properties concerned from the manufacturing point of view are,

- Cast ability
- Weld ability
- Surface properties
- Shrinkage
- Deep drawing etc.

7.1.2. MANUFACTURING CASE:

Sometimes the demand for lowest possible manufacturing cost or surfacequalities obtainable by the application of suitable coating substances may demand the use of special materials.

7.1.3. QUALITY REQUIRED:

This generally affects the manufacturing process and ultimately the material. For example, it would never be desirable to go casting of a less number of components which can be fabricated much more economically bywelding or hand forging the steel.

7.1.4. AVAILABILITY OF MATERIAL:

Some materials may be scarce or in short supply.it then becomes obligatory for the designer to use some other material which though may not be a perfect substitute for the material designed.the delivery of materials and the delivery date of product should also be kept in mind.

7.1.5. SPACE CONSIDERATION:

Sometimes high strength materials have to be selected because the forces involved are high and space limitations are there.

7.16. COST:

As in any other problem, in selection of material the cost of materialplays an important part and should not be ignored.

Some times factors like scrap utilization,appearance,and non-maintenanceof the designed part are involved in the selection of proper materials.

CHAPTER-8 LIST OF MATERIALS

Sl. No.	PARTS	Qty.	Material
1	PNEUMATIC SINGLE ACTING CYLINDER	2	ALUMINUM

2	SOLENOID VALVE	1	STAINLESS STEEL
3	FLOW CONTROL VALVE	1	STEEL
5	PU CONNECTOR , REDUCER , HOSE COLLAR	-	NGINEERED PLASTICS
6	STAND	-	MS
7	NUTS AND BOLTS	1	MS

CHAPTER-9 COST ESTIMATION

1. MATERIAL COST

Sl. No.	PARTS	Qty.	Amount (Rs)
1	PNEUMATIC SINGLE ACTINGCYLINDER	1	3500
2	SOLENOID VALVE	1	750
3	FLOW CONTROL VALVE	1	500
4	PU CONNECTOR , REDUCER , HOSE COLLAR	-	750
5	STAND	-	2500
6	NUTS AND BOLTS	1	100

TOTAL =8100

2. LABOUR COST

LATHE, DRILLING, WELDING, GRINDING, POWER HACKSAW, GASCUTTING:

Cost = 900

3. OVERHEAD CHARGES

The overhead charges are arrived by "Manufacturing cost"

Manufacturing Cost = Material Cost + Labour cost
= 8100+900
=

Overhead Charges = 20% of the manufacturing cost1800
=

TOTAL COST

Total cost =Material Cost + Labour cost + OverheadCharges
= 8100+900+1800
= 10800
Total cost for this project = 10800

CHAPTER-10 ADVANTAGES

- It requires simple maintenance cares
- The loaded light vehicles can be easily lifted.
- Checking and cleaning are easy, because of the main parts arescrewed.
- Handling is easy.
- Manual power not required
- Repairing is easy.
- Replacement of parts is easy.

CHAPTER-11 APPLICATIONS

- It is very much useful for Car Owners & Auto-garages. This automaticpneumatic jack is used for lifting the vehicles.
- Thus it can be useful for the following types of vehicles;

1) MARUTI,
2) AMBASSADOR,
3) FIAT,
4) MAHINDRA,
5) TATA.

REFERNCE

1. Design data book -P.S.G.Tech.
2. Machine tool design handbook –Central machine tool Institute, Bangalore.
3. Strength of Materials -R.S.Kurmi

4. Manufacturing Technology -M.Haslehurst.

WEB SITES:

1. http://www.atmel.com/ for microcontroller details)
2. http://www.pneumatics.be (pneumatic cylinder details)
3. http://fpef.org/ (solenoid details)