

**# Pattern :** Pattern is a replica of casting required has same shape & size to the final product and is placed in suitable sand for mould formation.

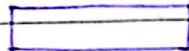
**Pattern materials:** Wood, Plaster of Paris, Metals, Plastics, and Wax.

cheap, light, easily available.

#### Types of Pattern.

(1) **Single Piece Pattern:** It is used for very simple and large casting.

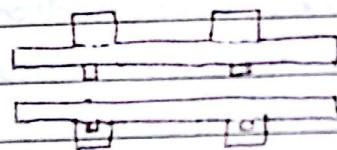
If Patterns are made without joint between them single piece pattern is called.



(2) **Split Pattern:** It is used when complexity of pattern is more and withdrawal of pattern is difficult.

Sometimes patterns cannot be made in single piece.

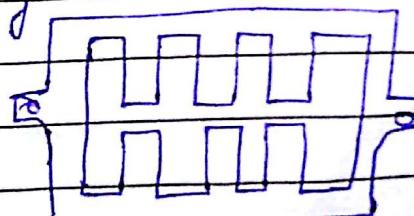
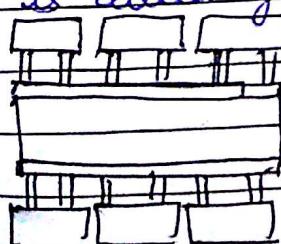
because of difficulties encountered in moulding or difficulty in withdrawal from the mould, so split piece pattern is used



(3) **Gated Pattern:** It is used when small component in mass production is required. To produce good casting it is necessary to ensure full supply of molten metal flow into every part of the mould.

provision for easy passage of flowing metal in the mould is called gating.

Gated Pattern

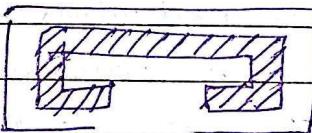


→ Match Plate Pattern.

④ Match Plate Pattern : It is used for production of small size casting in mass production like piston ring.

- Advantages :
- ① mass production
  - ② greater dimensional accuracy
  - ③ Minimum machining requirement

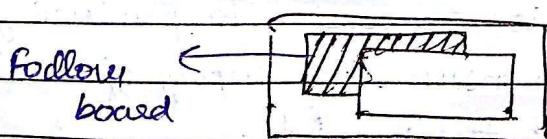
⑤ Loose Piece Pattern : It is used when parts with internal webs. ~~parts with internal webs~~  
Withdrawal of pattern is difficult from the mould in order to overcome this we will make the pattern in form of loose pieces so that we can easily withdraw the pattern in form of loose piece.



⑥ Follower Board Pattern : Used when thin or overhanging section in casting is required.

During casting, thin section or overhanging section of pattern are distorted because of the casting force which is applied in moulding process.

To support such structures, follower board is used which may fit inside the pattern.



22/03/2017.

## WELDING

Welding is the process of joining 2 similar or dissimilar matter with or without application of pressure and with or with out use of filler material.

The fusion of metal takes place by means of heat.

### ADVANTAGES

- ① A good weld is strong as the base metal.
- ② A large no. of metals and alloys can be joined by welding.
- ③ Repair by welding very easy.

### DISADVANTAGES

- ① Welding produces harmful radiation.
- ② A skilled welder is required.
- ③ Welding heat produced metallurgical changes.
- ④ cost of equipment is high.

### Applications

- ① Aircraft industry -
- ② Building construction
- ③ Bridge construction
- ④ Piping and pipelines
- ⑤ Automobile industry

### TYPES OF WELDING

Solid State

(Autogenous).

(No filler material is used)

Liquid State

Fusion Welding

(Filler material is same as base metal)

Solid/Liquid  
(Heterogeneous)

Brazing

Soldering

Shielded metal

arc welding

Arc

Chemical  
Reaction

Resistance  
welding

SMAW/ MMAW

Submerged  
Arc  
Welding Gas

welding

Thermite

welding

Spot Projection Seam

TIG.

MIG

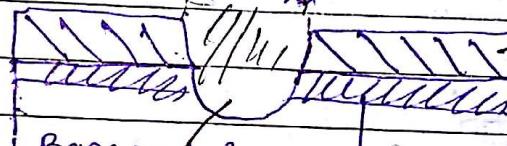
~~Shielded~~

Shielded

Metal

Arc

Welding.



electrode  
wire

Flux coating

Slag coating

Depth of penetration

Solidified weld metal.

## ~~GAS WELDING~~

Welding Torch. → gas control valve.

Pressure

Regulator.

Mixing  
chamber

Solidified  
weld  
metal.

Workpiece.

$C_2H_2$

Acetylene

Black color

Oxygen.

Maroon color.

## # Shielded Metal Arc Welding.

It uses coated electrode of 2.5 to 6.35 mm diameter and 300 to 450 mm length held in an electrode holder. Initially the arc is being created b/w electrode and workpiece.

This process is highly versatile and can be used extensively for both simple as well as sophisticated jobs. Further the equipment is least expensive compared to that being used in other arc welding processes. Weld by this process can be made in any position (vertical / horizontal / downhand and overhead).

Job of any thickness can be welded by SMAW but very small thickness below 3mm may give rise to difficulty in welding.

Similarly, very large thickness above 20mm. can take long time for filling up the joint root. The SMAW can be done with either AC or DC power source. Initially the arc can be created b/w electrode wire and workpiece flux by taking energy from the arc and gets melted and mixture of liquid metal and molten flux get simultaneously settled in the groove.

Since, the density of flux is lower it comes over the surface of weld bead and provide black coating.

→ Flux has following functions:

Since Flux gives alloy to the weld bead material. Weld bead becomes stronger than parent metal. It protects the weld bead from the attack of atmospheric gases.

5<sup>th</sup> April '2017,

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## ASSIGNMENT

### GAS WELDING - 01

- Q6: What are the various types of milling and drilling operations?
- Q7: Types of defects in Casting
- Q8: What is sheet metal and explain its various types of operations?
- Q9: Explain the working and principle with neat sketch of following terms:
- ① Vernier callipers
  - ② Height gauge
  - ③ Micrometer
  - ④ Dial indicator
- Q10: What is comparator? Explain the types of comparators.

23/03/2017, Gas Welding 5. It is also called air oxy-fuel gas welding derive the heat from the combination of a fuel gas such as acetylene in combination with oxygen. The process is a fusion welding process where joint is completely melted to obtain the fusion. The fuel gas generally used is acetylene because of high temperature generated in the flame. This process is also called Oxy-acetylene welding.

When acetylene is mixed with oxygen in correct proportion in the ~~welding~~ cutting torch

and ignited, the flame is produced which is sufficiently hot to melt and join the parent metal.

3 Types of flames used :-

- ① Neutral Flame (1:1:1) → Used for mild steel, cast iron, stainless steel, copper and aluminium.
- ② Oxidising flame (1:15 > 1) It is used for non-ferrous alloy.
- ③ Carburising flame (0.9:1) Copper, alloys, high speed steel, high carbon steel.

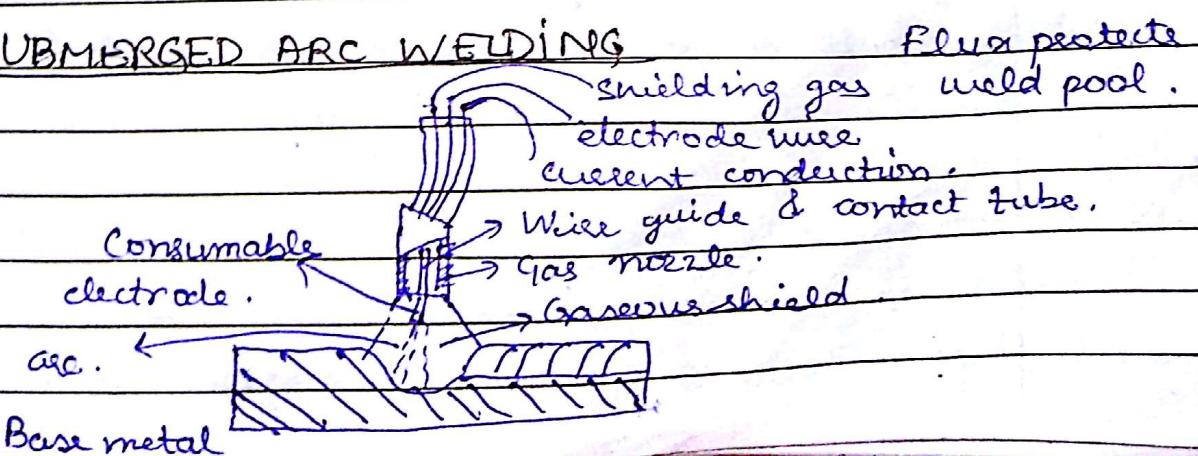
#### # ADVANTAGES OF GAS WELDING

- ① It can be applied to wide variety of manufacturing.
- ② no electric current is required.
- ③ Less equipment cost.

#### # DISADVANTAGE OF GAS WELDING

- ① Flame temp. is less than the temp. of arc.
- ② Gas flame takes a long time to heat up a metal than an arc.
- ③ More skilled operators are needed.

#### # SUBMERGED ARC WELDING



## \* Spot, Seam, Projection Welding

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This is semi-automatic process which can be produced along weld run. In this type of welding, electrode is in the form of a spool of copper coated wire & granular flux is used as powdered flux is initially poured into the welding area and arc is maintained within the pool of flux. It is mainly used in the down and welding position in a semi-automatic welding process. The fielding of electrode towards weld pool is controlled by machine. The metal most widely welded through this process are : Low carbon steel, Low alloy steel and stainless steel, and high alloy steel.

It is extensively used in the joints in thick plate, pressure vessels, welded pipes and nuclear reactors. It can be used for plate less than 5 mm thickness.

# MACHINING OPERATIONS / TOOLS.

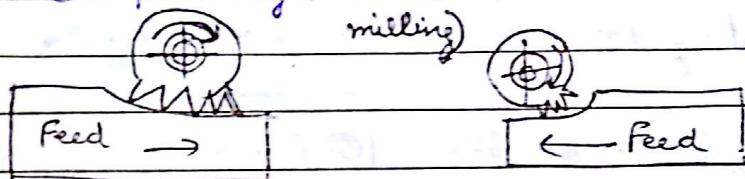
20/03/2017.

## MILLING PROCESS

Milling machine is a machine tool in which metal is removed by means of revolving cutter with many teeth (Multipoint). Each tool having a cutting edge which remove the metal from the workpiece. This machine is very much suitable in tool room work due to its variety of operation and better surface finish.

Milling can be classified into two categories:

- ① Upmilling (Conventional milling)
- ② Downmilling (Climb milling)

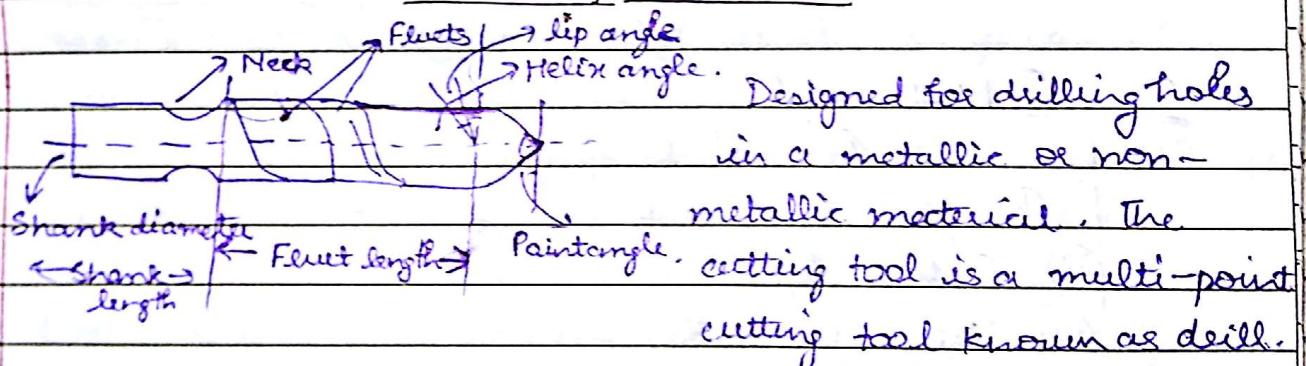


① Upmilling: The cutter rotates against the direction of workpiece and

② Downmilling: Cutter rotates in the same direction as the workpiece

#.

## DRILLING MACHINE



The drill are made slightly smaller in size so that there is some margin for reaming.

→ Twist Drill is the most commonly used drill manufactured by twisting a flat piece of tool steel longitudinally for several revolutions and making 2 cutting edges

at the end face of the drill. The flutes help in removing the chips upward from the drill hole. Additionally these flutes are used as a passage for coolant to reach the cutting edge.

Q. What is Shaper and Planer?

Shaper: Shaper is to remove unwanted material and groove tool is moving, workpiece is fixed.

Planer      Shaper

① Cutting takes place by reciprocating tool over the job.

② Field is given to the job during the ideal stroke of the ram.

③ The tool used on shaper are smaller and lighter.

④ This is suitable for smaller jobs.

① Cutting takes place by reciprocating the job under the tool.

② Field is given to the tool during the ideal stroke of work table.

③ Tools used on planer are longer, heavier and stronger.

④ This is used for larger and heavier jobs.

### Assignment

Q10. (i) Mechanical -

(a) Reed Type.

(b) Sigma Comparator.

(ii) Optical Comparator.

(iii) Zeiss Optimeter.

(iv) Neumatic comparator.

(a) Flaw Type

(b) Differential Type.

30/03/2017

## Introduction to Quality measurements

Q. What is Inspection?

Checking of any component of workpiece.

### # Introduction To Quality measurement of manufacturing processes

Whenever parts must be inspected in large numbers, 100% inspection of each part is not only slow and costly process but in addition doesn't eliminate all of defective parts. Quality control enables an inspector to sample the parts being produced in a mathematical manner and to determine whether or not entire stream of production is acceptable provided that the company is willing to allow certain known numbers of defective parts. The no. of acceptable defectives is usually taken as 3 out of 1000 parts produced.

## STANDARDS OF MEASUREMENT

Classified into 3 categories :

- ① Primary Standard : The highest standard of either a base unit or a derived unit is called as primary std. These stds. essentially are copies of international prototypes and are kept throughout the world in national standards, laboratories and institutions of similar standing. The Primary std. constitute the ultimate basis of reference and are used for the purpose of verification and calibration of secondary standards. These standards have the highest possible accuracy but are very expensive. The primary standards are not available for use outside the national ~~laboratory~~ laboratories -

- ⑦ Secondary Standard: They are reference calibrated standards designed and calibrated from primary standard. These are sent periodically to the national standard laboratories for their calibration. These stds. are kept by the measurement laboratories and the industrial organizations to check and calibrate the general tools for their accuracy and precision.
- ⑧ Working Standard: They have an accuracy of one order lower than that of secondary standard. These are the normal standards which are used by the workers and technicians who actually carry out the measurements.

### Accuracy & Precision

↳ Closeness to exact value of the target and  
 ↳ It is the repeatability.

### Line Standard & End Standard

Here the measurement is made b/w two parallel lines engraved across the standards. The most common example of line standard or line measure is steel rule or scale with its division shown as line marked on it.

### End Standard

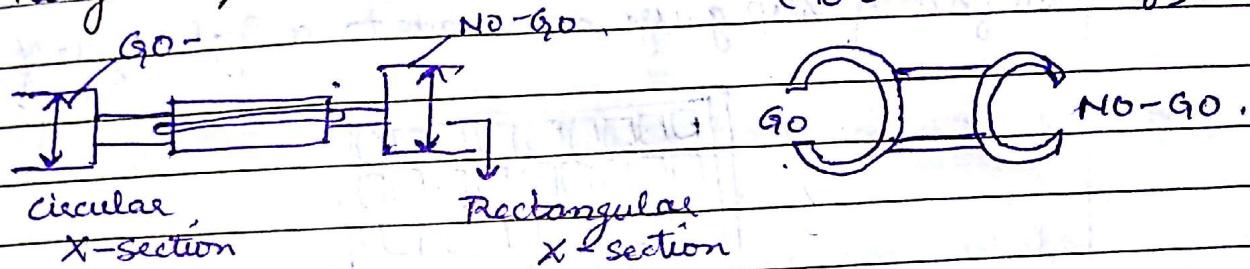
Here the measurement is made b/w two flat parallel faces, e.g., vernier callipers and micrometer.

### Gauges

A gauge is a tool or instrument used to measure or compare a component. It is here employed in the sense of an instrument which having fixed dimension

and is used to determine whether the size of the some component exceeds or is less than the size of the gauge itself.

- Two types of Gauges (hole)
- ① Plug Gauge (To check the hole)
  - ② Ring gauge (To check the shaft).



Gauge (No-Go) are designed to check both hole and shaft that whether they come within their tolerance limit or not. The gauge used for shaft are called ring gauge and the gauge used for hole are called plug gauge.

Gauges are designed according to tailors principle which has two statements:

- ① On the go side of limit gauge all related dimensions should be checked simultaneously.
  - ② While on the non-go side each dimension is checked separately. There are three main grades of limit gauge used are:
- (a) Workshop limit gauge to be used on the machine for gauging the ~~material~~ dimensions of the component during production

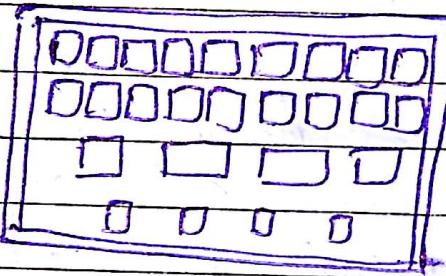
(b) Inspection limit gauge to be used in inspection department for checking the component after production.

(c) Reference gauge to be used in ~~material~~ metrology

~~laboratories for reference purpose.~~

### ③ Slip Gauge.

They are used as measuring blocks. It is also called as precision gauge blocks. They are made of hardened alloy steel of rectangular cross section. The surface of slip gauge are made to a high degree of accuracy.



### # Classification of Slip gauge :

It is done according to their usage as follows :

① Grade ~~not~~ .2 : It is work shop grade slip gauge used for setting tools, cutter and checking dimensions roughly.

② Grade 1 : Grade used for precise work in tool room.

③ Grade 0 : It is used as inspection grade of slip gauge mainly by inspection department.

④ Grade 00 : It is mainly used in high precision work in the form of error detection ~~in the~~ instrument.