Production Process 2

Q.P CODE: 72780

Sem 4/Mechanical/ Choice based/ May-19

Q.1]a] How does additive manufacturing differs from CNC machining? [5]

Ans :

Sr. No	Additive manufacturing	CNC machining
1.	AM stand for additive manufacturing techniques.	CNC stands for computer numerical controlled techniques.
2.	It is additive process.	It is a subtractive process.
3.	I am generally uses for making materials.	CNC machine in can process Machin able materials.
4.	Speed is much lower in CNC machining.	Speed of CNC machine is faster than AM.
5.	Setup time required is less.	Considerable amount of time is required to set machine.
6.	AM can manufacture complex intricate shaped products in less time.	Certain complex shaped products cannot be manufactured on CNC unless they are broken into smaller section and reassembled at later stage.
7.	Accuracy of obtained by AM process is higher than date of CNC machining as the machine operates with a resolution of a few tens of microns.	Because of tool wear problem, vibration, material defect issues, accuracy of CNC machined product is less.
8.	Incorrect programming results into incorrect built of product.	Incorrect programming results in several damages and safety risks.

Q.1]b] what is the difference between traditional and nontraditional machining process? [5]

Ans:

Sr.No.	Traditional machining	Nontraditional machining
1.	Direct contact of tool work piece	Tools are non-conventional techniques like LBM, EDM
2.	Cutting tool is always harder than work piece.	Told maybe not harder and it may not be physically present.
3.	Tool life is less due to high wear	Tool life is more.
4.	Generally microscopic chip formation.	Material removal rate occur with chip or without chip formation.
5.	Material removal takes place due to the action of cutting force.	It uses different energy electrical thermochemical etc. to provide machining.
6.	Suitable for all materials.	Not suitable for all materials.

7.	It cannot be used for making prototype parts very effectively	It can be used for making prototype parts very effectively.

Q.1]c] what is meant by grit, grade and structure of grinding wheel? [5]

Ans:

The characteristics of a grinding that determine how the wheel performs in a cutting operation include the kind of abrasive, grain size, type of bond used, grade on strength of the bond and a structure or packing density of the wheel.

Grain size

- Coarse grains may be used to take heavy cuts of materials but in hard materials it is better to use fine grained wheels since more cutting ages will be in action simultaneously.
- Fine grains make small scratch marks and in general, produce better surface finish.
- Fine grade wheels permit truing of wheels to thin sections and hold shape at corners.
- Example. Thread grinding where fine grained wheels are designed to hold shape required for thread roots.
- Fine grained wheels are also preferred when grinding is done in small area of contact.

Grade

- The grade of a grinding wheel is present strength of its bond.
- The binding material in a will does not completely occupies the space between its grains.
- It together coats the grains and the grains are held together by the binding action at the point of contact.
- Only coats the grains and the grains are held together by the binding action at the point of contact.
- This leaves voids in the wheel making the wheel porous.
- The great is designated quality as soft or hard.
- The grade of the wheel therefore depends upon the density of the wheel, the number of points of contact between grains, the strength of these binding contacts and quantity of the bond.

Structure

- Structure of a grinding with specified how close to the grains of the wheels are held together.
- It represents the relation between the abrasive grains and the bond in the terms of the voids between them.
- An open structure which has more voids and cuts cooler.
- It can be used for removing more materials with Deeper cuts in soft materials.
- A dense will as less voids and more cutting edges per unit area. It is preferable for harder materials because more grains will be working simultaneously.

- Dense structures also help to produce more the surfaces and maintain wheel shape.
- Structure and grade are interrelated.

Q.1]d] Differentiate between compound die and combination die. [5]

Ans:

Sr.No	Compound die	Combination die
1.	Combined pair of two punch and die sets at one station.	A combined pair of two punch and die sets at one station.
2.	Two or more operations performed on the same station one after the other.	Two operation performed on the same station one after the other in one stroke.
3.	Functions performed are of similar kind such as blanking and piercing.	Functions performed at different types of shearing or blanking and forming.
4.	The job is complicated at one station after stock is fed to the die.	Job is completed in one station after the stock is fed to the die.
5.	Job completed one station.	Job completed at one station.

Q.1]e] what is meant by chip thickness ratio? What does it depend on? The neat labelled sketch how to show various angles and velocity is related to chip thickness ratio. [5]

Ans:

The ratio of the thickness of the chip before removal to the thickness after removal is termed as **cheap thickness ratio.**

The reciprocal of the chip thickness ratio is known as **chip compression factor.**

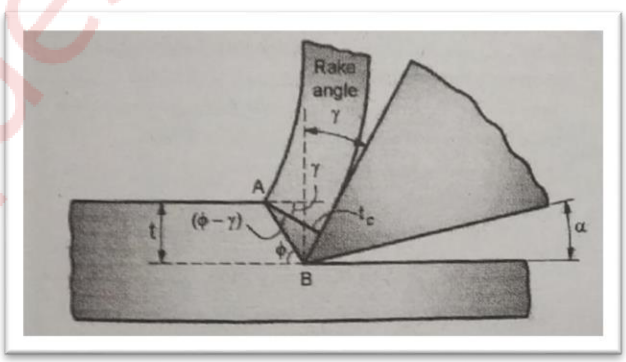


Fig 1

From figure 1

Chip thickness ratio, $r_c = \frac{t}{t_c}$

$= \frac{AB \sin \emptyset}{AB \cos(\emptyset - \gamma)}$

$= \frac{\sin \emptyset}{\cos(\emptyset - \gamma)}$

$= \frac{1}{\cot \emptyset \cos \gamma + \sin \gamma}$

$\cot \emptyset \cos \gamma = \frac{1 - r_c \sin \gamma}{r_c}$

$\tan \emptyset = \frac{r_c \cos \gamma}{1 - r_c \sin \gamma}$ …..(1|)

The chip thickness ratio and shear angle existing during a cut can be determined by measuring average thickness of the cheap after the cut.

- R_c can also be determined from the volume consistency consideration by measuring length l_c of the cheap and comparing it with the length of the work piece from which it is came. If b is the width of the chip.
  Volume of the chip =l t b = l t b
  Or $r_c = \frac{t}{t_c} = \frac{l_c}{l}$

- Measurement by this method can be easily done by using a word peace with a slot. This lord will break the chip or cause a notch to be formed on the chip for each revolution of the work piece.

Q.2]a]what are the factors determining the material removal rate in electric discharge machining process. Elaborate on them. [10]

Ans: The following process that affect the material removal rate in EDM include the following:

1. Current in each spark.
2. Frequency of discharge
3. Electrode material
4. Work piece material
5. Dielectric flushing conditions.

Current in each spark

- The material removal in EDM is a result of craters formed on the work piece due to the action of the spark.
- The mount removed is third depended on the depth of the crater which is directly proportional to the current. As a current increases the crater depth increases and so does the metal removal rate.

- The surface finish produced also is affected by the depth of the crater. As such when current is increased to increase the metal removal rate the surface finish goes down.
- The surface finish can be improved by decreasing the current and hence decrease in the crater depth. If the frequency is increased at the same time the material removal rate also can be improved.

Work and tool materials

- If the metal removal rate is affected considerable by the relative properties of the work and tool materials. Higher the melting point of the work material the lesser it wears.
- The tool material and thus to be selected considering the relative wears rates of work and tool material and other characteristics like thermal stability, producibility etc. of the tool.

Dielectric flushing conditions

- Metal removal rate is also dependent on the circulation of the dielectric fluid as shown in the figure.
- The correct circulation of dielectric fluid between the electrode and the work piece is an important aspect of efficient EDM machining.
- Eroded particles must be flushed out by the dielectric fluid as they reduced further metal removal.
- Without forced circulation the wear particles repeatedly melt and reunite with the electrode.

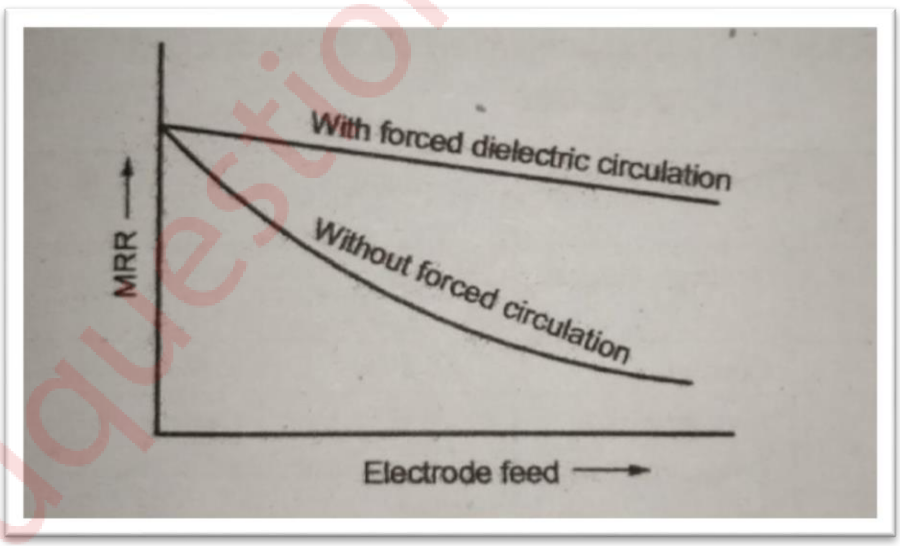


Fig 1 Effect of dielectric circulation on MRR

Q.2]b] Differentiate between orthogonal and oblique cutting. [10]

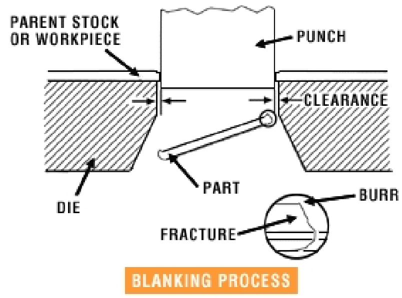
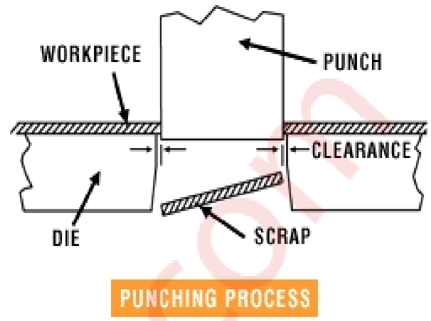
Ans :

Sr.No	Orthogonal cutting	Oblique cutting
1.	The cutting edge is perpendicular to the direction of the cutting velocity.	The cutting edge is inclined at an acute angle with the normal to the cutting was direction.
2.	The direction of the chip floor on the tool face is normal to the cutting edge.	The chips flow on the double face making an angle with the normal to the cutting edge.
3.	The cutting edge is larger than the width of the work piece. Example, there is no side flow	The cutting edge may or may not clear the width of the work piece.
4.	Maximum chip thickness occurs at middle.	The maximum chip thickness may not occur at the middle.
5.	The tool is perfectly sharp and contacts the chip on the rake face only.	More than one cutting edges maybe action frequently.
6.	Only two components of the cutting forces act on the tool (mutually perpendicular to each other).	The cutting force system is generally three dimensional.
7.	To life is higher	To life is lower
8.	The chips flow over the tool	The chip flow along the side
9.	The shear force act per unit area is high which increases the heat developed per unit area.	The shear force act per unit area is low, which decreases the heat developed per unit area.
10.	Use in Grooving,partinreg,slotting inate system	Use in almost all industrial cutting,drilling,grinding,milling.

Q.3]a] Differentiate between blanking and punching process with the labelled sketch. [10]

Ans :

Sr.no	Characteristics	Blanking	Punching
1.	Purpose	Cutting out intermediate shapes called blanks which are to be further processed.	To cut out unwanted portion from a sheets
2.	Scrap	The sheet remaining after the blank it cut out.	The cutout slug.
3.	Size	Size of the blank is equal to the size of the die.	Size of the hole is equal to the size of the punch.
4.	Punch size	Size of die -2C	Size of the hole.
5.	Die size	Size of the blank	Size of hole size +2C
6.	Shear angle to be provided on	Die	Punch.

7.	Diagram		

Q.3]b] What is meant by locating clamping resting with respect to jigs And fixture. [10]

Ans :

Locator

Locator used for restricting movement of a part and their location must be decided with the following consideration.

1. The locators must be positioned to contact the work on a machine surface to ensure that the placement is accurate and repeatability of placement is insured.
2. The locators should be spaced as far apart as possible then using minimum number of locators.
3. The locators must be placed to ensure complete contact over the locating surface.
4. The placement of locators must be in sure no interference with chips or dust. If it is not possible the locators should be revealed as shown in the figure.
5. Fool proofing should be insured so that the part will not fit only in the correct position.
6. Redundancy of locators should be avoided so that a movement is restricted only by one locator.

   Locators are part of jig and fixture that ensure that the work is located in proper position.

   Locators are design depending upon the shape and the requirements of the work.

Clamping

1. Clamps should help hold work piece rigidly to locating faces without distorting them in anyway. This requires application of holding forces at points where they will act against solid metal in the work piece. These components required particular attention if distortion is to be avoided.
2. Clamping should be simple quick and full proof.
3. Clamp should be designed to be operated by unskilled or at best semi-skilled operator who do not possess mechanical instincts to tighten clamps intelligently.

4. Clamping pressure should be directed parallel to the cutting operation. It should be directed towards the cutting operation.
5. Component parts of clamping system must be robust as far as possible made non detachable. The first part is obvious but sometimes clams are so thin that they band on application of clamping force. There is possibility of detachable parts of jigs to be misplaced.
6. The movement of clamp should be strictly limited and if possible should be guided.
7. Clamp should never be used for holding the work piece against the cutting force. Clamps should be arranged directly above the work piece supports otherwise distortion of work piece can occur.
8. A clamp should be designed to deliver the required clamping force with smallest force applied.

Q.4]a] What is meant by cutting tool signature? How do you express it in ORS and NRS system. Draw a neat labelled sketch to show it in the two successive along with the nomenclature. [10]

Ans: The geometry of a single point cutting tool with sometime specified in terms of the sequence numbers called **tool signature.**

- In this ASA system for example the tool signature may as 16-14-6-8-15-3
- The numbers in digital signature respectively denote the value of back rake angle (α_b), side rake angle (α_s), end relief angle (θ_c), end cutting edge angle (C_e), side cutting edge angle (C_s) and nose radius R (mm).
- In the ORS system the tool signature 0-10-6-6-8-75-1 represent respectively.

Inclined rake angle I = 0°

Orthogonal rake angle α = 10°

Side relief angle γ = 6°

End relief angle γ_1 = 6°

Auxiliary cutting angle ϕ_1 = 8°

Approach angle λ = 75°

Noise radius R = 1 mm

Tool geometry in orthogonal system of planes

- In the ASA system tool angles are specified without reference to the position of the cutting edge. This does not give any indication about the behavior of the tool in the practice.
- In specifying the actual cutting conditions, it is necessary to include principal cutting edge in the reference planes.

- The geometry of tool can be specified in another system of reference planes called the orthogonal rake system (ORS), international system.
- In this system shown in the figure have two angles are specified with reference to two three different planes as follows
  1. **The principal or cutting plane L :** It is the plane containing the principal cutting edge and perpendicular to the base of the tool.
  2. **Orthogonal plane :** Also called **chief plane.** This is the plane normal to the principal cutting edge.
  3. **Auxiliary reference plane M :** This is the plane normal to the projection of the end cutting edge on the basic plane.

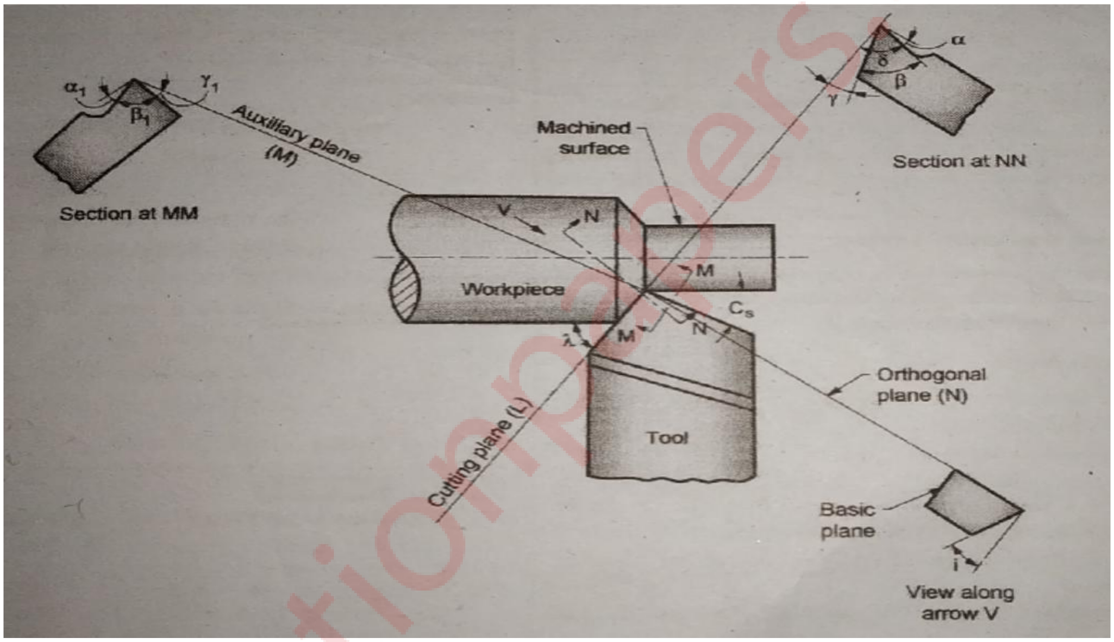


Fig 1 : Tool geometry orthogonal system of planes

Angles in orthogonal plane are

1. **Side relief angle γ :** It is the angle between the side flank and the cutting plane passing through the main cutting edge.
2. **Side rake angle α :** also known as orthogonal rake angle rectangle it is angle between the tool face and a plane normal to the cutting plane passing through the main cutting edge.this angle is positive in the face look downwards.
3. **Wedge angle β :** design girl between the tool face and the main flank.
4. **Cutting angle δ :** it is the angle between the tool face and the cutting plane.

5. **Inclination angle :** angle between the principal cutting edge and a line passing through the point of the tool parallel to the principal plane is called the inclination angle and corresponds to the black rake angle.

Angles in auxiliary plane

- Angle in the auxiliary reference plane include the end relief angle γ_1 Back rake angle α_1 (also called auxiliary rake angle) and the side wedge angle β_1.

Approach angle

- It varies from 30 to 70°
- The angles specified in the co-ordinate plane system are preferred bi workshop staff because they are more useful for manufacturing and resharpening of the tools.
- The angles in the two system of specification are related as given below
  These relations can be used for conversion between ASA and ORS system.

$$\tan\alpha = \tan\alpha_s \sin\lambda + \tan\alpha_b \cos\lambda$$

$$\tan i = \tan\alpha_b sin\lambda - \tan\alpha_s \cos\lambda$$

$$\tan\alpha_b = \cos\lambda \tan\alpha + \sin\lambda \tan i$$

$$\boldsymbol{\tan\alpha_s = \sin\lambda \tan\alpha - \cos\lambda \tan i}$$

Q.4]b] Describe the process of photo polymerization with a neat labelled sketch [10]

Ans :

- Photo polymerization processes make use of liquid, radiation curable resins, or photopolymers as their primary materials.
- Most photopolymers react to radiation in the ultraviolet (UV) range of wavelengths, but some visible light systems are used as well. Upon irradiation, these materials undergo a chemical reaction to become solid.
- This reaction is called photo polymerization, and is typically complex, involving many chemical participants.
- Photopolymers were developed in the late 1960s and soon became widely applied in several commercial areas, most notably the coating and printing industry.
- Many of the glossy coatings on paper and cardboard, for example, are photopolymers. Additionally, photo-curable resins are used in dentistry, such as for sealing the top surfaces of teeth to fill in deep grooves and prevent cavities.
- In these applications, coatings are cured by radiation that blankets the resin without the need for patterning either the material or the radiation. This changed with the introduction of stereo lithography.
- Most **photo polymerization** reactions are chain-growth polymerizations which are initiated by the absorption of visible or ultraviolet light.
- The light may be absorbed either directly by the reactant monomer, or else by a **photosensitizer** which absorbs the light and then transfers energy to the monomer.

- In general, only the initiation step differs from that of the ordinary thermal polymerization of the same monomer; subsequent propagation, termination and chain transfer steps are unchanged

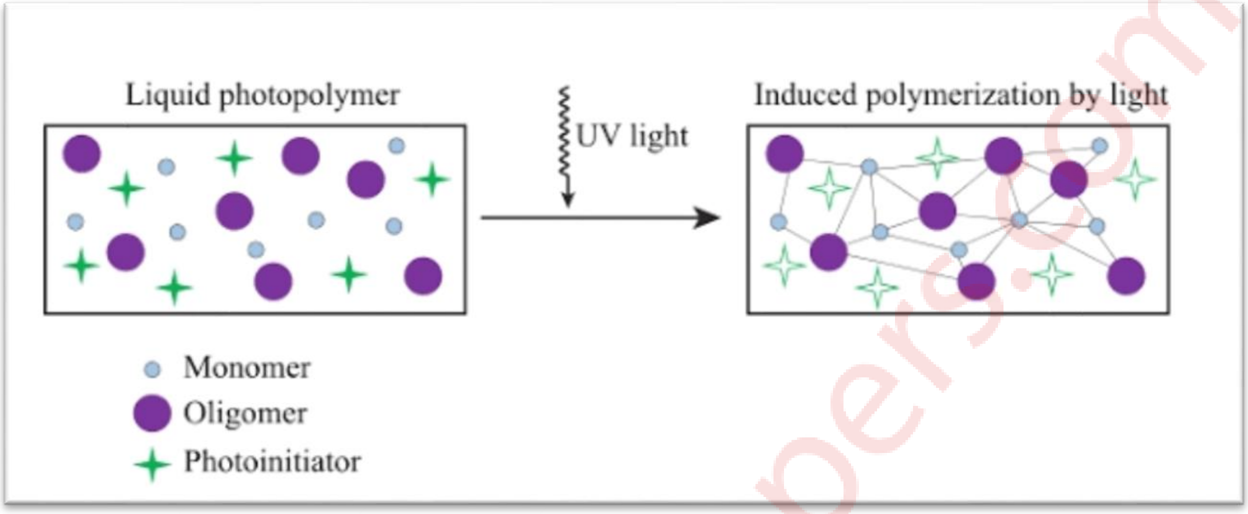


Fig 1 Photo polymerization

Application of photo polymerization

1. Photo polymerization can be used as a photographic or printing process, because polymerization only occurs in regions which have been exposed to light.
2. Unreacted monomer can be removed from unexposed regions, leaving a relief polymeric image.
3. Several forms of 3D printing including layer by layer stereolithographic and two-photon absorption 3D photo polymerization use photo polymerization.

Q.5]a] What are the parameters governing photo polymerization process. [10]

Ans : Following are the parameters governing photo polymerization

Introduction

- The use of additive manufacturing (AM) methods to create parts and products beyond the abilities of traditional subtractive or molding manufacturing methods has grown rapidly in recent years. AM, or 3D printing, holds the promise of nearly unlimited design and creation flexibility using either metal or soft material-based AM processes.
- This has led to broad-based implementation of the various processes to create objects from consumer level trinkets to medical devices to in-service parts for automotive and aerospace applications.

- However, continued movement from proof-of-concept design evaluation applications (i.e., rapid prototyping) toward truly functional prototypes and volume production of reliable parts requires a more robust and rigorous investigation of starting material properties and the process parameters that impact final part quality.

Materials and methods

- Commercially available photopolymer resins were obtained from several suppliers VeroWhitePlus (RGD835), TangoBlackPlus (FLX980), and VeroClear (RGD810) were obtained from Stratasys Ltd.
- To create discrete structures for measuring resin cure parameters a series of masks with openings of various sizes and shapes were 3D printed using a Objet Connex500 printer.
- The masks were made from a printer-defined mixture of TangoBlackPlus and VeroWhitePlus resins that produced a rigid opaque part.
- For this study the printed mask consisted of a single 3 mm × 3 mm square opening in a 1 mm thick mask.
  The liquid photopolymer resin was contained in a well (52 mm (L) × 18 mm (W) × 2 mm (D)), made from the same material as the mask, within a larger structure that supported a glass slide at the same level as the surface of the resin.

Results and discussion

- Continued development of additive manufacturing methods based on photo curing of photosensitive resins will benefit from the availability of more detailed information about the characteristics of the starting materials and its influence on the printing process.
- The methodology reported here allows for a systematic approach to obtaining two such critical parameters, D_p and E_c, from working curves based on accurate measurement of C_d for UV cured resins.
- The results indicate caution should be exercised when using contact-based methods like calipers or micrometers to determine C_d, especially for soft elastomeric materials.
- The D_p and E_c values determined for five commercial resins showed a wide range of values that, when provided to designers and/or operators of 3D printers, may allow for improved printer performance through optimization of curing and stage movement parameters.

Q.5]b] What is meant by tool life equation? How it is useful? [10]

Ans : Tool life may be defined as the effective time interval between resharpening of a tool.

- **Cutting speed**
  Cutting speed is the most important variable affecting to life. It has been shown that to life decreases with cutting speed according to the relation known as Taylor tool life equation.

  V = cutting speed m/s
  T= tool life min

n = exponent whose value many depends on the tool for the very slightly with other machine variables

C = a constant whose value depends upon the work material and other variables.

Numerically c is equal to the cutting speed in m/s which will give way to life of 1 minute.

- The value of exponent and can be e obtained by plotting equation 1 on a log plot as shown in the figure.

$$n = \tan\emptyset = \frac{p}{q} = \frac{(\ \log v_1 - \log v_2)}{(\log t_2 - \log\ t_1)}$$

- The average value of n four common tool material is high speed steel 0.1 to 0.15 carbides 0.2 to 0.5 and ceramics 0.6 to 1.0

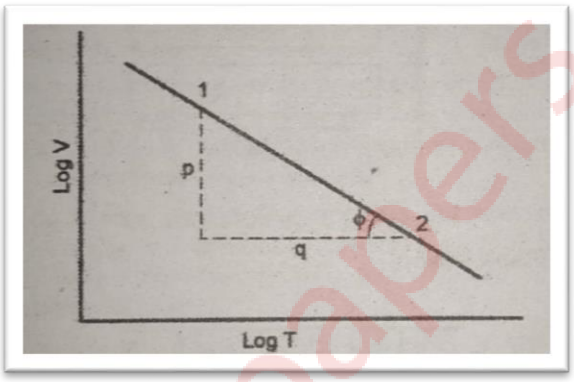


Fig 1 Tool life as a function of cutting speed

2. **Feed and depth of cut**
    - Another tool life equation that has been suggested involves feed and depth of cut in addition to cutting speed V.

$$VT^{N}F^{N_1}d^{N_2} = k$$

    - The values of coefficient n four feed and n for depth of cut very from 0.06 to 0.34 and 0.10 to 0.12 respectively.

3. **Tool material**
    - Tool material that can withstand high cutting temperature without losing their mechanical properties and geometry will have life.
    - High hardness give good wear resistance to the tool but reduces its toughness for shock resistance.
    - Material having higher thermal shock resistance, high thermal conductivity and low coefficient of thermal expansion need to higher tool life.
4. **Tool geometry**
    - Tool life is influenced by the geometry of the tool in following ways
    - Increase in positive rake angle reduces cutting forces and heat generation leading to increase tool life.
    - But increasing the rectangle inversely of its strength of the tool and uses the area of heat conduction leading to possibility of early tool failure.

- Relief or clearance angle prevent rubbing of the tool flank against the work and hence help increases tool life. Again larger angles mechanical weakens the tool.
- Tool life is also similarly affected by cutting edge angle

5. **Work material**
   - Hard work materials lead to higher power consumption and tool wear and hence shorter tool life.
   - Impurities or hard constitutes in the work material increases tool wear.
   - Scales and oxide layers present on the work material are highly abrasive and have adverse effect on tool life.
6. **Nature of cut**
   - Intermediate cutting leads to reduced tool life compared to continuous cutting.
   - Shock loading due to continuous work surface or hard spots leads to reduction in tool life.

Q.6]a] Geometry of a broach **[5]**

Ans :

1. The important features of an internal pull type broach are shown in the figure.
2. General considerations in design of various elements of broach discuss below.

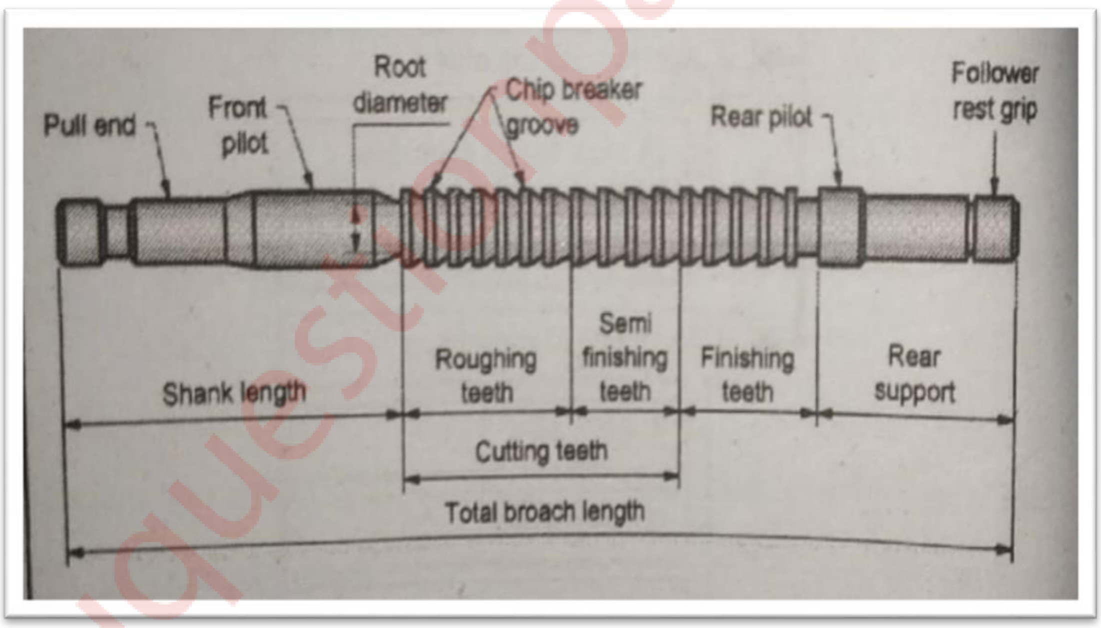


Fig 1 Internal pull type broach

- **Root diameter:** The root diameter of the minimum size of the browser is determined by the force required to pull or push the broach.
  This size occurs at the root of the first tooth or Shank at the pool end.
  This root diameter of the brooch must be capable of which standing the broaching for in tension or in compression and buckling as the case may be
- **Pitch:** The pitch of the teeth is one of the very important design feature of the broach.

it determines the length of the broach and the number of teeth simultaneously in contact with the work piece.
It also decides the construction and the size of the teeth and ability of the broach to hold is alignment during the cutting stroke

- **Chip space:** In any broaching operations it is the grounds to distinguish throughout the chip form is trapped and cannot escape till the tooth leaves a work piece.
The space provided between the teeth should therefore large enough to accommodate the chips form without cramping or crowding them.
Properly designed chips space will make the chip to curl and roll up while a faulty design or inadequate space will break the chip which may scratch the job and increase the frictional resistance.

Q.6]b] Laser beam machining. **[5]**

Ans :

Construction and working

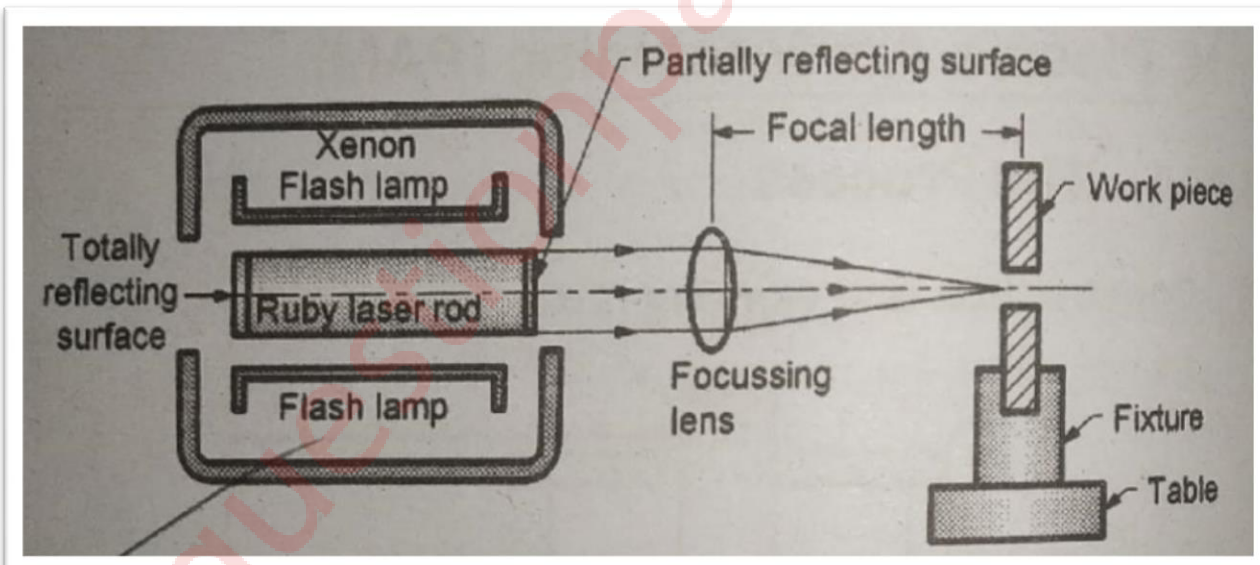


Fig 1 schematic diagram for laser beam drilling setup

- The schematic diagram for laser beam drilling setup is shown in the figure.
- The lasing material is in the form of a rod with the end faces made parallel to each other within 1/20 of the wavelength.
- One of the end of the rod is made totally reflective while the other end is only partially reflective.
- The number of flash lamps are placed around the laser rod for pumping it into the excited state.

Principal

- The action of the laser is based on the following well known principle
  If an atom or molecule of living material is raised to higher energy level by an outside source like light it or chemical reaction it does not permanently remain at that state. Sooner or later decay's back to its stable low energy level releasing a photon of light
- The frequency of emitted light depends upon the difference in energy level $E_1 - E_2$ and Planck's constant. If the photon of light so released come into contact with another atom or molecule that has been similarly raised to higher energy level II atom or molecule is triggered to return its stable energy level releasing another photon of light.
- The two photons generated are identical in wavelength phase direction.
- The sequence of triggering is multiplied manifold to produce the laser beam.
- The figure 1 when the ruby crystal consisting of aluminum oxide in to win 0.05% chromium has been introduced is pumped into the excited state by the series of xenon flash surrounding it, chromium items are raised to the higher energy level releasing a stream of photons when they fall back to the stable low energy level.
- When the light is reflected from the in mirrors with triggers more atoms to the ground state leading to a chain reaction of stimulated radiation.
- Some of off the light escaping from partially reflecting mirror on the right constitutes the laser beam.
- Because off mono chromatic nature this light can be easily focused and concentrated with the lengths to a very small diameter spot with a high intensity.

Q.6]c] Types of dynamometer used in machine tools [5]

Ans : Schematic diagram for two dimensional mechanical tool force dynamometer is given in the fig 1

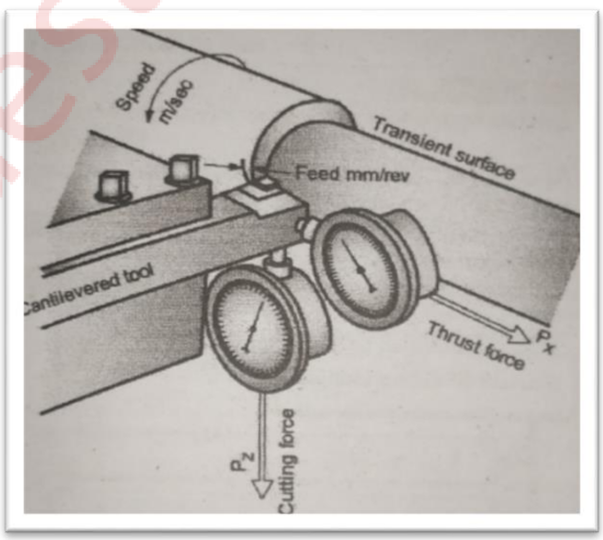


Fig 1 schematic diagram of a mechanical tool for dynamometer

- It uses two sensitive Dial indicators contact in two mutually perpendicular surfaces of the tool to measure deflection of the tool due to cutting and thrust forces on the tool.
- A lever system can be utilized to magnify the deflection for increasing the sensitivity of the dynamometer.

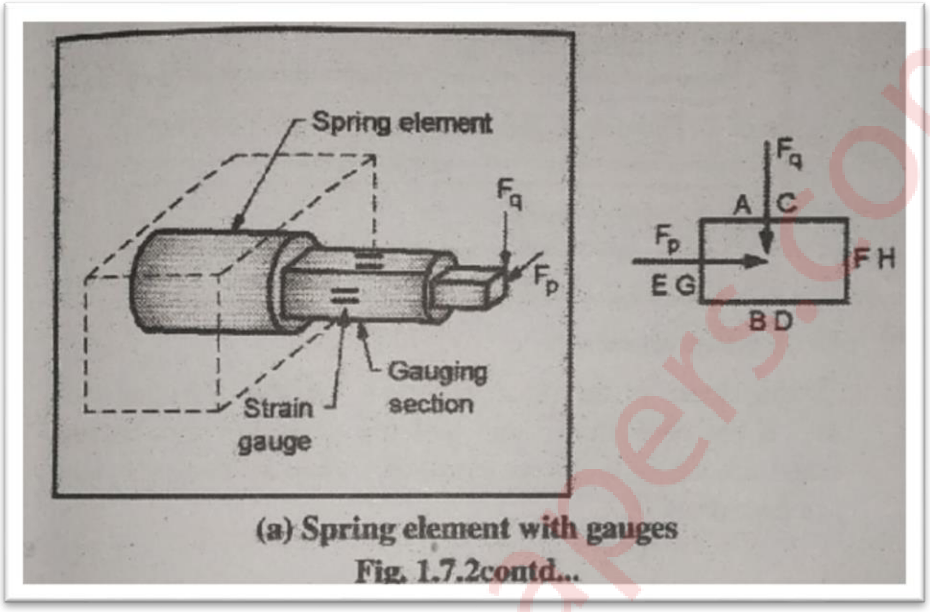


Fig 2 spring element with gauges

- The basic principle of strain gauge type dynamometer is shown in the figure 2.
- The spring element in this case is a circular rod which carries the tool.
- Strain gauges are mounted on to flat surface is machined on the rod the strain gauges given output EMF corresponding to the tool forces.

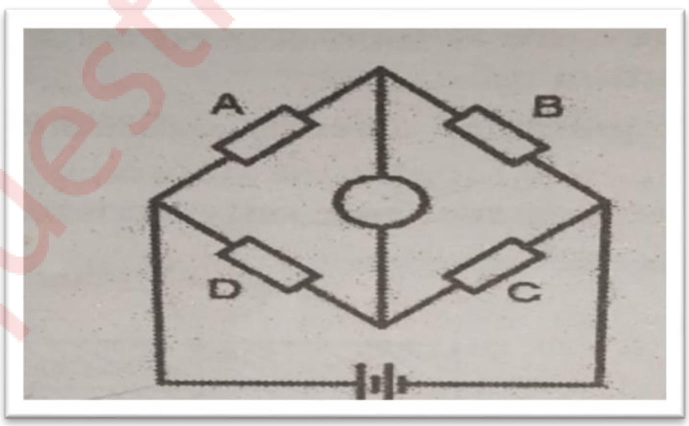


Fig 3 strain gauge connection for vertical force

- The gauges are connected in four arms of Wheatstone bridge as shown in the figure 3.
- The map from the bridge can be measured with the help of an oscilloscope or a recorder and calibrated to directly give the value of the forces in the corresponding direction.

- Strain gauge type dynamometer are more sensitive.

Q.6]d] Use of locators in designing jigs And fixtures. [5]

Ans :

Locating devices are usually made of casehardened steel and separate from the jig or fixture; accurately ground and accurately positioned in the jig or fixture body.

The typical locating devices used for jigs and fixtures are:

- Locating buttons.
- Adjustable locators.
- Conical locators
- Diamond and pin locators
- Locating pins

In jig and fixture design, it is not always possible to clamp the work directly to either the base or one of the walls of the fixtures,

e.g., the surface may not be machined at those places where it is most convenient to effect the clamping

Further the presence of chips between the mating surfaces can cause misalignment. Further if the locating faces are inclined at more than 90° then the misalignment error will be more than the thickness of the chip adhering between the inclined surfaces.

In such cases, when the reamed or finely finished holes are available, locating pins may be used for positioning purposes.

In the locating pins, the location diameter is made a push fit with the hole with which it engages.

Q.6]e] Requirements of a milling fixture. [5]

Ans :

Essentials of Milling Fixtures:

Base

A heavy base is the most important element of a milling fixture. It is a plate with a flat and smooth under face.

The complete fixture is built up from this plate. Keys are provided on the under face of the plate which are used for easy and accurate aligning of the fixture on the milling machine table.

By inserting them into one the T slot in the table.

These keys are usually set in keyways on the under face of the plate and are held in place by a socket head cap screw for end key.

Setting blocks

After the fixture has been securely clamped to the machine table, the work piece which is correctly located in the fixture , has to be set in correct relationship to the cutters.

This is achieved by the use of setting blocks and feeler gauges. The setting blocks is fixed to the fixture.

Feeler gauges are placed between the cutter and reference planes on the setting block so that the correct depth of the cut and correct lateral setting is obtained.

The block is made of hardened steel and with the reference planes (feeler surfaces) grooved

Locating and clamping elements

The same design principles of location and clamping apply for milling fixtures have been discussed above