LABORATORY MANUAL

II Year B. Tech II- Semester

Academic Year: 2022-23

MECHANICAL ENGINEERING

MATERIALS TESTING & MANUFACTURING PROCESSES LAB

R20A0383

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

DEPARTMENT OF MECHANICAL ENGINEERING

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MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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DEPARTMENT OF MECHANICAL ENGINEERING

B. Tech LAB TIME TABLE

YEAR:II SEMESTER:II NAME OF THE LAB: MATERIALS TESTING AND MANUFACTURING PROCESS LAB

Day/ Period	**1** 9.20 AM – 10.20AM	**2** 10.20 AM – 11.10AM	**3** 11.10 AM – 12.00 PM	**4** 12.00 PM – 12.50 PM	12.50 PM 01.30 PM	**5** 1.30 PM – 2.20 PM	**6** 2.20 PM – 3.10 PM	**7** 3.10 PM – 3.50 PM
MON					**L U N C H**			
TUE								
WED								
THU								
FRI								
SAT								

LAB FACULTY :

TECHNICIAN (S) :

MALLA REDDY COLLEGE OF ENGINEERING & TECHNOLOGY

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Department of Mechanical Engineering

VISION

- To Become An Innovative Knowledge Center In Mechanical Engineering Through State Of The Art Teaching –Learning And Research Practices, Promoting Creative Thinking Professionals.

MISSION

- The Department Of Mechanical Engineering Is Dedicated For Transforming The Students Into Highly Competent Mechanical Engineers to meet the needs of the industry, by strongly focusing in the fundamentals of engineering sciences for achieving excellent results in their professional pursuits.

QUALITY POLICY

- To Pursuit Global Standards Of Excellence In All Our Endeavors Namely Teaching, Research And Continuing Educations And To Remain Accountable In Our Core And Support Functions, Through Processes Of Self-Evaluation And Continuous Improvement.

- To Create A Midst of Excellence For Imparting State Of Art Education, Industry-Oriented Training Research In The Field Of Technical Education.

MALLA REDDY COLLEGE OF ENGINEERING AND TECHNOLOGY

II Year B.Tech. ME- II Sem L/T/P/C -/-/3/1.5

(R20A0383) MATERIALS TESTING & MANUFACTURING PROCESSES LAB

COURSE OBJECTIVES:

1. To understand the composition and metallurgical properties of metals based on theirmicrostructures.
2. To understand the mechanical properties of a material.
3. To know about the casting of different materials.
4. To study and practice different joining & forming processes.
5. To understand the drawing operation for different materials.

LIST OF EXPERIMENTS:

1. To the study of Microstructure of Ferrous Materials.
2. To the study of Microstructure of Non-Ferrous Materials.
3. To determine the Tensile Strength & Impact strength of a material using UTM.
4. To study the Vickers and Rockwell hardness of a specimen.
5. To prepare a pattern for designing a sand mould.
6. To prepare joints using arc, spot and Plasma Welding.
7. To perform joining and cutting using gas welding.
8. To perform blanking and piercing operation.
9. To prepare a product using Injection moulding/ blow moulding machine.
10. To manufacture components using 3D printing.

NOTE: Minimum a total of 8 experiments are to be conducted

COURSE OUTCOMES:

1. Students will be able to understand the micro structures of different materials.
2. The student will be able to understand mechanical properties of materials.
3. Students will be able deliver the concepts casting of metals.
4. Students can prepare a joint using various welding operations.
5. Students will be able to learn the molding process of plastic materials.

EXP:1 STUDY THE MICRO STRUCTURES OF PURE METALS LIKE IRON, AL, CU

Aim: Observation of microstructure of Aluminium specimen under metallurgic microscope.

Apparatus:

- Sample Specimen ,
- Belt Grinder
- Sand paper (80,150,180, 220, 400, 600),
- Emery Paper(1/0, 3/0, 4/0, grade),
- Disc polisher machine
- Etchant
- Drier
- Metallurgical Microscope

Etchants:30ml distilled water +5ml nitric acid+HF2.3 ml

Theory:

Aluminium is a chemical element in the boron group with symbol Al and atomic number 13. It is a silvery white, soft, nonmagnetic, ductile metal. Aluminium is the third most abundant element (after oxygen and silicon), and the most abundant metal in the Earth's crust. It makes up about 8% by weight of the crust, though it is less common in the mantle below. Aluminium metal is so chemically reactive that native specimens are rare and limited to extreme reducing environments. Instead, it is found combined in over 270 different minerals. The chief ore of aluminum is bauxite..

Procedure:

1. Cut the specimen into required shape by using cutoff machine.
2. The mounted specimen surface is ground until unevenness of surface is eliminated using Belt Grinder
3. Then polish the specimen again by using sand papers (80,150,180, 220, 400, 600, grade), and emery papers (1/0, 3/0, 4/0, grade).
4. Fine Polishing is done on a disc Polisher (Rotating Polishing Wheel), the wheel is fitted with a Polishing cloth and suspension of fine alumina powder in water used as apolishing medium.
5. A Scratch free surface is obtained after fine polishing for sufficient period (15minutes).
6. After fine polishing specimen is thoroughly washed with water and dried.
7. Observe the micro-structure of specimen under microscope and note it down.
8. Apply approximate etchant to the specimen and avoid under or over etching.

Precautions:

- Grinding should be done on the emery papers only in one direction
- While polishing the specimen uniform pressure should be exerted on the specimen
- While going to the next grade of emery papers, the specimen has to be rotated through90^0

Result:

Aim: Observation of microstructure of Copper specimen under metallurgic microscope.

Apparatus:

- Sample Specimen ,
- Belt Grinder
- Sand paper (80,150,180, 220, 400, 600),
- Emery Paper(1/0, 3/0, 4/0, grade),
- Disc polisher machine
- Etchant
- Drier

Etchants: 30ml distilled water 2% + nitric acid(12 to 30%)

Theory:

Copper is a chemical element with symbol Cu (from Latin: cuprum) and atomic number 29. It is a ductile metal with very high thermal and electrical conductivity. Pure copper is soft and malleable; a freshly exposed surface has a reddish-orange color. It is used as a conductor of heat and electricity, a building material, and a constituent of various metal alloys. The metal and its alloys have been used for thousands of years. In the Roman era, copper was principally mined on Cyprus. Architectural structures built with copper corrode to give green verdigris (or patina). Art prominently features copper, both by itself and as part of pigments.

Procedure:

1. Cut the specimen into required shape by using cutoff machine.
2. The mounted specimen surface is ground until unevenness of surface is eliminated using Belt Grinder.
3. Then polish the specimen again by using sand papers (80,150,180, 220, 400, 600, grade), and emery papers (1/0, 3/0, 4/0, grade).
4. Fine Polishing is done on a disc Polisher (Rotating Polishing Wheel), the wheel is fitted with a Polishing cloth and suspension of fine alumina powder in water used as a polishing medium.
5. A Scratch free surface is obtained after fine polishing for sufficient period (15minutes).
6. After fine polishing specimen is thoroughly washed with water and dried.
7. Observe the micro-structure of specimen under microscope and note it down.

Precautions:

- Grinding should be done on the emery papers only in one direction
- While polishing the specimen uniform pressure should be exerted on the specimen
- While going to the next grade of emery papers, the specimen has to be rotated through90^0
- While switching over to new emery paper, specimen should be thoroughly washed.

Result:

EXP: 2 STUDY OF THE MICROSTRUCTURE OF CAST IRONS.

Aim: Observation of microstructure of **Grey Cast Iron** specimen under metallurgic microscope.

Apparatus:

- Sample Specimen,Belt Grinder
- Sand paper (80,150,180, 220, 400, 600),
- Emery Paper(1/0, 3/0, 4/0, grade),
- Disc polisher machine
- Etchant, Metallurgical Microscope

Sample: Grey Cast Iron

Etchants: 3%Nital

Theory:

Gray iron, or grey cast iron, is a type of cast iron that has a graphitic microstructure. It is named after the graycolor of the fracture it forms, which is due to the presence of graphite. It is the most common cast iron and the most widely used cast material based on weight.

It is used for housings where the stiffness of the component is more important than its tensile strength, such as internal combustion engine cylinder blocks, pump housings, valve bodies, electrical boxes, and decorative castings. Grey cast iron's high thermal conductivity and specific heat capacity are often exploited to make cast iron cookware and disc brake rotors.

Procedure:

1. Cut the specimen into required shape by using cutoff machine.
2. The mounted specimen surface is ground until unevenness of surface is eliminated using Belt Grinder
3. Then polish the specimen again by using sand papers (80,150,180, 220, 400, 600, grade), and emery papers (1/0, 3/0, 4/0, grade).
4. Fine Polishing is done on a disc Polisher (Rotating Polishing Wheel), thewheel is fitted with a Polishing cloth and suspension of fine alumina powder inwater used as a polishing medium.
5. A Scratch free surface is obtained after fine polishing for sufficient period (15minutes).
6. After fine polishing specimen is thoroughly washed with water and dried.
7. Observe the micro-structure of specimen under microscope and note it down.
8. Apply approximate etchant to the specimen and avoid under or over etching.
9. Observe the micro scope structure and note it down.

Precautions:

- Grinding should be done on the emery papers only in one direction
- While polishing the specimen uniform pressure should be exerted on the specimen
- While going to the next grade of emery papers, the specimen has to be rotated through 90^0
- While switching over to new emery paper, specimen should be thoroughly washed with water to remove all loose particles.

Result:

EXP:3 TO DETERMINE THE TENSILE STRENGTH & IMPACT STRENGTH OF A MATERIAL USING UTM.

AIM: To Determine tensile Strength of a given specimen using UTM.

OBJECT: To conduct a tensile test on a mild steel specimen and determine the following:

(i) Limit of proportionality

(ii) (ii) Elastic limit

(iii) (iii) Yield strength

(iv) (iv) Ultimate strength

(v) (v) Young's modulus of elasticity

(vi) (vi) Percentage elongation

(vii) (vii) Percentage reduction in area.

APPARATUS:

(i) Universal Testing Machine (UTM)

(ii) (ii) Mild steel specimens

(iii) (iii) Graph paper

(iv) (iv) Scale

(v) (v) Vernier Caliper

THEORY:

The tensile test is most applied one, of all mechanical tests. In this test ends of test piece are fixed into grips connected to a straining device and to a load measuring device. If the applied load is small enough, the deformation of any solid body is entirely elastic. An elastically deformed solid will return to its original form as soon as load is removed. However, if the load is too large, the material can be deformed permanently. The initial part of the tension curve which is recoverable immediately after unloading is termed. As elastic and the rest of the curve which represents the manner in which solid undergoes plastic deformation is termed plastic. The stress below which the deformations essentially entirely elastic is known as the yield strength of material. In some material the onset of plastic deformation is denoted by a sudden drop in load indicating both an upper and a lower yield point. However, some materials do not exhibit a sharp yield point. During plastic deformation, at larger extensions strain hardening cannot compensate for the decrease in section and thus the load passes through a maximum and then begins to decrease. This stage the “ultimate strength”’ which is defined as the ratio of the load on the specimen to original cross- sectional area, reaches a maximum value. Further loading will eventually cause ‘neck’ formation and rupture.

ABOUT OF UTM

The tensile test is conducted on UTM. It is hydraulically operates a pump, oil in oil sump, load dial indicator and central buttons. The left has upper, middle and lower cross heads i.e; specimen grips (or jaws). Idle cross head can be moved up and down for adjustment. The pipes connecting the lift and right parts are oil pipes through which the pumped oil under pressure flows on left parts to more the cross-heads.

SPECIFICATIONS:

1. Load capacity = 0-40 Tones.
2. Least count = 8 kgf.
3. Overall dimension. =
4. Power supply = 440 V

PROCEDURE:

1. Measure the original length and diameter of the specimen. The length may either be length of gauge section which is marked on the specimen with a preset punch or the total length of the specimen
2. Insert the specimen into grips of the test machine and attach strain-measuring device to it
3. Begin the load application and record load versus elongation data.
4. Take readings more frequently as yield point is approached.
5. Measure elongation values with the help of dividers and a ruler.
6. Continue the test till Fracture occurs.
7. By joining the two broken halves of the specimen together, measure the final length and diameter of specimen.

OBSEVATION:

(a) Initial diameter of specimen d1 =
(b) Initial gauge length of specimen L1 =
(c) Initial cross-section area of specimen A1 =
(d) Load of yield point F_t =
(e) Ultimate load after specimen breaking F =
(f) Final length after specimen breaking L_2 =
(g) Diameter of specimen at breaking place d2 =
(h) Cross section area at breaking place A2 =

OBESERVATION TABLE:

S.No	**Load (N)**	**Original Gauge Length**	**Extension(mm)**	**Stress (N/mm2)**	**Strain**

CALCULATION:

- Ultimate tensile strength = ... $\frac{N}{mm^2}$
- Elastic limit = $\frac{Load\ at\ elastic\ limit}{original\ area\ of\ cros\ s\ section}$ = ... $\frac{N}{mm^2}$
- (iii) Modulus of Elasticity (E) = $\frac{stress\ below\ proportional\ limit}{corrsponding\ strain}$ =............... $\frac{N}{mm^2}$
- (iv) Yield Strength = $\frac{yield\ \ load}{original\ cross\ sectional\ area}$ =............... $\frac{N}{mm^2}$
- % Reduction in area = $\frac{A_f - A_i}{A_i} \times 100$ =.................... %
- Percentage of elongation = $\frac{l_i - l_f}{l_f} \times 100$ =.................... %

$$\frac{Load\ at\ limit\ of\ proprtionality}{original\ cross\ sectional\ area}$$

- Stress = $\sigma = \frac{Load}{Area} = \frac{P}{A}$ .... $\frac{N}{mm^2}$

- Strain = c = $\frac{change\ in\ length}{original\ length}$ = ...

PRECAUTIONS:

1. The specimen should be prepared in proper dimensions.
2. The specimen should be properly to get between the jaws.
3. Take reading carefully.
4. After breaking specimen stop to m/c.

RESULT:

(i) Average Breaking Stress =

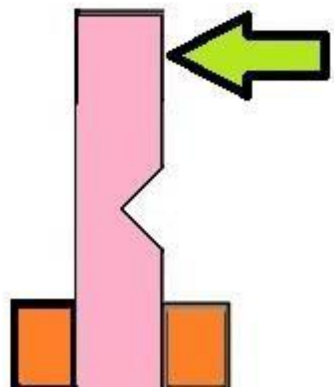
(ii) Ultimate Stress =

(iii) Average % Elongation =

AIM: To determine the Impact strength (Specific impact factor) through Izod test.

APARATUS: Impact testing machine, MS Specimen

DIAGRAM:



PROCEDURE:

1. For conducting charpy test, a proper striker is to be fitted firmly to the bottom of thehammer with the help of the clamming piece.

2. The latching take for charpy test is to be firmly fitted to the bearing housing at theside of the columns.

3. The frictional loss of the machine can be determined by free fall test, raise the hammer by hands and latch in release the hammer by operating lever the pointer will then indicate the energy loss due to friction. From this reading confirm that the friction loss not exceeding 0.5% of the initial potential energy. Otherwise frictional loss has to be added to the final reading.

4. The specimen for izod test is firmly fitted in the specimen support with the help of clamping screw and élan key. Care should be taken that the notch on the specimen shouldface to pendulum striker.

5. After ascertaining that there is no person in the range of swinging pendulum, release them pendulum to smash the specimen.

6. Carefully operate the pendulum brake when returning after one swing to stop the oscillations.

7. Read-off position of reading pointer on dial and note indicated value.

8. Remove the broken specimen by loosening the clamping screw.

The notch impact strength depends largely on the shape of the specimen and the notch. the values determined with other specimens therefore may not be compared with each other.

TABLE:

S.NO	Area of cross section specimen (A)	Impact Energy (K)	I (Impact strength)

	Charpy Impact Testing	Izod Impact Testing
Materials Tested	Metals	Plastics & Metals
Types of Notches	U-notch and V-notch	V-notch only
Position of the Specimen	Horizontally, notch facing away from the pendulum	Vertically, notch facing toward the pendulum
Striking Point	Middle of the sample	Upper Tip of the sample
Common Specimen Dimensions	55 x 10 x 10 mm	64 x 12.7 x 3.2 mm (plastic) or 127 x 11.43 mm round bar (metal)
Common Specifications	ASTM E23, ISO 148, or EN 10045-1	ASTM D256, ASTM E23, and ISO 180

PRECAUTIONS:

1. Measure the dimensions of the specimen carefully.
2. Locate the specimen in such a way that the hammer. Strikes it at the middle.
3. Note down readings carefully.

RESULT:

The Impact strength of the given specimen is-------------- $\frac{J}{m^2}$

VIVA QUESTIONS:

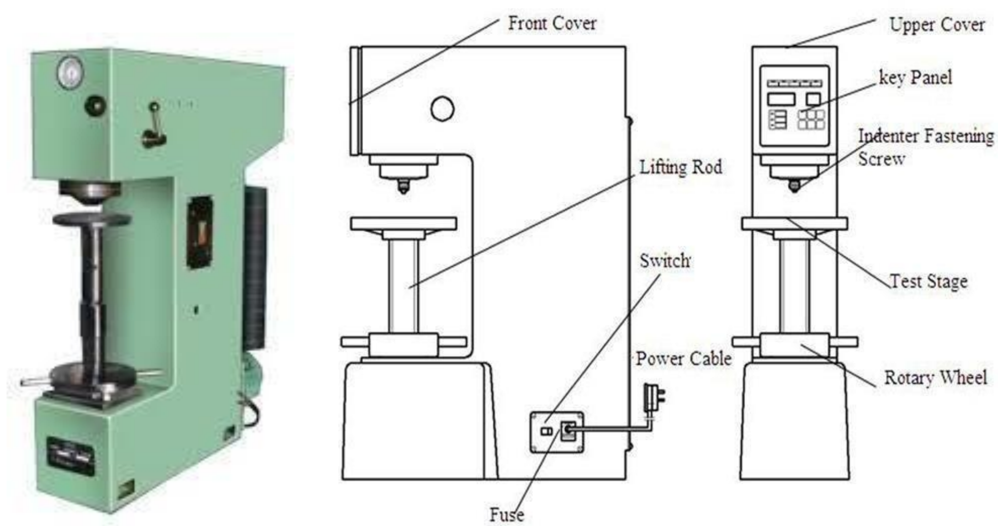
1. In what way the values of impact energy will be influenced if the impact tests are conductedon two specimens, one having smooth surface and the other having scratches on the surface
2. What is the effect of temp? On the values of rupture energy and notch impact strength?
3. What is resilience? How is it different from proof resilience and toughness?
4. What is the necessity of making a notch in impact test specimen?
5. If the sharpness of V-notch is more in one specimen than the other, what will be its effect onthe test result ?

EXP: 4 TO STUDY THE BRINELL AND ROCKWELL HARDNESS OF A SPECIMEN.

AIM: To determine the hardness of the given specimen using Brinell hardness test.

APPARATUS: Brinell hardness testing machine, Aluminum specimen, Ball indenter.

DIAGRAM:



THEORY:

In Brinell hardness test, a steel ball of diameter (D) is forced under a load (F) on to a surface of testspecimen. Mean diameter (d) of indentation is measured after the removal of the load (F).

Its specifications as follows:

1. Ability to determine hardness up to 500BHN.
2. Diameter of ball (as indenter) used D= 2.5mm, 5mm, 10mm.
3. Maximum application load= 3000kgf

.4. Method of load application= Lever type

5. Capability of testing the lower hardness range= 1BHNonapplicationof0.5D2load.

PROCEDURE:

1. Insert ball of diameter 'D' in the ball holder of machine.
2. Make the specimen surface clean by oil, grease, dust etc.
3. Make contact between the specimen surface and ball using jack adjusting wheel.

4. Pull the load release level and wait for 15 seconds.
5. Remove the specimen from the support table and locate the Indentation.
6. View the indentation through microscope and measure the diameter ‘d’ of the indentation usingmicrometer fixed on the microscope.
7. Repeat the procedure and take three readings.

OBSERVATIONS:

Test piece material =

Diameter of the ball D =

Load section F/D^2Test load =

Load application time =

=

Least count of Brinell Microscope =

S.NO	Ball Diameter D in mm	Load applied F in kgf		Diameter of indentation	$\frac{P}{D^2}$	

$$\textbf{BHN}= \frac{Load\ Applied\ (kgf)}{sperical\ surface\ area\ of\ indentation}$$

$$\textbf{BHN}= \frac{2P}{\pi D(D-\sqrt{(D^2-d^2})}$$

PRECAUTION:

1. Make sure that beam and load placed a proper position.
2. The cross- section of the beam should be large.
3. Note down the readings more carefully

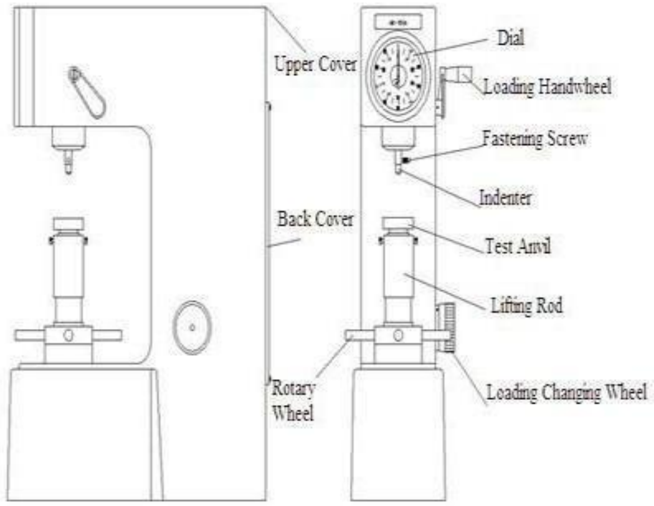
RESULT:

AIM: To determine the hardness of the given Specimen using Rockwell hardness test.

APPARATUS: Rockwell hardness testing machine,

MATERIAL: soft and hard mild steel specimens, brass, Aluminum etc., Black diamond cone indenter.

DIAGRAM:



THEORY:

Rockwell test is developed by the Wilson instrument co U.S.A in 1920. This test is an indentation test used for smaller specimens and harder materials. The test is subject of IS: 1586. The hardness of a material is resistance to penetration under a localized pressure or resistance to abrasion. Hardness tests provide an accurate, rapid and economical way of determining the resistance of materials to deformation.

There are three general types of hardness measurements depending upon the manner in which the test is conducted:

a. Scratch hardness measurement,

b. Rebound hardness measurement

c. Indention hardness measurement.

In scratch hardness method the material are rated on their ability to scratch one another and it is usually used by mineralogists only. In rebound hardness measurement, a standard body is usually dropped on to the material surface and the hardness is measured in terms of the height of its rebound .The general means of judging the hardness is measuring the resistance of a material to indentation. The indenters usually a ball cone or pyramid of a material much harder than that being used. Hardened steel, sintered tungsten carbide or diamond indenters are generally used in

PROCEDURE:

1. Examine hardness testing machine (fig.1)
2. Place the specimen on platform of a machine. Using the elevating screw raise the platform and bring the specimen just in contact with the ball. Apply an initial load until the small pointer shows red mark.
3. Release the operating valve to apply additional load. Immediately after the additional load applied, bring back operating valve to its position.
4. Read the position of the pointer on the C scale, which gives the hardness number.
5. Repeat the procedure five times on the specimen selecting different points for indentation.

OBSERVATION TABLE:

S.NO	**Specimens**	**Reading (HRC/)**			**Mean**	
		1	2	3		
1	Mild Steel				HRB =	
2	High Carbon steel				HRC =	
3	Brass				HRB =	
4	Aluminum				HRB =	

PRECAUTIONS:

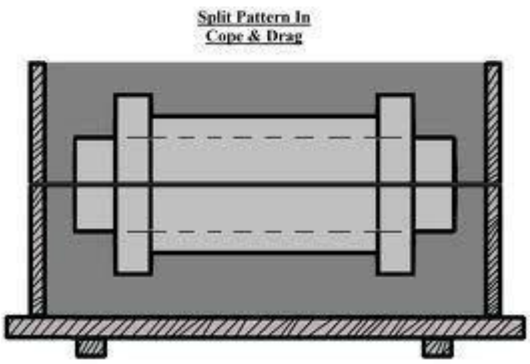
1. The specimen should be clean properly
2. Take reading more carefully and

RESULT:

EXP:5 TO PREPARE A PATTERN FOR DESIGNING A SAND MOULD.

Aim: To prepare a split wooden pattern detailed below with allowance.

Tools Equipment & Material: Steel rule, outside caliper, Mortise Chisel, inside chisel, peering chisel, Firmer Chisel, Wood rasp half round file, outside gauge, outside chisel, Try square, Handsaw, Mallet, Sandpapers, Teak Wood given size



Procedure: Match the two rectangular wood pieces of stock and fix them together by wood screws at either end in the excess portion of wood. This must give a firm clamping of the wood pieces to turn intosingle piece.

In body portion of the pattern mark a center link using marking gauge and extend it to the dressed end. Using the race with counter sunk make indentations at the center of each and to form locations for the head stock and tail stock center.

The wood stock is turned on the wood turning lathe using appropriate gauge and finally finished the dimensions.

Sanding paper No. ½ or No.0 does smooth finishing

The sand paper should be moved laterally on the rotating work.

PRECAUTIONS:

1. The tools are kept sharp to cut freely without burning and also without much pressure to cause chipping.
2. Maintain proper turning angles.
3. Be alert to avoid accidents.

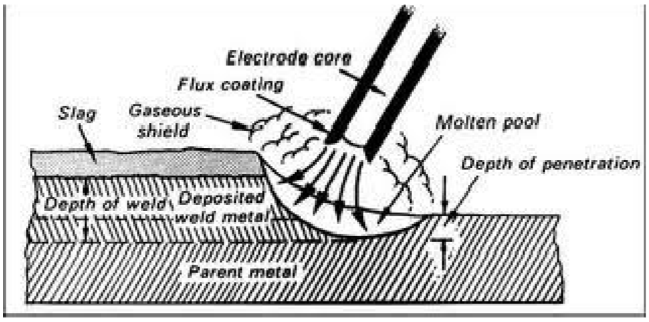
Result: The Required Split pattern is prepared

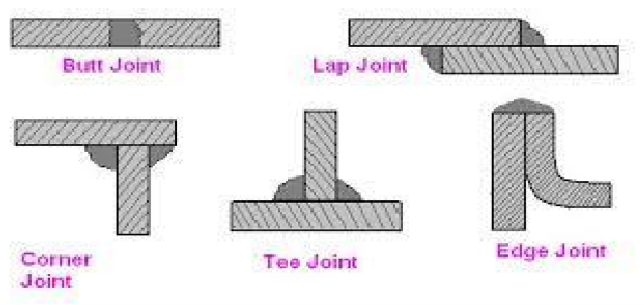
EXP: 6 TO PREPARE JOINTS USING ARC, SPOT AND PLASMA WELDING.

Aim: To prepare a butt joint with the specimens by Arc Welding.

Equipment and Material Required: D.C Welding machine, Bench vice, Tensile testing machine, M.S. Plates of 100x50x5(2), Metallurgical microscope.

Tools Required: Hack saw, Chipping hammer, wire brush, safety goggles, Hand gloves, Face shield, Files.





PROCEDURE:

1. Given 2 M.S. plates are filled at an angle of 45^0 at 2 surfaces to be joined (V groove is formed)
2. Electrode is fixed to electrode holder.
3. Connections to be given such that electrode- negative and work piece positive.
4. Welding is to be done carefully for the half-length of the plates.
5. The work piece is to be cut into two halves by power hacksaw.
6. The beads are polished, etched with two percent natal solution and studied under the microscope whosemagnification factors 10X for the heat effected zone.
7. By gripping the beads b/w the jaws pf Tensile testing machine and load is applied until the work piecebreaks and the readings is to be noted.
8. The same procedure is repeated for the remaining half which is welded by reverse polarity and theresults are to be compared

PRECAUTIONS:

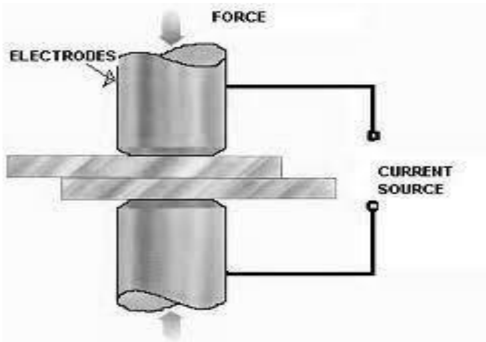
1. Edge preparation should be done very carefully.
2. Before welding ensure the surfaces are extremely clean.
3. While welding always use face shields or goggles.

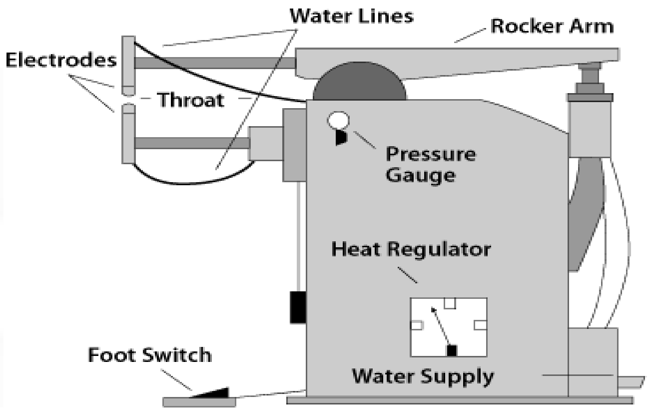
Result: The effect of polarity on weld strength and heat effected zone in arc welding was studied.

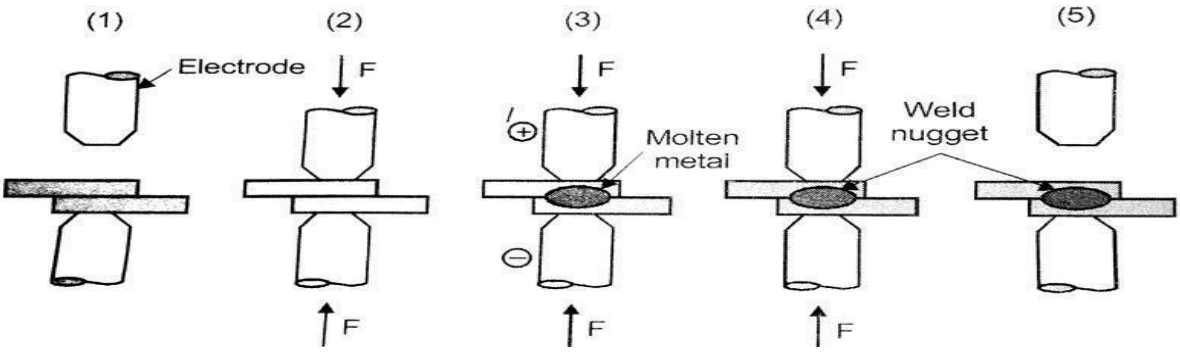
Aim: To spot welding process on two sheet metal pieces.

Equipment: Spot welding machine

Material required: Two metal pieces of size 4”x2”







PROCESS OF SPOT WELDING

Description of the Equipment:

A typical resistance spot welding machine essentially consists of two electrodes, out of which one is fixed. The other electrode is fixed to a rocker arm (to provide mechanical advantage) for transmitting mechanical force from a pneumatic cylinder. This is simplest type of arrangement. The other possibility is that of a pneumatic or hydraulic cylinder being directly connected to the electrode without any rockerarm.

For welding large assemblies such as car bodies, portable spot welding machines are used.

Here the electrode holder and the pneumatic pressurizing system is present in the form of a portable assembly which is taken to the place, where the spot is to be made. The electric current, compressed air and the cooling water needed for the electrodes is supplied through cable and hoses from the main weldingmachine to the portabe unit.

In spot welding, a satisfactory weld is obtained when a proper current density (A/Sq mm) is maintained. The current density depends on the contact area between the electrode and the work piece. With the continuous use, if the tip becomes upset and the contact area increases, the current density will be lowered and consequently the weld is obtained over a large area. This would not but able to melt the metal and hence there would be no proper fusion.

A resistance-welding schedule is the sequence of events that normally take place in each of the welds. The events are the squeeze time is the time required for the electrodes to align and clamp the two work pieces together under them and provides the necessary electrical contact.

The weld time is the time of the current flow through the work pieces till they are heated to the melting temperature.

The hold time is the time when the pressure is to be maintained on the molten metal without the electriccurrent. During this time, the pieces are to be forge welded.

The off time is time during which, the pressure on the electrode is taken off so that the plates can be positioned for the next spot. The off time is not normally specified for simple spot welding, but only whena series of spots are to be made in a predetermined pitch.

PROCEDURE:

1. Switch on the machine and set the current in the machine to 2 Ampere
2. Set the timer to two seconds
3. Over lap the two metal pieces to the requires size and place them between the two electrodes.
4. Apply pressure by foot on the lever such that two electrodes come into contact if the over lappedmetals.
5. After 2 seconds remove the pressure on the lever slowly.
6. Now the joint is ready for use.
7. Repeat the same procedure at various amperes
8. Test the strength of the joints using universal testing machine.

PRECAUTIONS:

1. Ensure that the electrodes should not be touched.
2. Don’t touch the welded potion by hand immediately after the welding is done.

Result: Effect of current on strength of spot weld is studied.

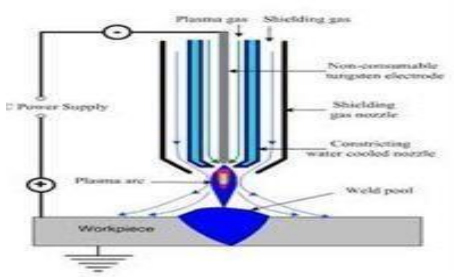
EXP No.: 7 PLASMA ARC WELDING

Aim: To Join two given work pieces using plasma arc welding and Brazing and cut the given plate into two parts using plasma cutting.

Apparatus required:

Plasma Arc Welding System

Material Required: MS flat 50x50x10 mm –3 Nos



Plasma Welding

Procedure:

1. The edge of the given material is prepared to the required V-shape using grinding machine
2. The machine is set to the required parameters(For Welding).
3. Place the two work pieces on the table with required position as shown in figure.
4. The work pieces are kept in the required position and tack welding is performed on the work pieces.
5. First run of welding is done to fill the gap and penetration of the weldment by holding the electrode atabout 700 and filler rod at 300and move the electrode to another end uniformly.
6. Second run of welding is done with proper weaving and uniform movement so that a uniform weldbead will be obtained.
7. The scale formed is chipped with chipping hammer.
8. Filing is done to remove any spatter around the weld.
9. The machine is set to the required parameters(For Cutting)

Precautions:

1.Never look at the arc with the naked eye. Always use a shield while welding.

2.Always wear the safety hand gloves, apron and leather shoes.

3. Ensure proper insulation of the cables and check for openings.

4. Care is taken to avoid arc blow, which will cause serious defect in the weldment

Result: The required butt joint is prepared by Plasma Arc Welding.

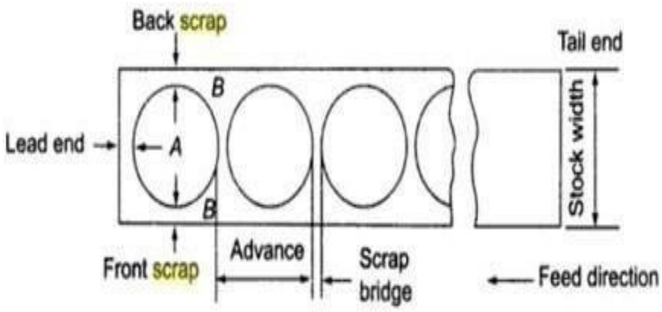
EXP:8 TO PERFORM BLANKING AND PIERCING OPERATION.

Aim: To perform blanking & piercing operation and study of simple, compound and progressive press tool.

EQUIPMENT AND TOOLS REQUIRED:

- Power press machine
- Punches
- Steel Rule

MATERIAL REQUIRED:



Specimen of mild steel 250 X 12 X 2mm

PROCEDURE:

- Take a steel of strip of given dimension and punch the holes
- Place the strip is available slot in the machine
- Punch holes on each side by pressing the lever
- After completing on one side report the same on other side

PRECAUTIONS:

- Care is taken while handling the rotating parts
- Check that lubrication is done properly

RESULT:

The object is made by power press by using die punch to required shape

Aim: To perform deep drawing and extrusion operation using Hydraulic press.

Equipment: Hydraulic Press, Compound Die, Progressive Die, Deep-Drawing Die.

Raw Material: Mild Steel

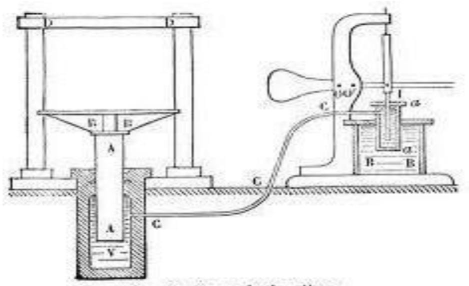


Fig. 2. Presse hydraulique.

Description of the equipment: Presses are classified in various ways. They may be classified according to

i. Source of power

ii. Method of actuation of the rams (slides)

iii. Number of slides

iv. Types of frames

v. The type of work for which the press has been designed.

SOURCE OF POWER:

Two kinds of sources of power supply to the ram: Mechanical and hydraulic.

Mechanical presses, the energy of flywheel is utilized which is transmitted to the work piece by gears, cranks, eccentrics or levers.

The flywheel rotates freely on the crankshaft and is driven from an electric motor through gears or v-belts. The motors runs continuously and stores energy in the flywheel. When the operator presses a foot treadle or actuates a button, the clutch gets engages and the flywheel is connected to the crankshaft. (Driveshaft). Starts rotating and the stored up energy in the flywheel is transmitted to the ram on its downward stroke. The clutch to engage and disengaged the flywheel to the drive shaft can be; a Jaw clutch and the air operated clutch or an electromagnetic clutch. In manually operated mechanical presses, the clutch is disengaged to each cycle. But in automatic presses in which the metal strip is fed to the die automatically, there is no need of single stroke clutch. Disengaging mechanism and the ram moves up and down continuously. These presses can be classified as plain and geared press, the flywheel is carried on a auxiliary shaft which is connected to the main shaft. Through one or more gear reduction, depending

upon size and energy needed. In this arrangement, the flywheel stores considerably more energy than theplain as its speed is higher than the main drive shaft.

In Hydraulic press, the ram is actuated by oil pressure on a piston in a cylinder.

Mechanical presses have following advantages over the hydraulic presses.

1. Run faster
2. Lower maintenance cost
3. Lower capital cost.

PROCEDURE:

1. Set the compound die or progressive die or deep drawing die in the required position.
2. Switch on the motor to start the machine.
3. Pass the MS sheet in to the progressive die/compound die. In case of deep drawing
4. Apply injection pressure using direction control valve.
5. The plunger punches the sheet into the mosquito coil stand/washer lid shape.
6. Release injection pressure.
7. Take out the finished product from the die.

PRECAUTIONS:

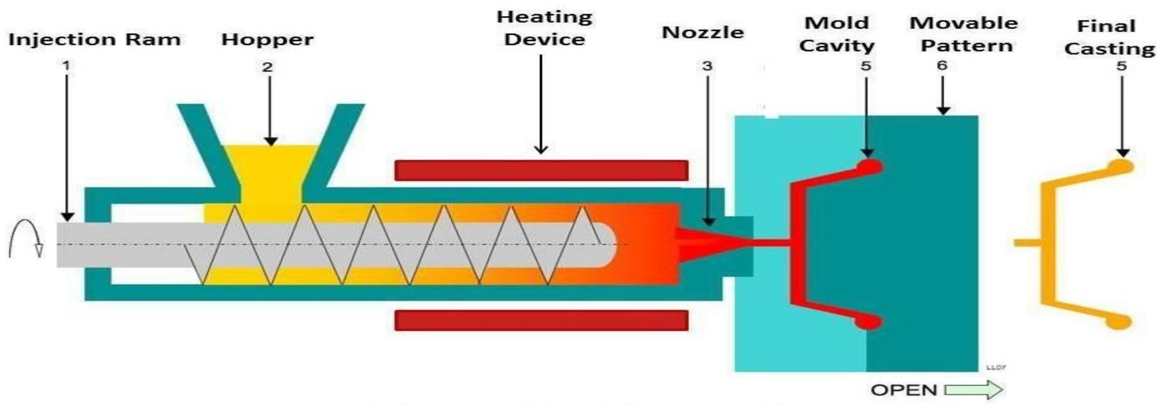
1. Do not apply too high injection pressure
2. Proper lubrication must be done between moving parts of die and press
3. Operate the hydraulic press carefully.

Result: Mosquito coil stand/Washer/lid is prepared using corresponding die un hydraulic press.

EXP 9: TO PREPARE A PRODUCT USING INJECTIONMOULDING/BLOWMOULDING MACHINE.

Aim: To Prepare a Plastic product using Injection Moulding machine

Equipment: Injection moulding machine.



Injection Moulding Machine

Material Required: High grade poly ethylene

DESCRIPTION OF THE EQUIPMENT:

Hydraulic Plastic Injection Moulding machine, Model JIM-1HD has been designed for moulding variety components up to 45 Gms capacity in polystyrene. The machine is robustly built to ensure consistent highquality and volume production of precision components. Operator fatigue due to injection process is completely eliminated by use of hydraulic power for both the injection and releases operations.

Locking Unit: This locking made by Hydraulic Cylinder.

Injection Unit: Injection Unit consists of two guide rods, nuts, top and bottom plates with injection cylinder and barrel. Injection cylinder is designed to develop 3 Tons load. Barrel diameter 30mm is attached with the machine as standard.

Hydraulics: Hydraulic pump is driven by 3 HP Induction motor for a rated delivery of 14 lp, at 1440 Rpm and at 80kg/cm^2. The maximum pressure in the hydraulic system is present in our works and is not to be altered. The oil tank capacity is 60 liters. All hydraulic system manufacturers safety precautions are provided to hydraulic system by using section strainer, which will prevent the contamination entering into the system.

Oil Cooler: Oil cooler provided to keep the oil temperatures below 50^{0}c which will gives more life to hydraulic oil in continuous use.

Electricals: Electrical control panel with automatic blind temperature controller is fixed on the right hand side of the machine for clear viewing of the temperature and for easy to operate the switches. Designed with safety measure, which will protect the motor from over load.

WORKING PROCEDURE:

Injection moulding makes use of heat softening characteristics of thermo plastic materials. These materials soften when heated and re harden when cooled. No chemical change takes place when the material is heated or cool. For this reason the softening and re hardening cycle can be repeated any no. oftimes.

1. The granular moulding material is loaded hopper where it is metered out in a heating cylinder by afeeding device.
2. The exact amount of material is delivered to a cylinder, which is required to fill the mould completely.
3. Set the die in position Provide spacing plates if necessary. Clamping the Die using hydraulic operateram.
4. Set the injection pressure by rotating (clockwise) the regulator knob to suit the requirement of mouldingthe container.
5. Switch on the heater. Set the required timings to the timers, for top and middle heater**.** Set the temperature by adjusting automatic temperature controller to control the bottom heater. Allow sufficient time to stabilizer. When temperature reached, operate the hand lever valve to inject the material.
6. Apply injection pressure on the heated material using plunger rod.
7. The injection ram pushes the material in to the heating cylinder and in doing so pushes a small amount of heated material out of the other end of the cylinder through the nozzle and screw bushing and into thecavity of closed mould.
8. The material is cooled in a rigid state in the mould.
9. Release the injection pressure. In clamp the Die using hydraulic operated ram.
10. The mould is then opened and piece I ejected out.

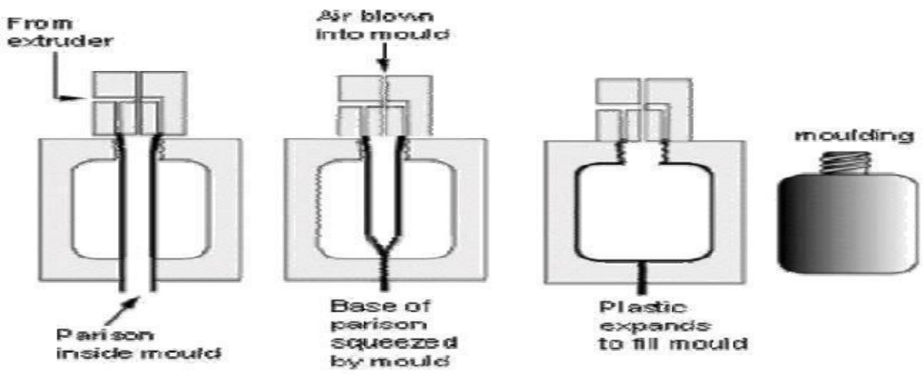
Result: Required Product is made using injection moulding machine.

AIM: To prepare a bottle of 200ml using blow moulding machine.

APPARATUS REQUIRED: Die, blow-moulding equipment, air compressor.

MATERIALS REQUIRED: Plastic pellets

TOOLS REQUIRED: Blow Molding machine, grained plastic, Die (bottle shaped)



PROCEDURE:

1. Set the die in position. Adjust the guide rod nuts to suit die height. Align the tapered face of the die for sealing the parison while blowing also checks for the face opening and closing ofthe die.
2. Ensure minimum die height is 80mm. provide spacing plates if necessary.
3. Set the injection, release and blow pressure by rotating (clockwise) the regulator knob tosuit the requirement of moulding the container.
4. Feed correct quantity & quality of plastic material and switch on the power supply.
5. Switch on the heater.
6. Set the required timings controller to control the bottom heater.
7. Allow sufficient time tostabilizer.
8. When temperature reached, operate the hand lever valve.
9. Extrude the parison (Tubular form) to the required length and close the two die halves.Release the injection cylinder.
10. Operate the hand lever valve and blow the air so that the parison to form the shape of thecontainer as designed in the die.
11. Allow the component to cool.
12. Open the die & take the product out of the die.
13. Now the machine is ready for nest cycle.

PRECAUTIOS:

1. The material should not be heated rapidly.
2. The die should be placed exactly below the nozzle.
3. Proper temperature should be maintained while heating the plastic.

RESULT: Required product is made using blow molding process