

**SREENIVASA INSTITUTE OF TECHNOLOGY AND MANAGEMENT STUDIES,
CHITTOOR – 517 127
(AUTONOMOUS)
DEPARTMENT OF MECHANICAL ENGINEERING
LAB MANUAL**



MANUFACTURING PROCESSES LABORATORY

SUBJECT CODE : 23MEC245L
NAME :
ROLL NO. :
CLASS :
BRANCH :

INSTITUTE VISION AND MISSION

➤ **VISION**

- To emerge as a center of excellence for learning and research in the domains of engineering, computing and management.

➤ **MISSION**

- Provide congenial academic ambience with state-art of resources for learning and research.
- Ignite the students to acquire self-reliance in the latest technologies.
- Unleash and encourage the innate potential and creativity of students.
- Inculcate confidence to face and experience new challenges.
- Foster enterprising spirit among students.
- Work collaboratively with technical institutes/universities/industries of national and international repute.

DEPARTMENT VISION AND MISSION

➤ VISION

- To become a center of excellence in mechanical engineering studies and research.

➤ MISSION

M1: Provide congenial academic ambience with necessary infrastructure and learning resources.

M2: Inculcate confidence to face and experience new challenges from industry and society.

M3: Ignite the students to acquire self-reliance in the latest technologies.

M4: Foster enterprising spirit among students.

PROGRAMME EDUCATIONAL OBJECTIVES (PEO's)

Graduates of Mechanical Engineering shall

PEO1: Have professional competency through the application of knowledge gained from subjects like mathematics, physics, chemistry, inter-disciplinary and core subjects like manufacturing engineering, thermal sciences, CAD/CAM and design and development. (**Professional Competency**).

PEO2: Excel in one's career by critical thinking towards successful services and growth of the organization or as an entrepreneur or through higher studies. (**Successful Career Goals**).

PEO3: Enhance knowledge by updating advanced technological concepts for facing the rapidly changing world and contribute to society through innovation and creativity. (**Continuing Education and Contribution to Society**).

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: Apply the knowledge obtained in core areas for the design, analysis and manufacturing of mechanical systems and processes.

PSO2: Exhibit novel concepts on product development with the help of modern CAD/CAM integration, while ensuring best manufacturing practices.

PROGRAM OUTCOMES (PO's)

PO1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO2. Problem analysis: Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.

PO4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5. Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

PO8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9. Individual and team work: Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

II B.Tech IV Semester

L T P C

- - 3 2

MANUFACTURING PROCESSES LAB

Course Educational Objectives:

CEO1: To help students acquire knowledge about the behavior and manufacturing properties of all engineering materials and basic concepts of welding, foundry and casting processes.

CEO2: To help students acquire knowledge about sheet metal and manufacture plastic components.

List of Experiments:

1. Preparation of pattern Making & Design.
2. Preparation of green sand molding for Stepped Cone Pulley.
3. Preparation of green sand molding for single piece pattern.
4. Preparation of lap joint by arc welding.
5. Preparation of single v-butt joint by arc welding.
6. Preparation of Tee fillet welded joint by arc welding.
7. Preparation of soldering welded joint..
8. Prepare a model by using injection Molding.
9. Prepare a model by using blanking, piercing & bending.

On successful completion of the course, students will be able to:

Course	Course Outcomes		POs related to COs
Manufacturing Processes Lab	C245.1	Demonstrate knowledge on sand moulding, casting, welding, Blanking, Piercing and injection moulding operation.	PO1
	C245.2	Analyze the results from the fabrication of casting, Welding, Sheet metal operation, Injection moulding operation.	PO2.
	C245.3	Design and develop the wooden patterns for casting process and also design the different welded joints by using the different methods of welding operation.	PO3
	C245.4	Identification of casting defects, Welding defects and Burr formation in Shearing operation in sheet metal.	PO4
	C245.5	Follow ethical principles and safety procedure inside the laboratory.	PO8
	C245.6	Do experiments effectively as a team for the experiments.	PO9
	C245.7	Communicate verbally and in written form, the understandings about the experiments.	PO10
	C245.8	Utilise the knowledge of the theory and principles for their future research and projects.	PO12

INTERNAL MARKS - INDEX SHEET

S.No	Experiment Name	Knowledge Gained	Analysis, Design and Use of Modern Tool / Technique	Ability of do experiment and following of ethical principles	Result & Conclusion	VIVA VOCE (Communication, Life Long learning)	TOTAL	Signature of the Faculty
		5	5	5	5	10	30M	
1	Design and Manufacture a Wooden Pattern							
2	Mould for the given stepped cone pulley							
3	Mould for the given split pattern							
4	Lap joint by arc welding							
5	Square butt joint by arc welding							
6	Tee fillet joint' by arc welding.							
7	Lap joint by Soldering operation							
8	Screw type Bottle Cap by Using Injection Molding							
9	Bending, Blanking and Punching operation on the sheet metal.							

Signature of the Faculty In-charge with date

ATTAINMENT LEVEL - INDEX SHEET

S. No	Experiment Name	CO1	CO2	CO3	CO4	CO5	CO6	CO7	CO8	CO9
		Knowledge	Analysis	Design	Complex Analysis & Conclusion	Use of modern tools	Communication ability	Ethics	Individual / Team work	Life Long Learning
1	Design and Manufacture a Wooden Pattern									
2	Mould for the given stepped cone pulley									
3	Mould for the given split pattern									
4	Lap joint by arc welding									
5	Square butt joint by arc welding									
6	Tee fillet joint' by arc welding.									
7	Lap joint by Soldering operation									
8	Screw type Bottle Cap by Using Injection Molding									
9	Bending, Blanking and Punching operation on the sheet metal.									
Total Attainment (B1)										

****Excellent (3) Good (2) Fair (1)**

Signature of the Faculty In-charge with date

PATTERN DESIGN AND MAKING

THEORY:

A pattern is a mold forming tool in the hands of foundry men.

A pattern is the model or the replica of the object to cast.

Except for the various allowances a pattern exactly resembles the casting to be made.

A pattern may be defined as a model or form around which sand is packed to give rise to a cavity known as mould cavity in which when molten metal is poured, the result is CAST OBJECT.

Functions of a Pattern:

A pattern prepares a mold cavity for the purpose of making a casting.

A pattern may contain projections known as core prints if the casting requires a core and need to be hollow.

Runner, gates and risers (used for introducing and feeding molten metal to the mold cavity) may form the part of the pattern.

A pattern may help in establishing locating points on the mold and therefore on the casting with a purpose to check the casting dimensions.

Pattern establishes the parting line and parting surfaces in the mold.

Patterns properly made and having finished and smooth surfaces reduce casting defects.

Properly constructed patterns minimize overall cost of the castings.

Pattern Materials:

The following factors assist in selecting proper pattern material:

1. The number of castings to be produced. Metal patterns are preferred when the production quantity is large.
2. The dimensional accuracy and surface finish required for the castings.
3. Nature of molding process i.e., sand casting, permanent mold casting, shell molding, investment casting etc. Sand castings can be produced with the help of wooden patterns whereas investment castings needs wax patterns.
4. Method of molding i.e., hand or machine molding.
5. Shape, complexity and size of the pattern.

6. Casting design parameters (i.e., minimum section thickness) and the complexity of the cast part.
7. Type of the molding materials i.e., sand etc.
8. The chances of repeat orders.

Materials for making patterns:

Patterns may be constructed of the following materials. The different materials have their own advantages, limitations and the field of applications.

- (a) Wood
- (b) Metal
- (c) Plastic
- (d) plaster and
- (e) Wax.

Allowances:

A pattern is always larger in size when compared to normal casting, because it carries certain allowances due to mechanical reasons and metallurgical reasons for example, shrinkage allowance is the result of metallurgical phenomenon whereas machining, draft, distortion, shake and other allowances are provided on the patterns because of mechanical reasons.

The various pattern allowances are:

- (a) Shrinkage or contraction allowance.
- (b) Machining or finishing allowance.
- (c) Draft or topper allowance.
- (d) Distortion or camber allowance.
- (e) Shake or rapping allowance.

Shrinkage Allowance:

All most all cast metals shrink or contract volumetrically after solidification and therefore the pattern to be obtain a particular sized casting is made oversize by an amount equal to that of shrinkage or contraction. Different metals shrink at different rates because shrinkage is the property of the cast metal or alloy. The metal shrinkage depends upon the cast metal or alloy, pouring temperature of the metal or alloy, casting dimensions (size), and Molding conditions (i.e., mold materials and molding methods employed).

Machine Allowance:

A casting is given an allowance for machining, because Castings get oxidized in the mold and during heat treatment; scales etc., thus formed need to be removed.

It is intended to remove surface roughness and other imperfections from the castings. It is required to achieve exact casting dimensions.

Surface finish is required on the casting.

The above factors necessitate the provision of extra metal on the castings or the Machining/allowance. How much extra metal or how much machining allowance should be provided, depends upon the factors listed below:

Nature of metal i.e., ferrous or nonferrous. Ferrous metals gets cared while nonferrous metals do not.

Size and shape of the casting. Long castings tend to warp and need more material (i.e., allowance) to be added to ensure that after machining the casting will be alright.

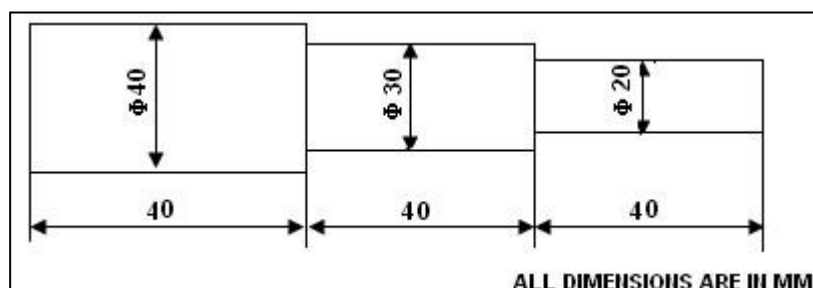
The type of machining operation (i.e., grinding, milling, turning, boring etc).

Casting conditions i.e., whether casting conditions result in a rough casting or a semi finished one.

Molding process employed. Die casting produces parts which need little machining allowance whereas parts sand cast, require more machining allowance.

Number of cuts to be taken. Machining allowance is directly proportional to the number of cuts required for finishing the casting.

The degree of surface finish desired on the cast part.



Problem:

Design a Pattern for the casting shown in fig. which is to be made of steel by considering shrinkage and machining allowance.

Solution:

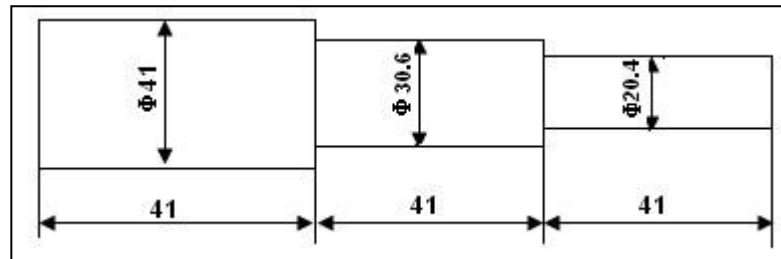
For Steel Shrinkage Allowance is 21mm/m.

For dimension 40, allowance is $40 \times 21/1000 = 0.84 \sim 1.0$

For dimension 30, allowance is $30 \times 21/1000 = 0.63$

For dimension 20, allowance is $20 \times 21/1000 = 0.42$

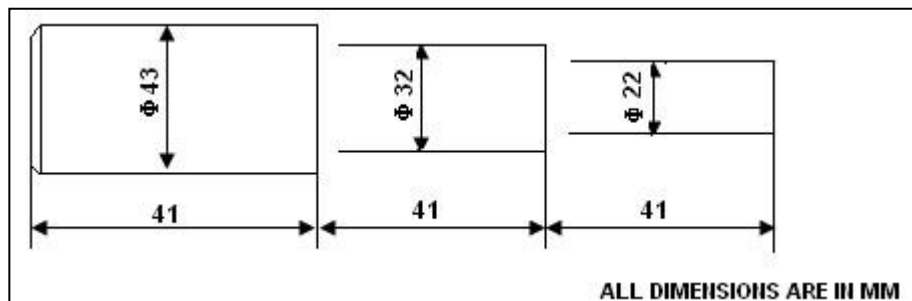
The pattern drawing with required dimensions taking shrinkage into account is shown in fig.



Machining Allowance:

Assume 2mm allowance on larger diameter size, 1.4mm on 30mm diameter size and 1.6mm on smaller diameter size.

The pattern drawing with required dimensions taking shrinkage into account is shown in fig.



PATTERN DESIGN AND MAKING

Exp. No.:

Date:

Aim:

To Design and Manufacture a Wooden Pattern for a given Casting.

Material Required:

Teak wood of 50 x 50 x 130 mm³

Equipment And Tools Required:

Wood Turning Lathe, Vernier Calipers, Spanner, chuck spanner, and Single Point Cutting tool, Emery Paper

Pattern Making

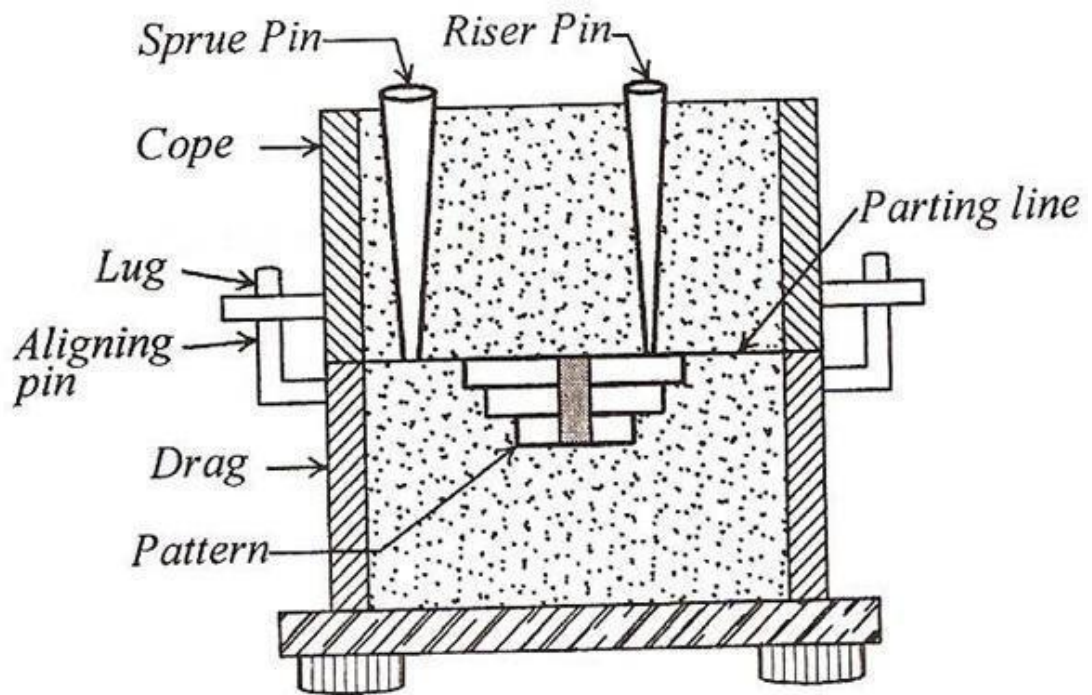
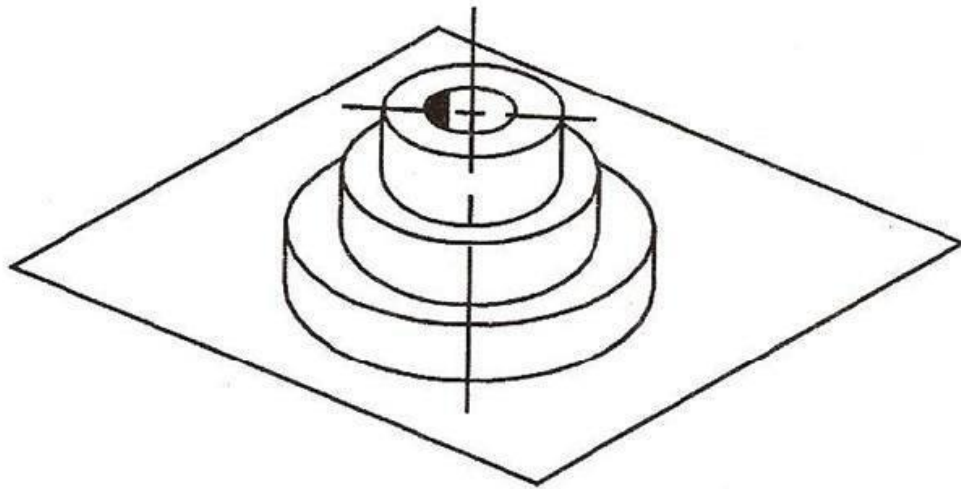
Procedure:

1. The work piece is fixed between live centre and dead center of wood working lathe.
2. Adjust the machine to run the job to a required cutting speed.
3. Fix the cutting tool in the tool post and make sure that the axis of the job coincides with the tip of the cutting tool.
4. Give the depth of cut and feed to the cutting tool.
5. Plain turning operation is performed until the diameter of the work piece reduces to 43 mm.
6. Step turning operation is performed according to the given dimensions.
7. Perform shoulder turning operation according to the dimensions shown in fig.
8. Frequently check the dimensions by using vernier calipers.
9. Finish the work piece using emery paper.

Precautions:

1. The work piece should be held rigidly between the two centers before operating the machine.
2. Tool should be properly ground, fixed at correct height and properly secured, and work also be firmly secured.
3. Optimum machining conditions should be maintained.

Result:



STEPPED CONE PULLEY

Exp. No.:

Date:

Aim:

To make the mould for the given stepped cone pulley.

Material required:

- Moulding board
- Moulding box
- Green sand
- Trowel
- Riddle
- Gate cutter
- Vent rod
- Riser pin
- Sprue pin
- Rammer
- Lifter
- Draw spike
- Bellow

Procedure:

1. Place the moulding board on a horizontal surface.
2. A suitable core is prepared with the help of core box.
3. The drag box is placed above the moulding board. Now the pattern is kept at center of drag.
4. Now parting sand is sprinkled before we keep pattern.
5. Facing sand is sprinkled over the pattern to a depth of 5mm. then green sand is filled over it.
6. Proper ramming is done on the green sand to get a air tight packing.
7. Excess sand is removed by strike off bar.
8. The drag box is inverted upside down.
9. The cope box is placed over the drag box and locked.
10. The riser pin sprue pin placed at right position and green sand is filled over the pattern.
11. Proper ramming is done on the green sand to get air tight packing with strike off bar leaving is done.
12. Now riser pin and sprue pin get removed from the green sand mould. The pattern is removed by draw spike tool.
13. Gate is prepared using gate cutter and core is placed vertically inside the cavity.
14. The vent holes are made with vent rod and cope.

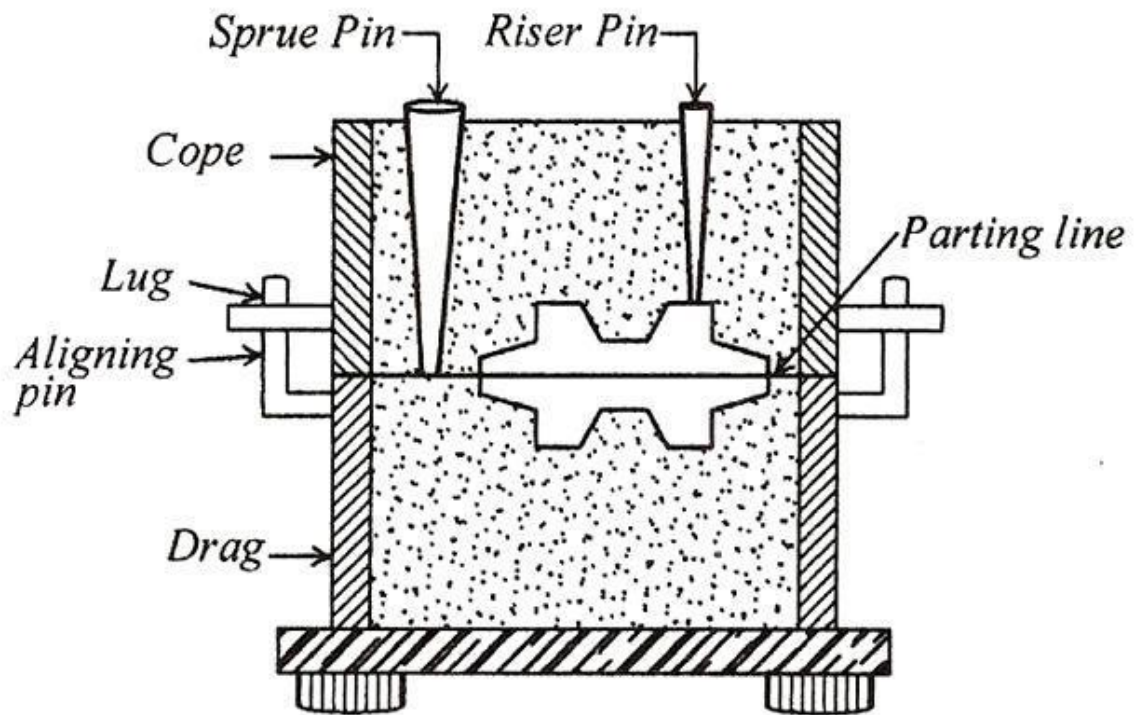
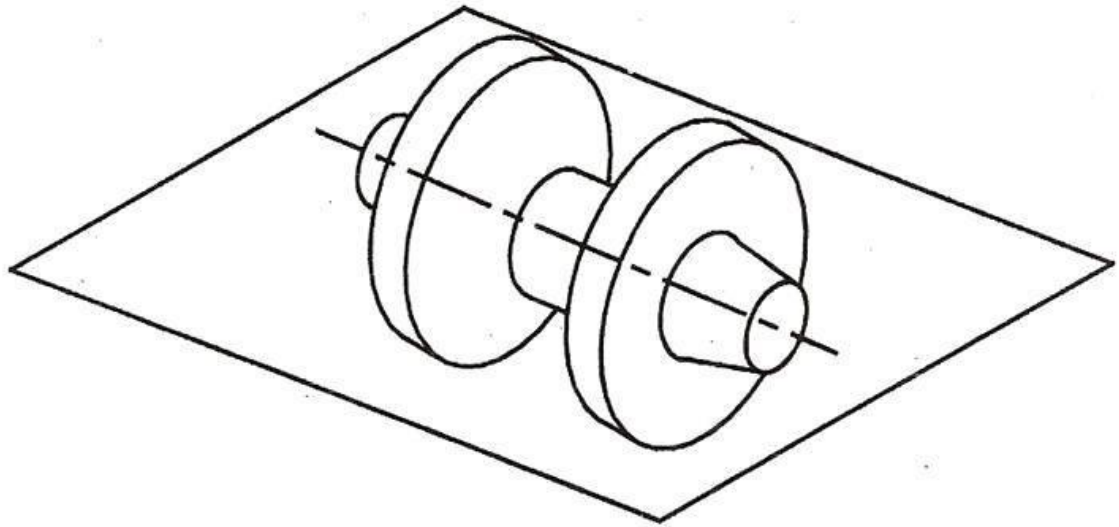
Precautions:

1. Care must be taken to have proper alignment of the pattern as well as boxes.
2. Sand should be rammed properly and evenly.
3. The pattern should be rapped gently and withdrawn carefully without damaging the mould cavity.
4. Care should be taken to avoid over cuts and corners.
5. Care should be taken while pouring the molten metal in to the cavity.

Questions:

1. Define Casting.
2. Explain the core making process?
3. What are pattern allowances?
4. Describe the types of patterns.
5. Explain the composition and properties of moulding sand?

Result:



MOULD WITH SPLIT PATTERN

Exp. No.:

Date:

Aim:

To make the mould for the given split pattern.

Material required:

- Moulding board
- Moulding box
- Green sand
- Trowel
- Riddle
- Gate cutter
- Vent rod
- Riser pin
- Sprue pin
- Rammer
- Lifter
- Draw spike
- Bellow

Procedure:

1. Place the moulding board on a horizontal surface.
2. The drag box is placed above the moulding board. Now one piece of pattern is kept at center of the drag as shown in figure.
3. The parting sand is spread before we keep the pattern.
4. Facing sand is sprinkled over the pattern to a depth of 2mm. then greensand is filled over it.
5. Proper ramming is done on the green sand to get a air free packing.
6. Excess sand is remove with strike off bar.
7. The drag is inverted upside down.
8. The cope box is place over the drag box.
9. Now the parting sand is sprinkled over the parting surface.
10. The other piece of pattern is placed over the drag pattern.
11. Facing sand is riddled over the pattern to a depth of 5mm. then riser is place over the pattern and another sprue pin above parting surface.
12. Now green sand is filled over it.
13. Ramming operation is done to get an air tight packing with strike off bar leaving it.
14. Riser pin and sprue pin gets removed from the green sand.
15. Pattern is removed gently now.
16. Gate is cut using gate cutter.
17. The vent holes are made with vent rod on the cope side.

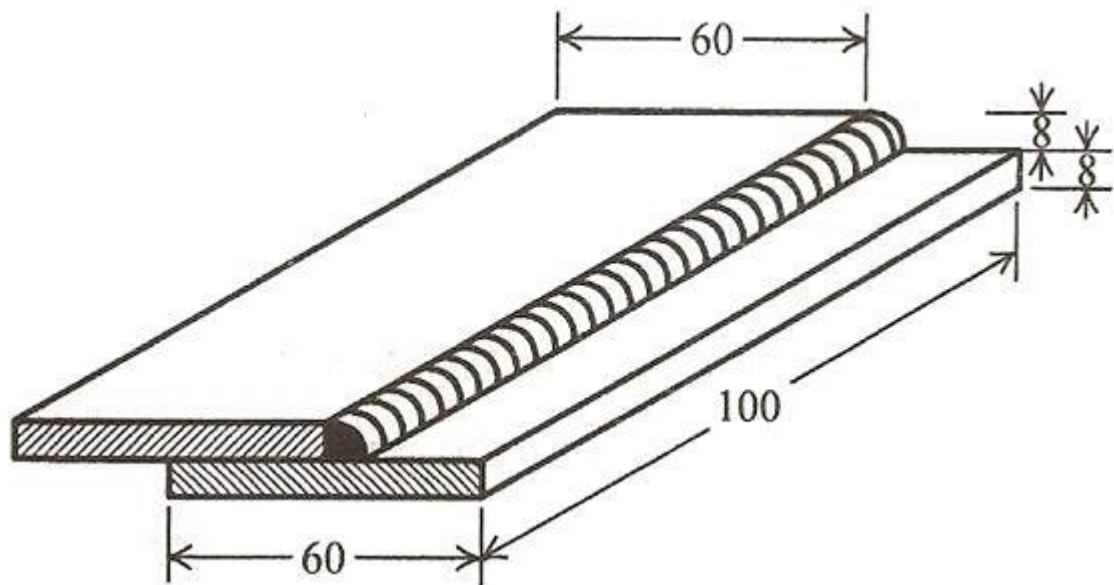
Precautions:

1. Care must be taken to have proper alignment of the pattern as well as boxes.
2. Sand should be rammed properly and evenly.
3. The pattern should be rapped gently and withdrawn carefully without damaging the mould cavity.
4. Care should be taken to avoid over cuts and corners.
5. Care should be taken while pouring the molten metal in to the cavity.

Questions:

1. Explain Casting Defects.
2. Explain the different types of furnaces?
3. What is shell moulding?
4. Describe the various moulding methods.
5. List the components used in moulding process?

Result:



LAP JOINT

Exp. No.:

Date:

Aim:

To join the given two work pieces as a lap joint by arc welding.

Material used:

Mild Steel plates.

Tools required:

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

Procedure:

1. The given work pieces are thoroughly cleaned, i.e. rust, scales are removed and the edges are filed.
2. The electrode is held in an electrode holder and ground clamp is clamped to the welding plates and the power is supplied.
3. The work pieces are positioned on the table to form a “Lab joint”.
4. The tag weld is done on the both the ends of joining plates to avoid the movement of work pieces during welding.
5. The welding is carried throughout the length of the work pieces on both sides by maintaining 3mm gap between plates and the welding rod.
6. The welded plates are allowed for air cooling after the slag's are removed.
7. The weld joint portions are cleaned by wire brush.

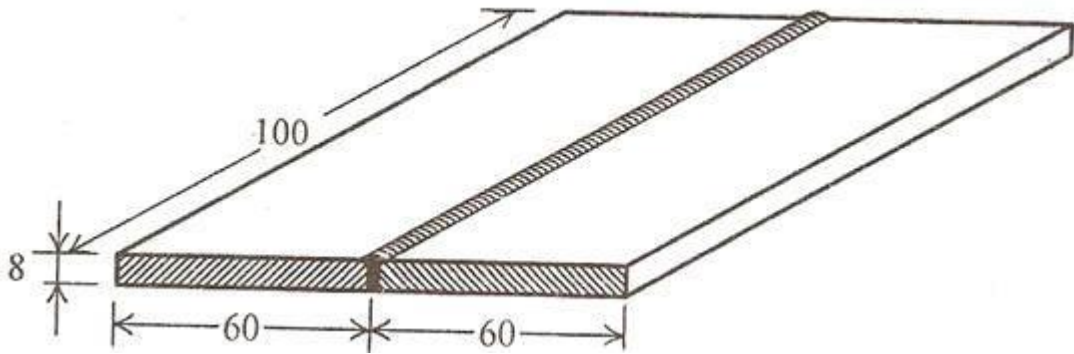
Precautions:

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.
5. Inflammable and combustible materials are removed from the vicinity of welding operations.

Questions:

1. What is the difference between arc welding and gas welding?
2. What is pressure welding?
3. What are the components of arc welding machine?
4. Name the different work holding mechanisms in a drilling machine.
5. How drilling is being carried out in lathe?

Result:



SQUARE BUTT JOINT

Exp. No.:

Date:

Aim:

To join the given two work pieces as a 'square butt joint' by arc welding.

Material used:

Mild steel plates.

Tools required:

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

Procedure:

1. The given workpieces are thoroughly cleaned, i.e. rust, scales are removed and the edges are filed.
2. The electrode is held in an electrode holder and ground clamp is clamped to the welding plates and the power is supplied.
3. The workpieces are positioned on the table form a "square butt joint".
4. The tag weld is done on the both the ends of joining plates to avoid the movement of workpieces during welding.
5. The welding is carried throughout the length of the workpieces on both sides by maintaining 3mm gap between plates and the welding rod.
6. The welded plates are allowed for air cooling after the slags are removed.
7. The weld joint portions are cleaned by wire brush.

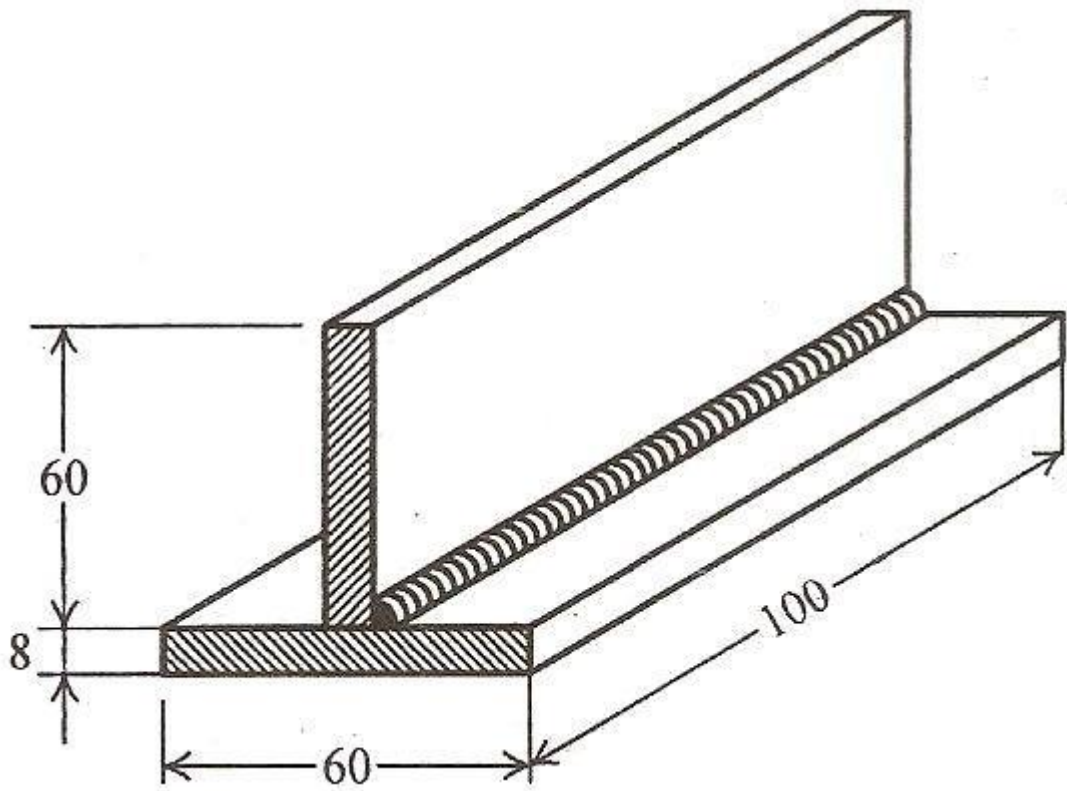
Precautions:

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.
5. Inflammable and combustible materials are removed from the vicinity of welding operations.

Questions:

1. What is electrode and give its purpose?
2. What is consumable and non-consumable electrode?
3. What are the components of arc welding machine?
4. Define welding process.
5. Explain MIG and TIG?

RESULT:



TEE FILLET JOINT

Exp. No.:

Date:

Aim:

To join the given two work pieces as a 'Tee fillet joint' by arc welding.

Material used:

Mild steel plates.

Tools required:

- Welding power supply
- Welding rod
- Electrode holder
- Gloves and apron
- Shield and goggles
- Flat file
- Chipping hammer
- Wire brush
- Earthing clamps

Procedure:

1. The given workpieces are thoroughly cleaned, i.e. rust, scales are removed and the edges are filed.
2. The electrode is held in an electrode holder and ground clamp is clamped to the welding plates and the power is supplied.
3. The workpieces are positioned on the table to form a "Tee fillet joint".
4. The tag weld is done on the both the ends of joining plates to avoid the movement of workpieces during welding.
5. The welding is carried throughout the length of the workpieces on both sides by maintaining 3mm gap between plates and the welding rod.
6. The welded joint portions are allowed for air cooling after the slag is removed.
7. The weld joint portions are cleaned by wire brush.

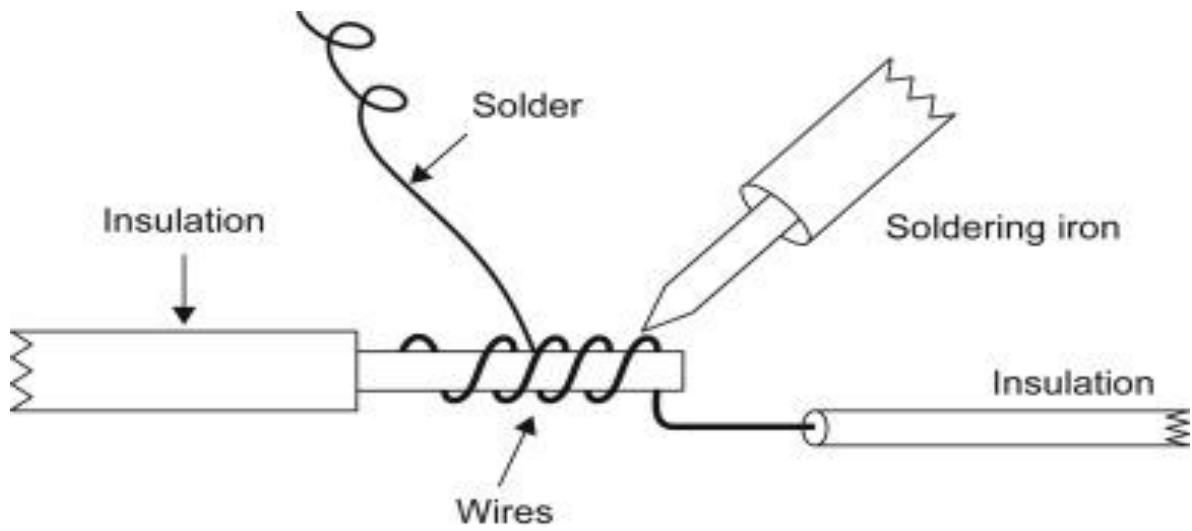
Precautions:

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.
5. Inflammable and combustible materials are removed from the vicinity of welding operations.

Questions:

1. Explain PAW?
2. Explain friction welding and its advantages?
3. Explain thermit welding?
4. Explain EBW?
5. Explain LBW?

RESULT:



SOLDERING

Exp. No.:

Date:

Aim:

Joining of two thin wires as shown in figure using soldering operation

Apparatus:

- Soldering iron,
- Lead free solder,
- Solder wick,
- De-soldering tool,
- Nose pliers.

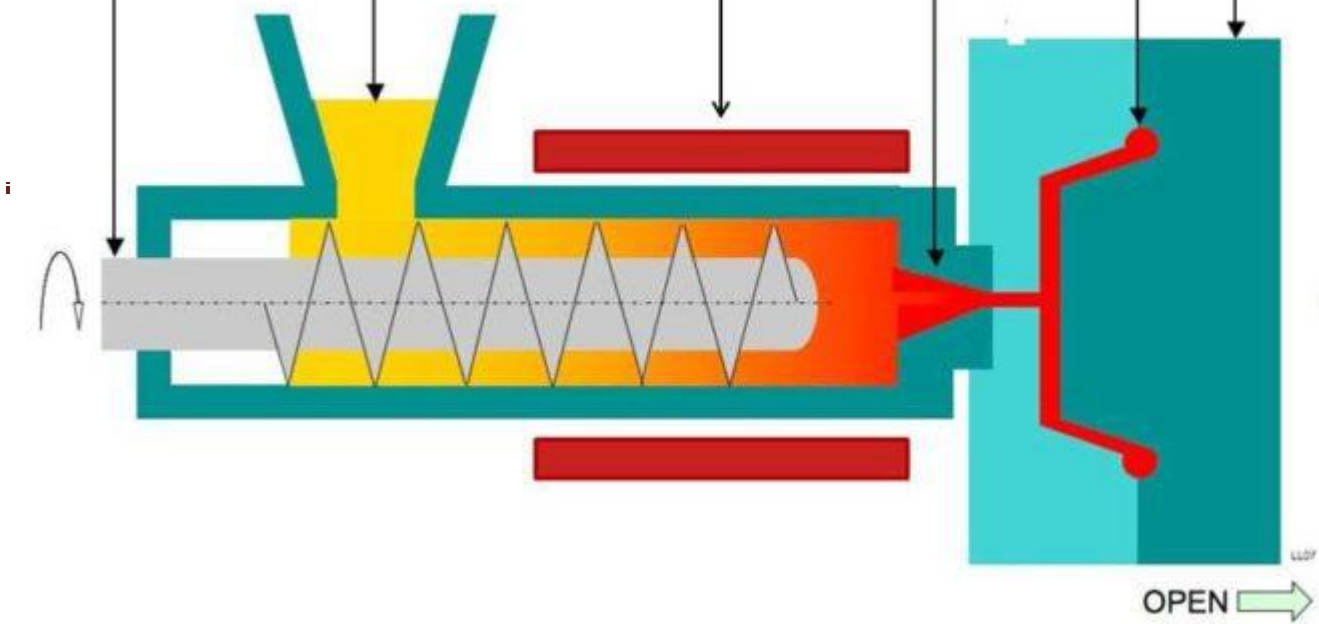
Procedure:

1. Grab a few wires, strip 1cm off each end and bend each end in a U-shape.
2. Crimp the two wires together with a pair of pliers.
3. Heat the two wires 1 to 2 seconds and flow soldering on the connection. Once we see the solder flow evenly throughout the connection, remove the solder and soldering iron.

Precautions:

1. Wear safety glasses when soldering.
2. Place soldering iron in an approved holder when not in use. The iron is hot and cause burns.
3. Ensure access to proper ventilation.
4. Provide plenty of space to work.
5. Do not touch molten solder.

RESULT:



Injection Moulding Machine

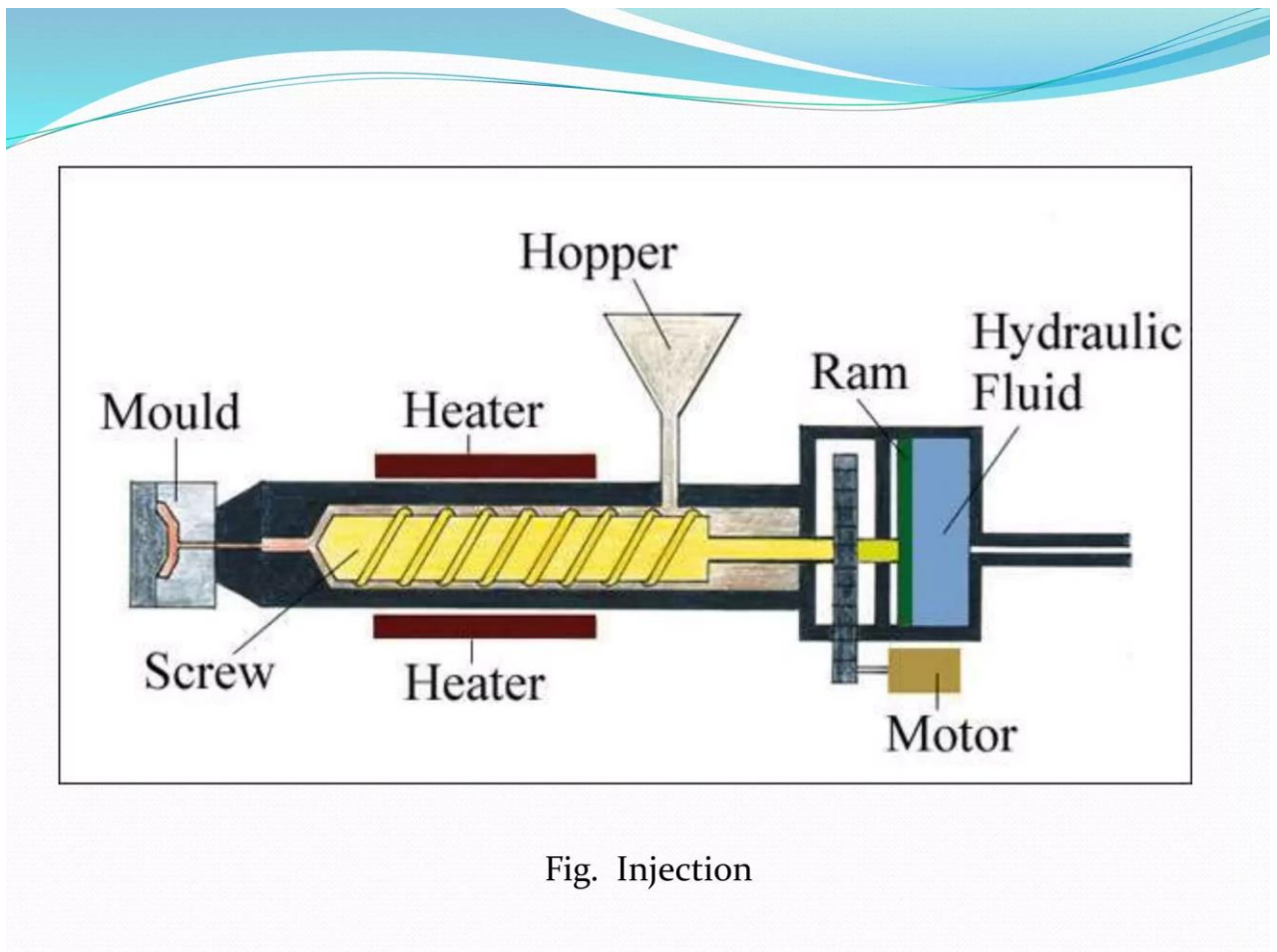


Fig. Injection

INJECTION MOULDING (SCREW TYPE BOTTLE CAP)

Exp. No.:

Date:

Aim: To Make a Screw type Bottle Cap by Using Injection Moulding.

Apparatus Required: Die, Injection Moulding equipment.

Materials Required: Plastic pellets

Theory:

Plastics:

Polymers can be divided into three broad divisions: plastics, fibers and elastomers (polymers of high elasticity, for example, rubber). Synthetic resins are usually referred to as plastics. Plastics derive their name from the fact that in a certain phase of their manufacture they are present in a plastic stage (that is acquire plasticity), which makes it possible to impart any desired shape to the product. Plastics fall into a category known chemically as high polymers.

Thus Plastics is a term applied to compositions consisting of a mixture of high molecular compounds (synthetic polymers) and fillers, plasticizers, stains and pigments, lubricating and other substances. Some of the plastics contain nothing but resin (for instance, polyethylene, polystyrene).

Types of Plastics:

Plastics are classified on the broad basis of whether heat causes them to set (thermosetting) or causes them to soften and melt (thermoplastic).

Thermosetting Plastics: These plastics undergo a number of chemical changes on heating and cure to infusible and practically insoluble articles. The chemical change is not reversible. Thermosetting plastics do not soften on reheating and cannot be reworked. They rather become harder due to completion of any left over

polymerization reaction. Eventually at high temperatures, the useful properties of the plastics get destroyed. This is called degradation. The commonest thermosetting plastics are: alkyds, epoxides, melamines, polyesters, phenolics and ureas.

Thermoplastic Plastics: These plastics soften under heat, harden on cooling, and can be resoftened under heat. Thus they retain their fusibility, solubility and capability of being repeatedly shaped. The mechanical properties of these plastics are rather sensitive to temperature and to sunlight and exposure to temperature may cause thermal degradation. Common thermoplastics are: acrylics, poly tetra fluoro ethylene (PTFE), polyvinyl chlorides (PVC), nylons, polyethylene, polypropylene etc.

Processing of Thermoplastic Plastics:

The common forms of raw materials for processing plastics into products are: Pellets, Powders, Sheet, Plate, and Tubing. Liquid plastics are used especially in the fabrication of reinforced plastic parts.

Thermoplastics can be processed to their final shape by moulding and extrusion processes. However, extruding is often used as an intermediate process to be followed by other processes for example vacuum forming or machining. An important industrial method of producing articles of thermoplastics is Injection Moulding.

Procedure:

1. The pellet form of plastic is introduced into the container through hopper.
2. The plastic pellet enters into the container. The container is heated with the coil, which is wound around it.
3. The plastic of powder form is converted into molten stage at a temperature of 80°C
4. The die is placed exactly below the nozzle of the container.
5. The melted plastic is injected into the die with the help of lever arm and it is allowed to solidify say for about one minute.

6. Then retract the lever arm slightly and open the mould.
7. Then eject the mould piece of the required shape from the die.

Precautions:

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:

BENDING OPERATION

Exp. No.:

Date:

Aim: To perform the bending operation on the sheet metal.

Tools & Equipment: sheet metal, die set for bending, fly press, sheet shearing press, scribe, steel rule

Theory:

Sheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metal working, and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate.

Forming processes are the processes which cause the metal to undergo desired shape changes without failure, excessive thinning, or cracking. This includes bending, stretching, drawing, roll forming.

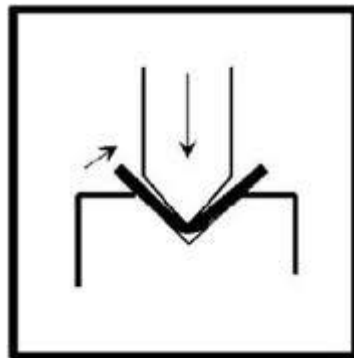


Fig. Forming Operation: Bending

Procedure:

1. Cut the required size of the sheet metal strip.
2. Fix the required die set in the fly press.
3. Check the alignment of die and punch.
4. Clamp the die properly.
5. Insert the blank into the press between the guides.
6. Apply the force by rotating the flywheel to undergo desired shape changes.
7. Remove the finished part.
8. Cut the required size of the sheet metal strip.
9. Fix the required die set in the fly press.
10. Check the alignment of die and punch.
11. Clamp the die properly.
12. Insert the blank into the press between the guides.
13. Apply the force by rotating the flywheel to undergo desired shape changes.
14. Remove the finished part.

RESULT:

BLANKING & PUNCHING OPERATIONS

Exp. No.:

Date:

Aim: To perform Blanking and Punching operations on the sheet metal.

Tools & Equipment: Sheet metal, Die sets for Blanking and Piercing, Scriber, Steel rule, Sheet shearing press, Fly press

Theory:

Sheet metal is simply metal formed into thin and flat pieces. It is one of the fundamental forms used in metal working and can be cut and bent into a variety of different shapes. Countless everyday objects are constructed of the material. Thicknesses can vary significantly, although extremely thin thicknesses are considered foil or leaf, and pieces thicker than 6 mm (0.25 in) are considered plate.

Shearing processes are the processes which apply shearing forces to cut, fracture, or separate the material. This includes punching, blanking, perforating, parting, notching, and lancing.

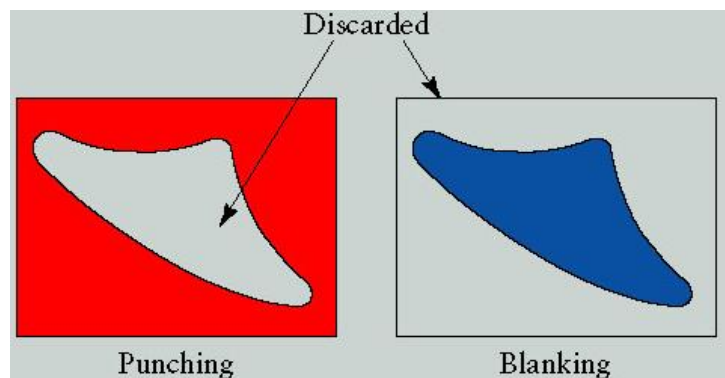


Fig. Shearing Operations: Punching, Blanking

Procedure:

1. Cut the required size of the sheet metal strip.
2. Fix the required die set in the fly press.
3. Check the alignment of die and punch.
4. Clamp the die properly.
5. Insert the sheet metal into the press between the guides.
6. Apply the force by rotating the flywheel to cut the required part from the sheet.
7. Remove the finished part.

RESULT:

RUBRICS FOR MANUFACTURING TECHNOLOGY LAB

	Excellent(3)	Good(2)	Fair(1)
Conduct Experiments (CO1)	Student successfully completes the experiment, records the data, analyzes the experiment's main topics, and explains the experiment concisely and well.	Student successfully completes the experiment, records the data, and analyzes the experiment's main topics	Student successfully completes the experiment, records the data, and unable to analyzes.
Analysis and Synthesis (CO2)	Thorough analysis of casting, welding designed	Reasonable analysis of casting, welding designed	Improper analysis of casting, welding designed
Design (CO3)	Student understands what needs to be tested and designs an appropriate experiment, and explains the experiment concisely and well	Student understands what needs to be tested and designs an appropriate experiment.	Student understands what needs to be tested and does not design an appropriate experiment.
Complex Analysis & Conclusion (CO4)	Thorough comprehension through analysis/ synthesis	Reasonable comprehension through analysis/ synthesis	Improper comprehension through analysis/ synthesis
Use modern tools in engineering practice (CO5)	Student uses the tools to measure correctly, and understands the limitations of the hardware.	Student uses the tools to measure correctly.	Student uses the tools correctly, and unable to measure properly.
Report Writing (CO6)	Status report with clear and logical sequence of parameter using excellent language	Status report with logical sequence of parameter using understandable language	Status report not properly organized
Lab safety (CO7)	Student will demonstrate good understanding and follow lab safety	Student will demonstrate good understanding of lab safety	Students demonstrate a little knowledge of lab safety.
Ability to work in teams (CO8)	Performance on teams is excellent with clear evidence of equal distribution of tasks and Effort	Performance on teams is good with equal distribution of tasks and effort	Performance on teams is acceptable with one or more members carrying a larger amount of the effort
Continuous learning (CO9)	Highly enthusiastic towards continuous learning	Interested in continuous learning	Inadequate interest in continuous learning

