

UNIT - I METAL CASTING PROCESSES**1. State any four types of patterns.**

The various types of patterns which are commonly used are as follows: 1) Single piece or solid pattern 2) Two piece or split pattern 3) Loose piece pattern 4) Cope and drag pattern 5) Gated pattern

2. Mention any two advantages and disadvantages of die casting.

Advantages: i. It is a very fast process. ii. Moulds have longer life. iii. Better surface can be obtained. Limitations: iv Moulds are much costlier. v. This method is not suitable for small quantity production. vi. Shape and weight of the casting is limited.

3. Write the requirements of good pattern.

i. Simple in design, ii. Cheap and readily available, iii. Light in mass, iv. Surface is smooth, v Have high strength

4. What is core venting ?

While pouring the mould with molten metal mould walls and cores heat up rapidly and releases large amount of gases. In order to prevent casting defects these gases must be vented out. For this purpose core venting are used. Core venting are incorporated in the core box itself.

5. What function of core ?

Functions of core are: i. Core provides a means of forming the main internal cavity for hollow casting. ii. Core provides external undercut feature, iii. Cores can be inserted to obtain deep recesses in the casting. iv. Cores can be used to increase the strength of the mould

6. Which process is called lost waxing method? Why?

Investment casting process is also known as Lost-wax process. The term investment refers to a clock or special covering apparel. In investment casting, the clock is a refractory mould which surrounds the percolated wax pattern.

7. What is the function of core prints?

i. Core prints are basically extra projections provided on the pattern ii. They form core seats in the mould when pattern is embedded in the sand for mould making. iii. Core seats are provided to support all the types of cores. iv. Though the core prints are the part of pattern, they do not appear on the cast part

8. What are the advantages and applications of ceramic moulds?

Advantages: a) It is less expensive b) Intricate objects can be casted. c) Castings of thin sections and which do not require machining can be produced. Applications: d) It is mainly used for all material using better ingredient in slurry.

9. What are the pattern materials?

1) Wood 2) Metal 3) Plastic 4) Plaster 5) Wax

10. Explain the term fettling.

Fettling is the name given to cover all those operations which help the casting to give a good appearance. It includes the removal of cores, sand, gates, risers, runners and other unwanted projections from the casting.

11. Name the steps involved in making a casting

Steps involved in making a casting are (1) Pattern making (2) Sand mixing and preparation (3) Core making (4) Melting (5) Pouring (6) Finishing (7) Testing (8) Heat treatment (9) Re-testing

12. What are the applications of casting ?

Transportation vehicles (in automobile engine and tractors) • Machine tool structures • Turbine vanes and power generators • Mill housing • pump filter and valve.

13. Define pattern.

A pattern is defined as a model or replica of the object to be cast. A pattern exactly resembles the casting to be made except for the various allowances.

14. Define mould making.

It is a model or form around which sand is packed to give rise to a cavity called as mould cavity, in which molten metal is poured and the casting is produced.

15. Why is a pattern larger than casting?

A pattern is slightly larger than the casting because a pattern carries allowance compensate for metal shrinkage.

16. What do you mean by coreprints in pattern?

To produce seats for the cores in the mould in which cores can be placed, for producing cavity in the casting. Such seats in the mould are called as coreprints.

17. Name the functions of pattern.

(1) Prepare a mould cavity (2) To produce seats for the cores (3) To establish the parting line (4) To minimize casting defects.

18. Name the materials for making patterns

The common materials of which the patterns are made are as follows: (1) Wood (2) Metal (3) Plastic (4) Plaster (5) Wax

19. List the various alloys and metal used in pattern.

The various metals and alloys employed for making patterns are : (a) Aluminum and its alloys (b) Steel (c) Brass (d) Cast iron (e) White metal

20. Explain wax moulding.

After being moulded, the wax pattern is not taken out; rather the mould is inverted and heated and the molten wax comes out or gets evaporated, hence there is no chance of the mould cavity getting damaged while removing the pattern.

21. List the allowances of pattern.

The following allowances are provided on the pattern : (a) Shrinkage or contraction allowance (b) Machining allowance (c) Draft or taper allowance (d) Distortion allowance (e) Rapping or shake allowance

22. List the three forms of contraction.

Contraction takes place in three forms (1) Liquid contraction (2) Solidifying contraction (3) Solid contraction

23. Shrinkage of metal depends on what factors?

The shrinkage of metal depends on the following factors : (1) The metal to be cast (2) Pouring temperature of the molten metal (3) Dimensions of the casting (4) Method of moulding

24. What do you mean by finish allowance?

Machining allowance or finish allowance is the amount of dimension on a casting which is made oversized to provide stock for machining.

25. What are the factors on which amount of machining depends ?

Factors affecting machining are (1) Metal of casting (2) Machining method used (3) Casting method used (4) Shape and size of the casting (5) Amount of finish required on the machined portion

26. Why is a taper allowance used ?

Draft allowance or taper allowance is given to all vertical faces of a pattern for their easy. Removal from sand without damaging the mould.

27. When does warpage occur ?

Warpage occurs when (1) It is of irregular shape. (2) It is of U or V-shape (3) The arms having unequal thickness. (4) One portion of the casting cools at a faster rate than the other.

28. How do you eliminate warpage ?

To eliminate this defect, an opposite distortion is provided on the pattern, so that the effect is balanced and correct shape of the casting is produced

29. Enlist the factors affecting selection of types of pattern

The type of pattern to be used for a particular casting will depend on following factors: (1) Quantity of casting to be produced (2) Size and shape of the casting (3) Type of moulding method (4) Design of casting

30. Name any four types of pattern.

The various types of patterns which are commonly used are as follows : (1) Single piece or solid pattern (2) Two piece or split pattern (3) Loose piece pattern (4) Cope and drag pattern (5) Gated pattern

31. Write the significance of loose moulding.

Some patterns embedded in the moulding sand cannot be withdrawn, hence such patterns are made with one or more loose pieces for their easy removal from the moulding box.

UNIT - II JOINING PROCESSES

1. List out any four arc welding equipment.

The most commonly used equipments for arc welding are as follows: (a) A.C or D.C. machine (b) Wire brush (c) Cables and connectors (d) Ear thing clamps (e) Chipping hammer

2. What are the special features of friction welding?

Friction welding is a solid state welding process where coalescence is produced by the heat obtained from mechanically induced sliding motion between rubbing surfaces. The work parts are held together under pressure. Its operating is simple. Power required for the operation is low. It is used for joining steels, super alloys, non-ferrous metals and combinations of metals.

3. Define resistance welding process.

Resistance welding is a process where coalescence is produced by the heat obtained from resistance offered by the work piece to the flow of electric current in a circuit of which the work piece is a part and by the application of pressure.

4. What is the purpose of flux?

- 1) It acts as shield to weld.
- 2) To prevent atmospheric reaction of molten metal with atmosphere.

5. How can slag inclusions in welding be avoided?

- i. Avoid multi layer welding
- ii. Reduce arc length
- iii. Increase electrode angle
- iv. Avoid using large electrode

6. How does brazing differ from braze welding?

Brazing	Braze Welding
The filler alloy is fed to one or more points in the assembly and it is drawn into the rest of the joint by capillary action	The filler alloy is deposited directly at the point where it is desired

7. Why is flux coated on filler rods?

The coating improves penetration and surface finish. Suitable coating will improve metal deposition rates.

8. What is the application of carburizing flame?

Carburizing flame is generally used for: i. Welding of low alloy steel rods, ii. Non-ferrous metals, iii. High carbon steel

9. What are the diameter and length of the electrodes available in the market?

Standard length of electrodes are 250 mm, 300 mm and 450 mm.
Standard diameters of electrodes are 1.6, 2, 2.5, 3.2, 4, 5, 6, 7, 8, and 9 mm.

10. Define weldability.

Weldability is defined as the capacity of a material to be welded under fabrication conditions imposed in a specific and suitably designed structure and to perform satisfactorily in the intended service

11. How is welding classified?

Welding is classified as, i. Gas welding, ii. Arc welding, iii. Resistance welding, iv. Solid state welding, v. Thermo-chemical welding processes, vi. Radiant energy welding processes

12. Explain the principle of oxy-acetylene welding.

When acetylene, in correct proportion, is mixed with oxygen in a welding torch and ignited, then the flame resulting at the tip of the torch is sufficiently hot to melt and join the parent metals.

13. How do we obtain oxidizing flame using neutral flame?

If, after the neutral flame has been established, the oxygen supply is further increased then oxidizing flame will be developed.

14. How does the flame of an oxidizing flame look?

It is recognized by the small white cone which is shorter, much bluer in color and more pointed than neutral flame.

15. Write down the methods of welding.

There are three typical methods that may be used which are as follows: Leftward or fore-hand welding method, Rightward or back-hand welding method, Vertical welding method

16. Explain the function of flux in welding.

While welding, if the metal is heated in air then the oxygen from air combines with the metal to form oxides. This results in poor quality, low weld strength hence, to avoid this difficulty a flux is employed during welding. It prevents the oxidation of molten metal.

17. Give the applications of gas welding.

Gas welding is most widely used for the following purposes: Joining thin materials. Joining most ferrous and non-ferrous metals. In automobile and aircraft industries. In sheet metal fabricating plant.

18. What is arc welding?

Electric arc welding is a fusion welding process in which welding heat is obtained from an electric arc between an electrode and the work piece.

19. Name the equipments of gas welding

The most commonly used equipments for arc welding are as follows:

(a) A.C or D.C machine, (b) Wire brush, (c) Cables and connector, (d) Earthling clamps, (e) Chipping hammer, (f) Wire brush, (g) Helmet, (h) Safety goggles, (i) Cable lug, (j) Hand gloves, apron, etc.

20. Name the types of arc welding.

The main types of arc welding are as follows: (a) Carbon arc welding, (b) Shielded metal arc welding, (c) Submerged arc welding, (d) Gas tungsten arc welding, (e) Gas metal arc welding, (f) Electro slag welding, (g) Plasma arc welding, (h) Flux cored arc welding, (i) Stud arc welding

21. Name types of adhesives

The most commonly used adhesives are as follows: Thermoplastic adhesives. Thermosetting adhesives

22. Give the applications of adhesive bonding.

Adhesive bonding are used in following industries

(a) Automotive (b) Aircraft (c) Packaging (d) Furniture (e) Ship-building (f) Book-binding (g) Shoe and apparel (h) Medical and dental (i) Electrical (j) Railroad (k) Tape, etc.

23. Define soft and hard soldering.

Soft soldering is used in sheet metal work for joining parts that are not exposed to the high temperature action and not subjected to excessive loads and forces. Hard soldering used solders which melt at higher temperatures and are stronger than those used in soft soldering

24. Name different defects in weld.

Some common weld defects are listed below: (a) Cracks (b) Distortion (c) Inclusions (d) Porosity and blow holes (e) Undercutting (f) Overlapping (g) Spatter (h) Poor fusion (i) Poor weld bead appearance (j) Incomplete penetration

25. Name the methods of brazing.

There are various brazing methods such as: i. Torch brazing ii. Resistance brazing iii. Immersion brazing iv Furnace brazing

UNIT - III BULK DEFORMATION PROCESSES

1. What are the four major drawbacks of hot working?

As hot working is carried out at high temperatures, a rapid oxidation or scale formation takes place on the metal surface which leads to poor surface finish and loss of metal. Due to the loss of carbon from the surface of the steel piece being worked, the surface layer loses its strength. This weakening of the surface layer may give rise to fatigue crack which results in failure of the part. Close tolerance cannot be obtained. Hot working involves excessive expenditure on account of high tooling cost.

2. Classify the types of extrusion.

- i. Extrusion
 - 1. Hot Extrusion
 - 2. Cold Extrusion
- ii. Hot Extrusion
 - 1. Direct extrusion
 - 2. Indirect extrusion
 - 3. Tube extrusion

3. What is the difference between a bloom and a billet?

A bloom has a square cross section with minimum size of 150x150 mm and a billet is smaller than bloom and it may have any square section from 38 mm up to the size of a bloom.

4. What is impact extrusion ?

The raw material is in slug form which have been turned from a bar or punched from a strip. By using punch and dies, the operation is performed. The slug is placed in the die and struck from top by the punch operating at high pressure and speed.

5. Why are a number of passes required to roll a steel bar?

To reduce the thickness and to increase the width of the bar number of passes are required.

6. How are seamless tubes produced?

Seamless tubing is a popular and economical raw stock for machining because it saves drilling and boring of parts. The piercing machine consists of two rape red rolls, called as piercing rolls

7. What is Sejournet process?

That extrusion process which is based both on the use of a lubricant in a viscous condition at extrusion temperature and on a separation between the lubrication of the chamber wall and die is called Sejournet process.

8. What is skew rolling ?

The rolls are powered and the work piece is in due to frictional force between metal and surface. The torque on the rolls is being zero.

9. Explain the term Extrusion process.

The extrusion process consists of compressing a metal inside a chamber to force it out through a small opening which is called as die. Any plastic material can be successfully extruded. A large number of extruded shapes which are commonly used are tubes, rods, structural shapes and lead covered cables. During the process, a heated cylindrical billet is placed in the container and forced out through a steel die with the help of a ram or plunger.

10. What are the disadvantages of forging processes?

Complicated shapes cannot be produced. Generally used for large parts. Because of cost of dies, process is costly.

11. What is mechanical working ?

Mechanical working fo a metal is a simply plastic deformation performed to change the dimensions, properties and siface conditions with the help of mechanical pressure.

12. Define cold and hot working in short.

Mechanical working of metals above the recrystallisation temperature, but below the melting or burning point is known as hot working whereas; below the recrystallisation temperature is known as cold working.

13. Name the commonly used rolled sections.

Commonly rolled sections are flat, tee, angle, channel, round, I-section.

14. What are the types of rolling mills?

According to the number and arrangement of the rolls, rolling mills are classified as follows: 1. Two-high rolling mill 2. Three-high rolling mill 3. Four-high rolling mill 4. Tandem rolling mill 5. Cluster rolling mill 6. Planetary rolling mill

15. Define extrusion.

The extrusion process consists of compressing a metal inside a chamber to force it out through a small opening which is called as die.

16. Name the method of extrusion.

The different methods of extrusion are hot extrusion and cold extrusions.

17. What are the factors affecting choice of extrusion?

The factors which govern the choice are: a) Metal to be extruded b) Thickness of the extrusion section c) Raw material size d) Capacity of the press e) Product type, etc.

18. Give the other name of indirect and direct extrusion.

Direct extrusion is also called as forward extrusion. Indirect extrusion is also called as backward extrusion.

19. What is forging?

Forging is the process of shaping heated metal by the application of sudden blows (hammer forging) or steady pressure (press forging) and makes use of the characteristic of plasticity of the material.

20. How is forging classified?

According to the equipments utilized for forging, they are classified as follows: 1. Smith die (Open die) forging: (a) Hand forging (b) Power forging 2. Impression die (Closed die) forging: (a) Drop forging (b) Press forging (c) Machine or upset forging (d) Roll forging

21. Define smithing.

Smithing is the act or art of working on forging metals, as iron, into any required shape.

22. Classify smith's hammer.

Smith's hand hammers are small in size and of following types: 1. Ball peen hammer 2. Cross peen hammer 3. Straight peen hammer

23. Explain machine forging

Machine forging is also called as hot heading. It consists of applying pressure longitudinally on a hot bar, which is gripped firmly between grooved dies, to upset a required portion of its length.

24. Name the typical forging operations.

A typical smith forging operations are as follows: 1. Upsetting 2. Drawing out or drawing down 3. Cutting 4. Bending 5. Punching and drifting 6. Setting down 7. Fullering 8. Welding

25. What is drifting?

In drifting, a tool known as drift, is made to pass through the punched hole to produce a finished hole of the required size.

UNIT - IV SHEET METAL PROCESSES

1. What is punching operation ?

It is the cutting operation with the help of which various shaped holes are produced in the sheet metal. It is similar to blanking; only the main difference is that, the hole is the desired product and the material punched out to form a hole is considered as a waste.

2. What is super plastic forming operation ?

Super plastic forming is a metalworking process for forming sheet metal. It works upon the theory of super plasticity, which means that a material can elongate beyond 100% of its original size.

3. What is press brake?

Press brake (bending brake) is an open frame press used for bending, cutting and forming. Generally, it handles long work pieces in the form of strips. Usually press brake have long dies and suitable and suitable for making long straight line bends.

4. Define hydro forming process

Hydro forming is a process which can be carried out in two ways: 1) Hydro - mechanical forming
2) Electro - hydraulic forming
Hydro - mechanical forming: In this method, the blank is placed over the punch whose shape is similar to inner of the final work piece. Electro - hydraulic forming: This method involves the conversion of electrical energy into mechanical energy in a liquid medium. Electric spark in a liquid produces shock waves and pressures which can be used for metal forming.

5. Give the difference between punching and blanking.

Blanking: It is the cutting operation of a flat metal sheet. The article punched out is known as blank. Blank is the required product of the operation and the metal left behind is considered as a waste. Punching: It is similar to blanking; only the main difference is that, the hole is the desired product and the material punched out to form a hole is considered as a waste.

6. How is hydro forming is similar to rubber forming ?

In both the sheet metal working processes sheet metal is pressed between a die and rubber block. Under pressure, the rubber and sheet metal are driven into the die and conform to its shape by forming the part.

7. What do you mean by minimum bend radius?

It is the radius of curvature on inside surface of the bend. If the bend radius is too small, then cracking of a material on the outer tensile surface takes place. To prevent any damage to punch and die, the bend radius should not be less than 0.8mm.

8. Define limiting drawing ratio.

It is the ratio of finished shell diameter (d) to the radius of bottom corner (r).

9. Define Embossing.

With the help of this operation, specific shapes or figures are produced on the sheet metal. It is used for decorative purpose or giving details like names, trade marks, specifications, etc. On the sheet metal.

10. Name the different sheet metals

1. Black iron 2. Galvanized iron 3. Aluminum Sheets: 4. Copper Sheets: 5. Stainless steel 6. Tin plates

11. Name the different hand tools used in sheets metals.

1. Hammers 2. Mallet 3. Swages 4. Tongs 5. Punches and shears 6. Stakes 7. Tri square and scribes 8. Wing compass

12. Name the operations of sheet metal working

The main operations are as follows: • Shearing • Bending • Drawing • Forming

13. Explain drawing

Drawing operation is used to produce thin walled hollow shapes in sheet metal. It is carried out by using a die and punch on a press machine. If the drawn length is more than the width then the operation is called as deep drawing.

14. Explain forming

For safety purpose, the edges of the sheet metal products are formed or folded. Also, formed edges provide stiffness to the components so that they will not retain their shapes during handling.

15. What is press working?

Press working is a chip less manufacturing process by which various components are produced from sheet metal.

16. Why are press machines preferred?

Press machines are preferred for mass production of similar components, because for each component separate tool is required and the cost of every press tool is very high as compared to the cost of other cutting tools.

17. What is clutch and flywheel?

Clutch and flywheel: Flywheel is used to store the energy, which is required to maintain the constant speed of the ram whereas, clutch is used to engage or disengage the drive shaft with the flywheel

18. Name die accessories.

Die set, Die, Die block, Punch, Lower shoe, Upper shoe, Punch plate, Back up plate, Stripper plate, Knockout.

19. Define trimming.

It is used for cutting unwanted excess material from the periphery of a previously formed workpiece.

20. Define shaving

It is almost similar to trimming, but only small amount of material is removed during the operation as compared to trimming

21. What is drawing?

If depth of drawn cup is up to half its diameter then the process is called as shallow drawing and if the depth of the drawn cup exceeds the diameter, it is called as deep drawing.

22 what do you mean by shallow and deep drawing?

If depth cup is upto half its diameter then the process is called as shallow drawing and if the depth of the drawn cup exceeds the diameter, it is called as deep drawing.

23. Define formability.

Formability represents the response and suitability of the material for forming processes.

24. What is process of fracturing?

It states that, ductility of the metal is lower if its section size is larger. It refers to identical metal from which specimens of different section thickness have been machined and tested.

25. Define roll forming

Roll forming process consists of feeding a continuous metal strip through a series of rolls whereby it is gradually formed into required shapes.

UNIT - V MANUFACTURING OF PLASTIC COMPONENTS

1. What are the characteristic of thermoplastics?

Thermoplastics polymers soften when heated and harden, when cooled. These types of polymers are soft and ductile. They have low melting temperature and can be repeatedly moulded and remoulded to the required shapes.

2. List out the material for processing of plastics?

The following mentioned are the various polymer additives used in practice: (1) Filler material (2) Plasticizers (3) Stabilizers (4) colorants (5) Flame retardants (6) Reinforcements (7) Lubricants.

3. List the advantage of cold forming of plastics?

Advantages: 1) Cold forming can be carried out at room temperature. 2) It is used to produce filament and fibres. 3) It is a simple process.

4. What is film blowing?

In this process a heated doughy paste of plastic compound is passed through a series of hot rollers, where it is squeezed into the form of thin sheet of uniform thickness. It is used for making plastic sheets and films.

5. What are the types of plastics?

Polymers are classified in two major categories: o Thermoplastic polymers (Soften when heated and harden when cooled) o Thermosetting polymers (Soften when heated and permanently hardened when cooled).

6. What is compression moulding?

The main objective is to melt the material due to compression.

7. Name the parts made by rotational moulding.

Rotational moulding process is mostly used for the production of toys in P.V.C like horse, boats, etc. Larger containers upto 20 m³ capacity, fuel tanks of automobile are made from polythene and nylon. This process is also used for production of large drums, boat hulls, buckets, housings and carrying cases.

8. What is parison ?

Blow moulding consists of extrusion of the heated tubular plastic piece called as parison which is transferred to the two piece mold.

9. Define degree of polymerization.

It is the number of repetitive units present in one molecule of a polymer. Degree of polymerisation = Molecular weight of a polymer / Molecular weight of a single monomer

10. What is rotational moulding of plastics?

1) Rotational moulding also called as roto-moulding. 2) A measured amount of polymer powder is placed in a thin walled metal mould and the mould is closed. 3) Then the mould is rotated about two mutually perpendicular axes as it is heated.

11. Define characteristic of polymers.

The important characteristic of polymers are 1) Light weight 2) High Corrosion resistance. 3) Low density. 4) Low thermal and electrical properties. 5) Low mechanical properties(can be improved by fibre reinforcement of plastics).

12. On what basis are polymers classified and how are they classified ?

According to mechanical response at high temperatures, polymers are classified into two major categories : 1) Thermoplastic polymers (Soften when heated and harden when cooled) 2) Thermosetting polymers (Soften when heated and permanently hardened when cooled).

13. Give the mechanism of thermosetting polymers.

These plastics are formed by condensation polymerization. During initial heating, covalent cross-links are formed which anchor the chains together and resist the vibration and rotational chain motions at high temperature. If heated to excessively high temperature, there occurs severance of these crosslink bonds leading to polymer degradation.

14. Define Isomerism.

It is a phenomenon where different atomic configurations are responsible for the formation of same configuration.

15. Define Oligo-polymers.

Oligo polymers or oligomers are polymers that have very short chains with molecular weight in order of 100g/mol. They are mainly liquids or gases.

16. Define High polymers.

Polymers which have a very high molecular weight ranging between 10,000 and 1,000,000 g/mol. are known as High-polymers. They are mainly solids.

17. Give the three methods of mechanism of polymerization

There are three general methods or mechanisms of polymerization: (1) Addition Polymerisation (2) Copolymerisation (3) Condensation polymerization

18. Give the three methods of mechanism of polymerization

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19. Define addition polymerization.

The Polymer is produced by adding a second monomer to the first, a third monomer to this dimer and so on till the long polymer chain is terminated. This process is called as addition polymerization.

20. Define copolymerization and give its example.

It is the addition polymerization of two or more different monomer forming copolymers. Example : Styrene and butadiene combine to give a copolymer of butadiene - styrene, a rubber used in tires.

21. Define condensation polymerization and give its other name.

Condensation polymerization is also known as step-growth polymerization. It is the formation of polymers by step wise intermolecular chemical reactions that normally involve at least two different monomers

22. Define pressure forming?

In this method, the heated plastics sheet is formed into the required shape between a pair of male and female dies . In this process vacuum is not used.

23. What is draw forming?

This process is similar to deep drawing process for metal. A heated blank of plastics sheet is plated over a die and held firmly by holding plates. A punch is pressed down into the die cavity to the material into the die and around its own body.

24. Explain the drape forming?

It is the simplest of all methods of forming. It consists of draping the heated plastics sheet over the contours of a male form, followed by pressure and cooling.

25. Define reaction injection moulding?

RIM is the different forms the conventional injection moulding process as the molten polymer is not injected into a mould but a mixture of two or more monomers (reactants) are forced into a mould cavity. The chemical reaction takes places between the mixture and the heat is generated. This generated heat is used to form a plastics polymer that solidifies and produces thermostat components.

