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TYPES OF CASTING

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II BTECH ISEM

TYPES OF CASTING

- ❑ CENTRIFUGAL CASTING
 - ❑ DIE CASTING
 - ❑ INVESTMENT CASTING
 - ❑ SHELL MOULDING
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CENTRIFUGAL CASTING

A family of casting processes in which the mold is rotated at high speed so centrifugal force distributes molten metal to outer regions of die cavity

- ✕ The group includes:
 - + True centrifugal casting
 - + Semicentrifugal casting
 - + Centrifuge casting

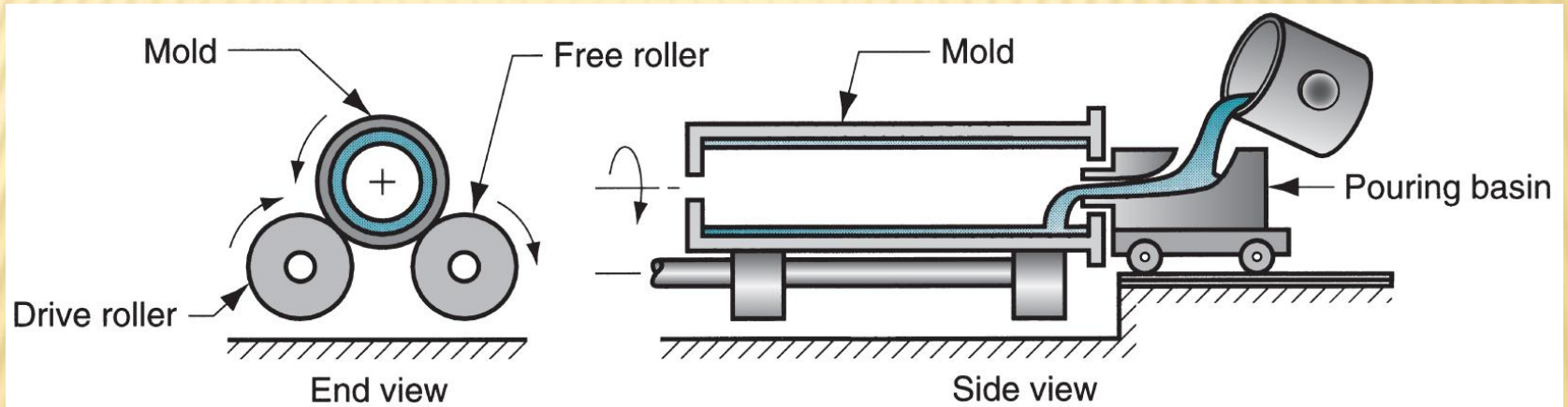
TRUE CENTRIFUGAL CASTING

Molten metal is poured into rotating mold to produce a tubular part

- ✖ In some operations, mold rotation commences after pouring rather than before
- ✖ Parts: pipes, tubes, bushings, and rings
- ✖ Outside shape of casting can be round, octagonal, hexagonal, etc , but inside shape is (theoretically) perfectly round, due to radially symmetric forces

TRUE CENTRIFUGAL CASTING

✖ Setup for true centrifugal casting

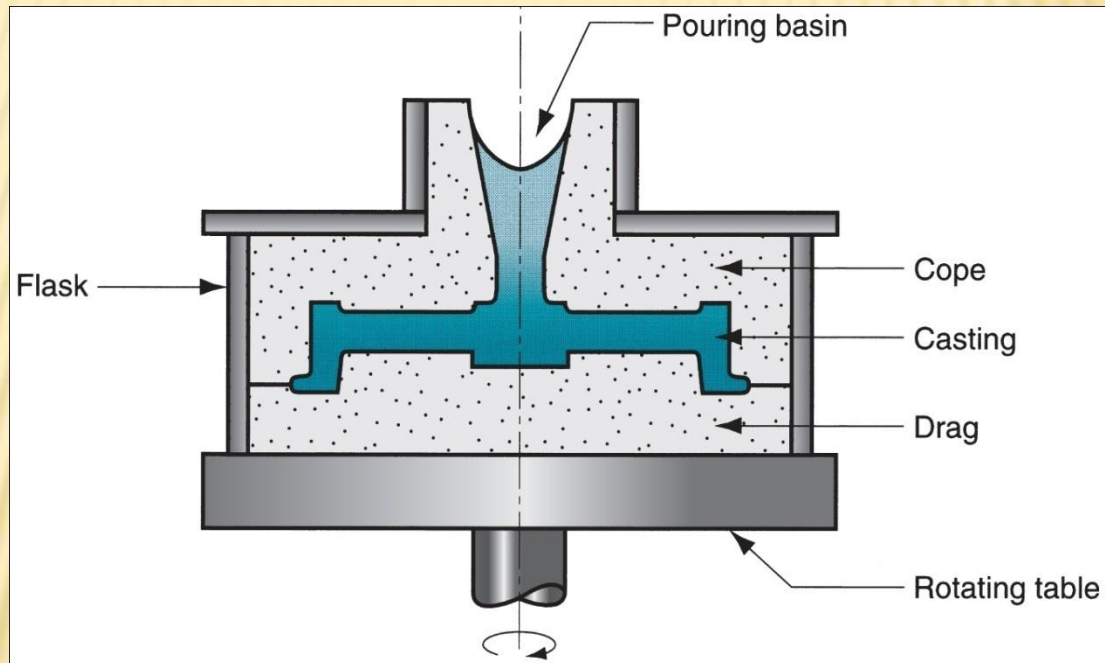


SEMICENTRIFUGAL CASTING

Centrifugal force is used to produce solid castings rather than tubular parts

- ✖ Molds use risers at center to supply feed metal
- ✖ Density of metal in final casting is greater in outer sections than at center of rotation
- ✖ Often used on parts in which center of casting is machined away, thus eliminating the portion where quality is lowest
 - + Examples: wheels and pulleys

SEMICENTRIFUGAL CASTING

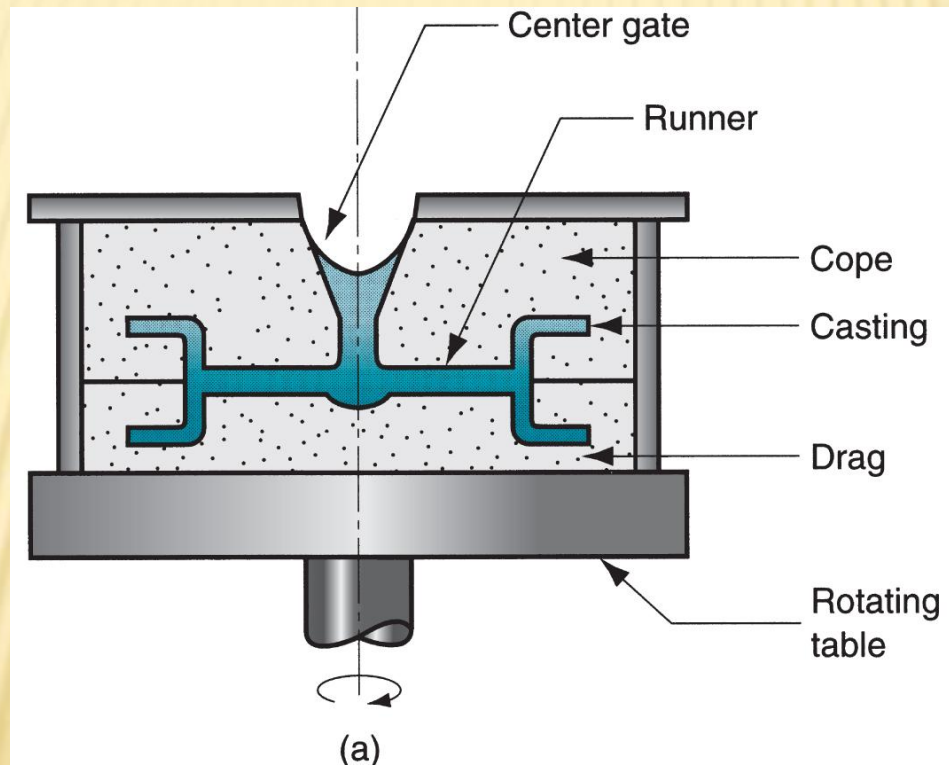


CENTRIFUGE CASTING

Mold is designed with part cavities located away from axis of rotation, so molten metal poured into mold is distributed to these cavities by centrifugal force

- ✗ Used for smaller parts
- ✗ Radial symmetry of part is not required as in other centrifugal casting methods

CENTRIFUGE CASTING



DIE CASTING

A permanent mold casting process in which molten metal is injected into mold cavity under high pressure

- ✖ Pressure is maintained during solidification, then mold is opened and part is removed
- ✖ Molds in this casting operation are called *dies*; hence the name die casting
- ✖ Use of high pressure to force metal into die cavity is what distinguishes this from other permanent mold processes

DIE CASTING MACHINES

- ✘ Designed to hold and accurately close two mold halves and keep them closed while liquid metal is forced into cavity
- ✘ Two main types:
 1. Hot-chamber machine
 2. Cold-chamber machine

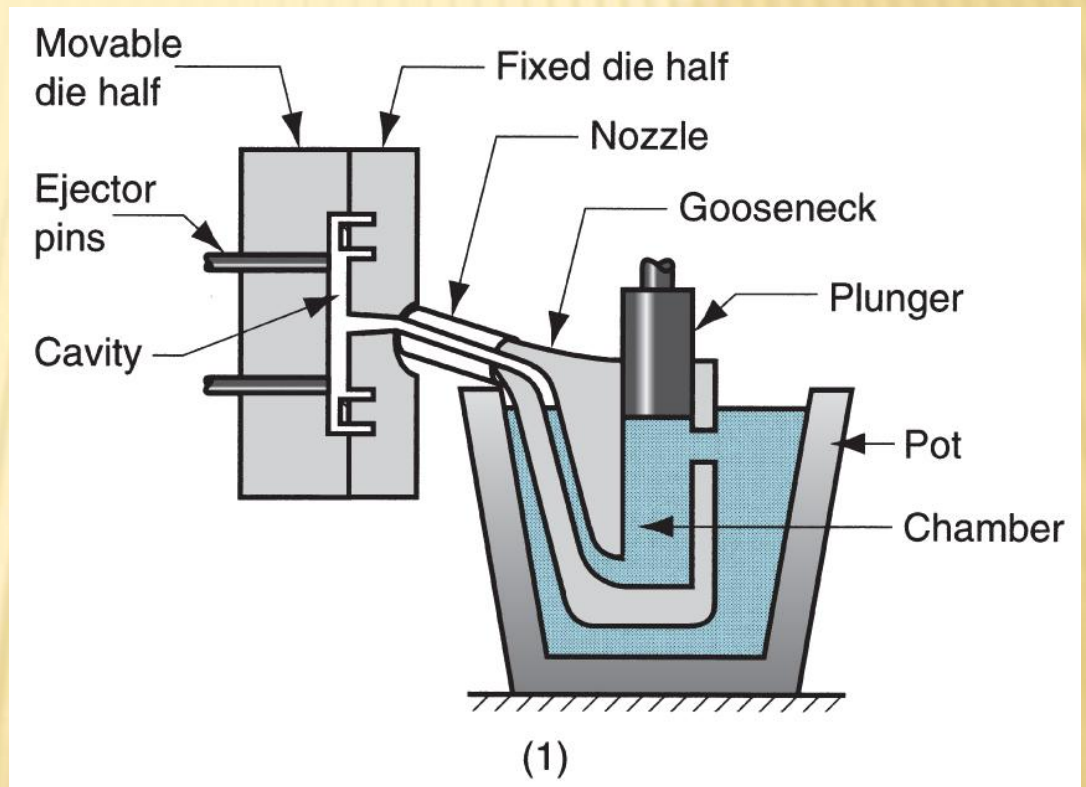
HOT-CHAMBER DIE CASTING

Metal is melted in a container, and a piston injects liquid metal under high pressure into the die

- ✖ High production rates
 - + 500 parts per hour not uncommon
- ✖ Applications limited to low melting-point metals that do not chemically attack plunger and other mechanical components
- ✖ Casting metals: zinc, tin, lead, and magnesium

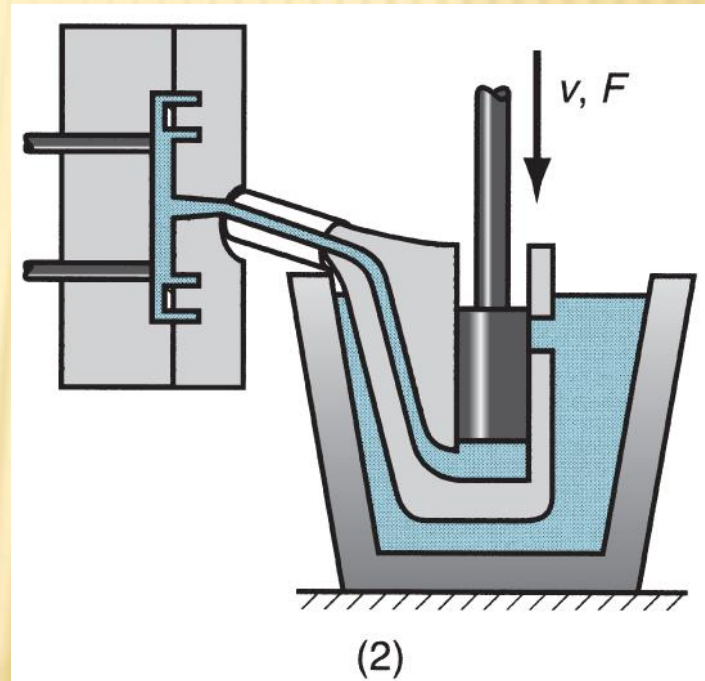
HOT-CHAMBER DIE CASTING

- ✗ Hot-chamber die casting cycle: (1) with die closed and plunger withdrawn, molten metal flows into the chamber



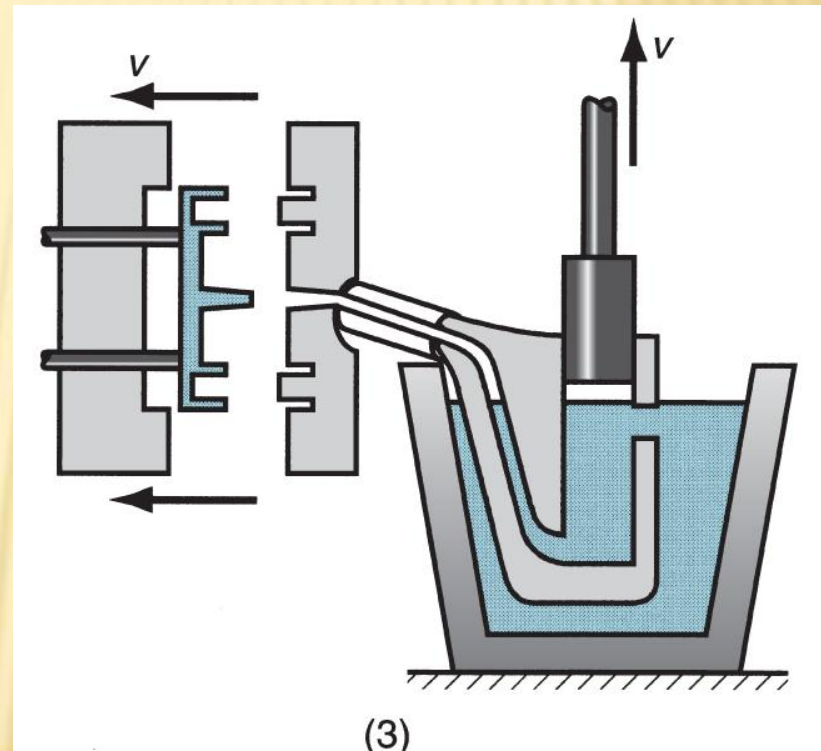
HOT-CHAMBER DIE CASTING

- ✖ (2) plunger forces metal in chamber to flow into die, maintaining pressure during cooling and solidification.



HOT-CHAMBER DIE CASTING

- ✖ (3) Plunger is withdrawn, die is opened, and casting is ejected



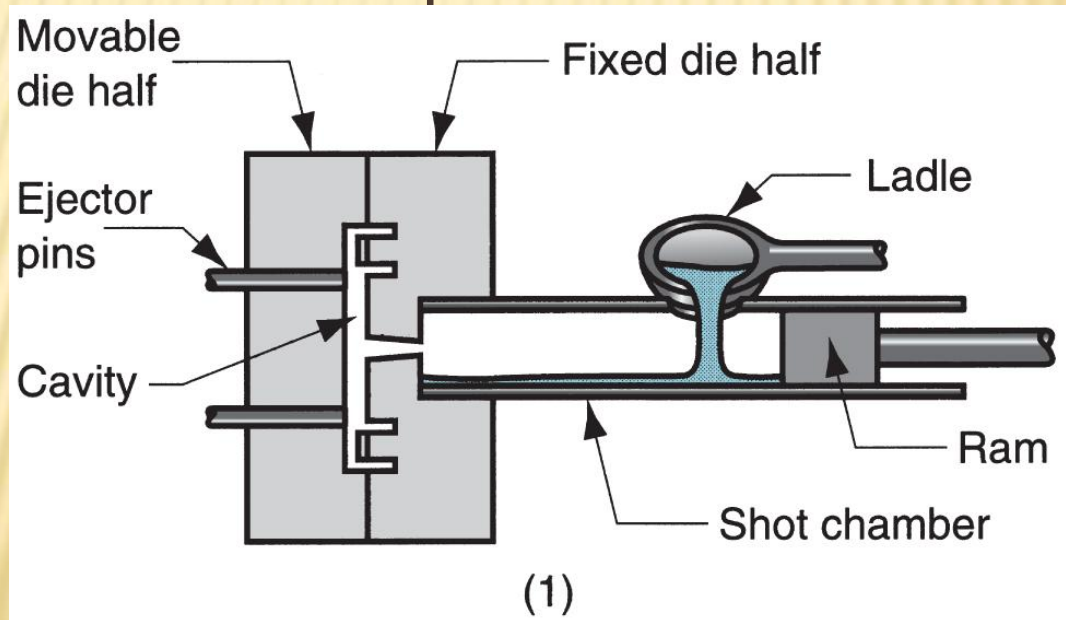
COLD-CHAMBER DIE CASTING MACHINE

Molten metal is poured into unheated chamber from external melting container, and a piston injects metal under high pressure into die cavity

- ✗ High production but not usually as fast as hot-chamber machines because of pouring step
- ✗ Casting metals: aluminum, brass, and magnesium alloys
- ✗ Advantages of hot-chamber process favor its use on low melting-point alloys (zinc, tin, lead)

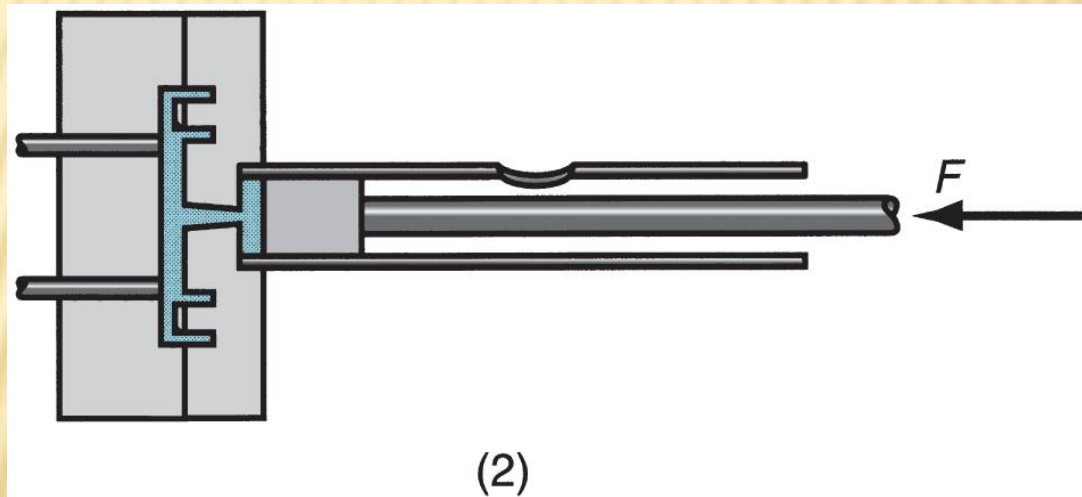
COLD-CHAMBER DIE CASTING CYCLE

- ✗ (1) With die closed and ram withdrawn, molten metal is poured into the chamber



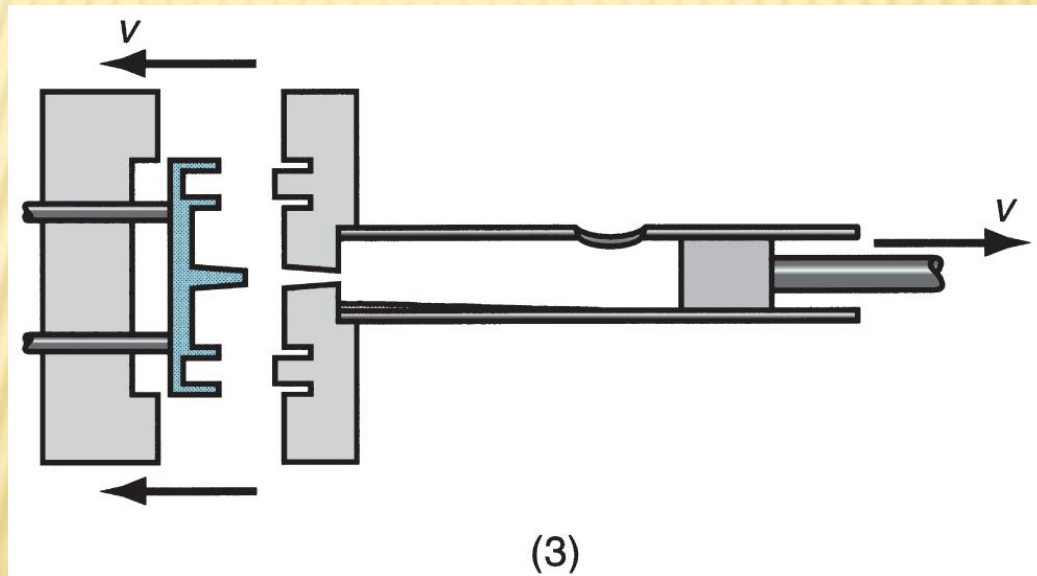
COLD-CHAMBER DIE CASTING CYCLE

- ✗ (2) Ram forces metal to flow into die, maintaining pressure during cooling and solidification



COLD-CHAMBER DIE CASTING CYCLE

- ✗ (3) Ram is withdrawn, die is opened, and part is ejected



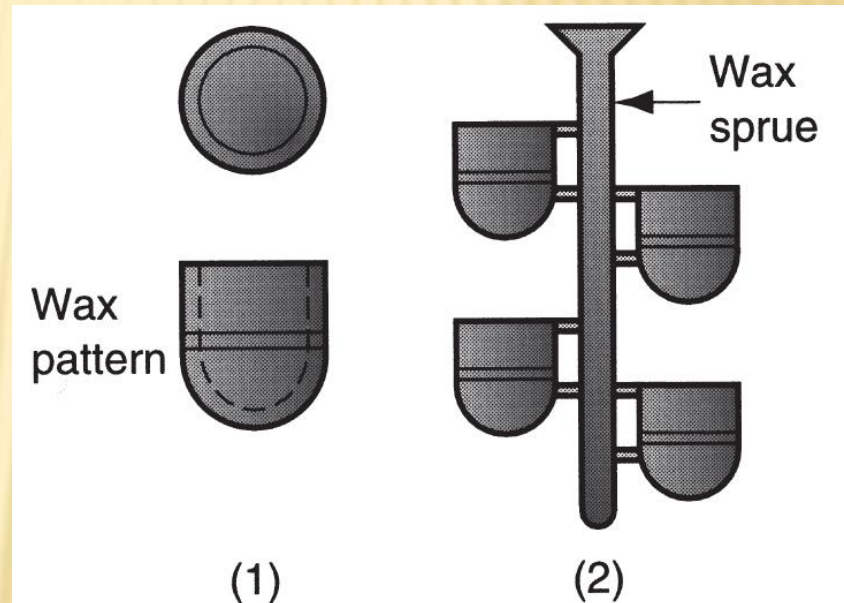
INVESTMENT CASTING (LOST WAX PROCESS)

A pattern made of wax is coated with a refractory material to make the mold, after which wax is melted away prior to pouring molten metal

- ✗ "Investment" comes from a less familiar definition of "invest" - "to cover completely," which refers to coating of refractory material around wax pattern
- ✗ It is a precision casting process
 - + Capable of producing castings of high accuracy and intricate detail

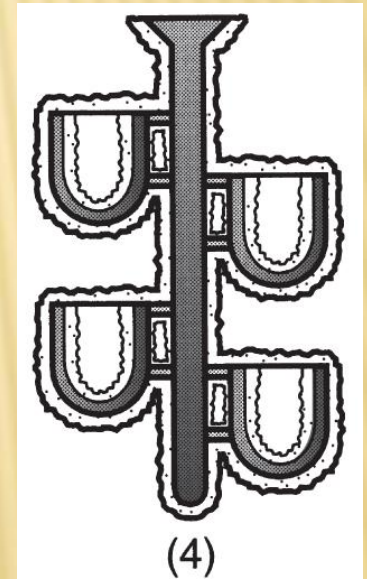
STEPS IN INVESTMENT CASTING

- ✖ (1) Wax patterns are produced
- ✖ (2) Several patterns are attached to a sprue to form a pattern tree



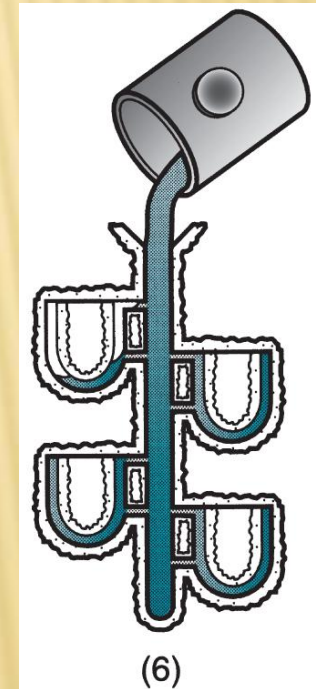
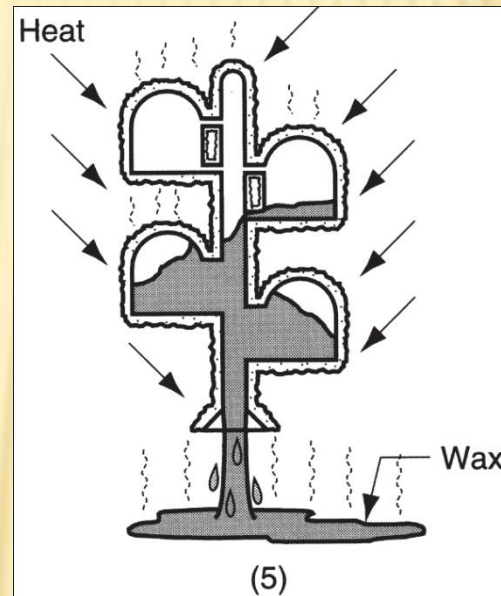
STEPS IN INVESTMENT CASTING

- ✖ (3) Pattern tree is coated with a thin layer of refractory material
- ✖ (4) Full mold is formed by covering the coated tree with sufficient refractory material to make it rigid



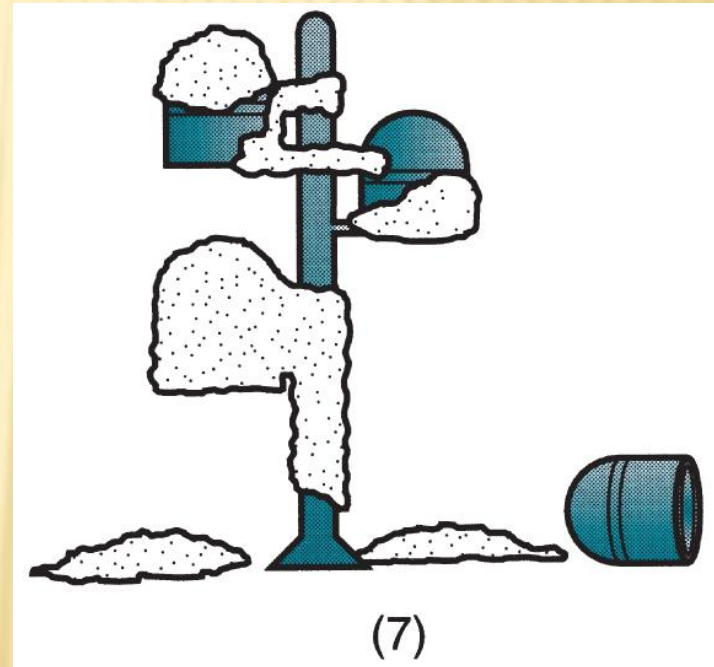
STEPS IN INVESTMENT CASTING

- ✗ (5) Mold is held in an inverted position and heated to melt the wax and permit it to drip out of the cavity
- ✗ (6) Mold is preheated to a high temperature, the molten metal is poured, and it solidifies



STEPS IN INVESTMENT CASTING

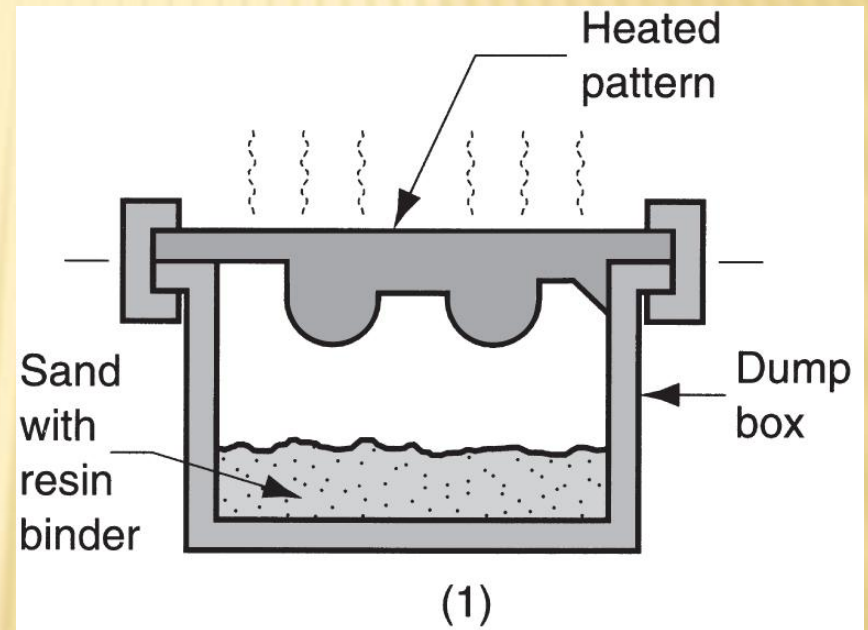
- ✗ (7) Mold is broken away from the finished casting and the parts are separated from the sprue



SHELL MOLDING

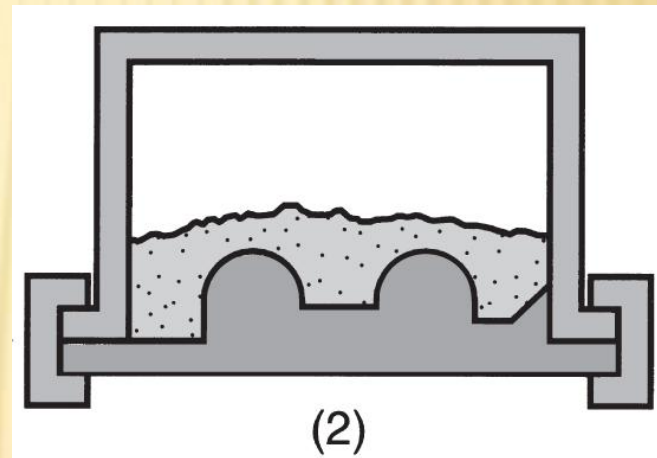
Casting process in which the mold is a thin shell of sand held together by thermosetting resin binder

- ✖ Steps: (1) A metal pattern is heated and placed over a box containing sand mixed with thermosetting resin



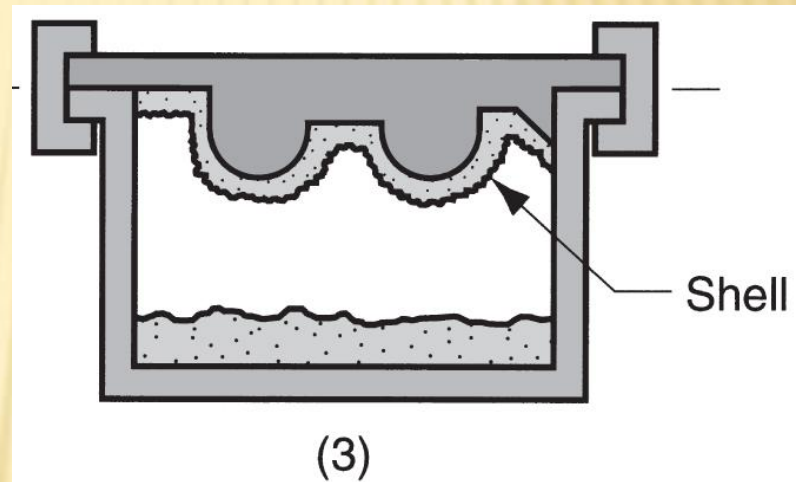
STEPS IN SHELL MOLDING

- ✖ (2) Box is inverted so that sand and resin fall onto the hot pattern, causing a layer of the mixture to partially cure on the surface to form a hard shell



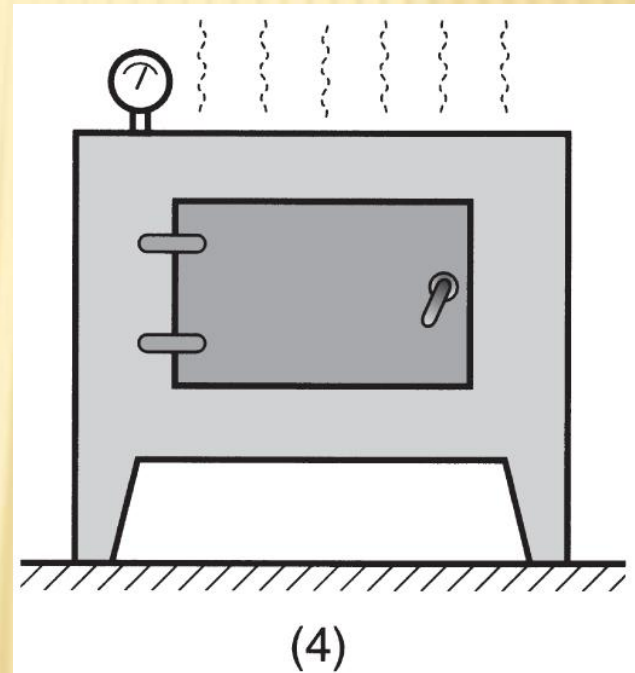
STEPS IN SHELL MOLDING

- ✖ (3) Box is repositioned so loose uncured particles drop away



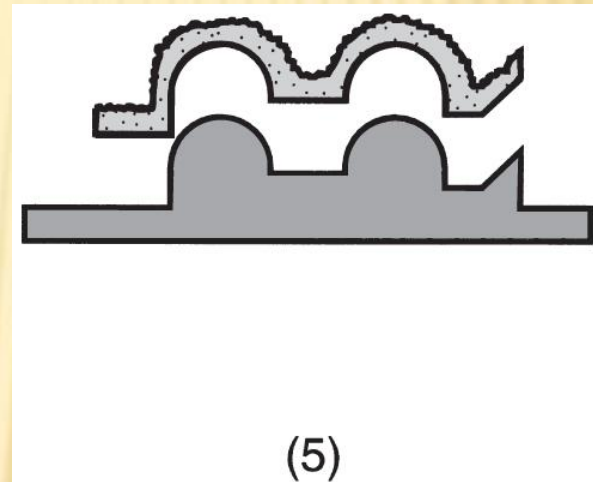
STEPS IN SHELL MOLDING

- ✖ (4) Sand shell is heated in oven for several minutes to complete curing



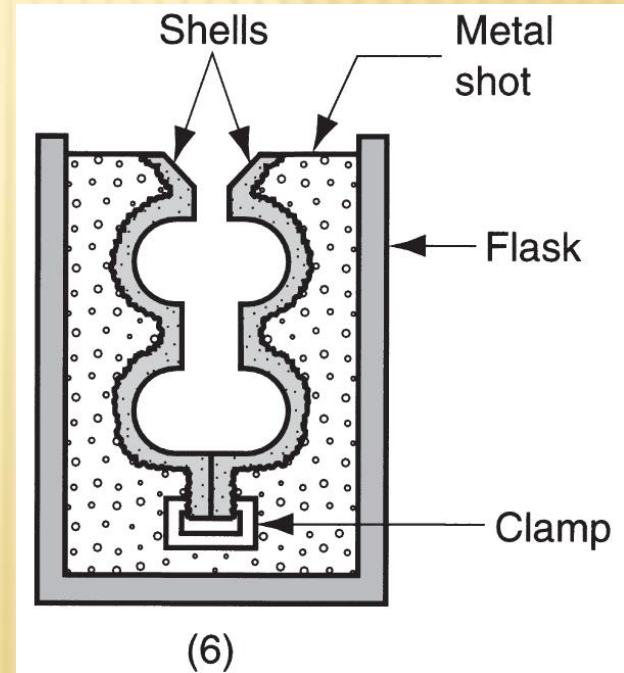
STEPS IN SHELL MOLDING

- ✗ (5) shell mold is stripped from pattern



STEPS IN SHELL MOLDING

- ✖ (6) Two halves of the shell mold are assembled, supported by sand or metal shot in a box, and pouring is accomplished



STEPS IN SHELL MOLDING

- ✖ (7) Finished casting with sprue removed

