Materials Engineering Department
Casting Technology

Fourth Class

General Materials Branch

Lecture Six :Investment Casting

Investment Casting

1. *Produce a master pattern*
2. *From the master pattern, produce a master die*
3. *Produce wax patterns*
4. *Assemble the wax patterns onto a common wax sprue*
5. Coat the cluster or tree with a thin layer of investment material

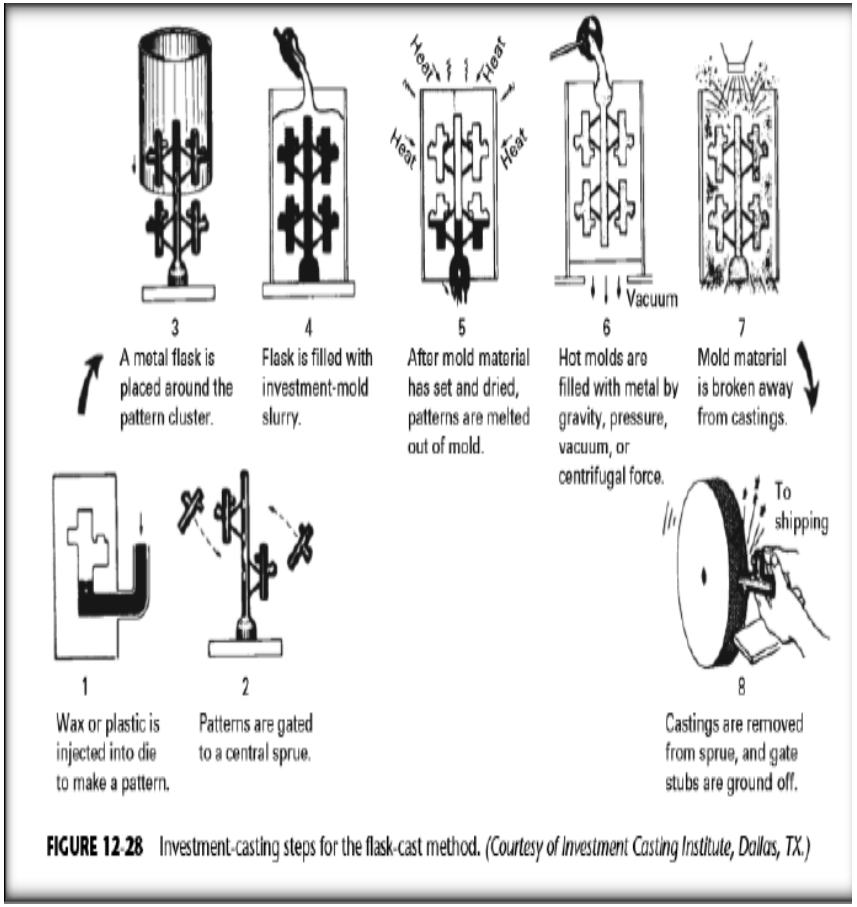


FIGURE 12-28 Investment-casting steps for the flask-cast method. *(Courtesy of Investment Casting Institute, Dallas, TX.)*

Investment Casting

6. *Form additional investment around the coated cluster*
7. Allow the investment to fully harden
8. *Remove the wax pattern from the mold by melting or dissolving*
9. *Heat the mold in preparation for pouring*
10. *Pour the molten metal*
11. *Remove the solidified casting from the mold.*

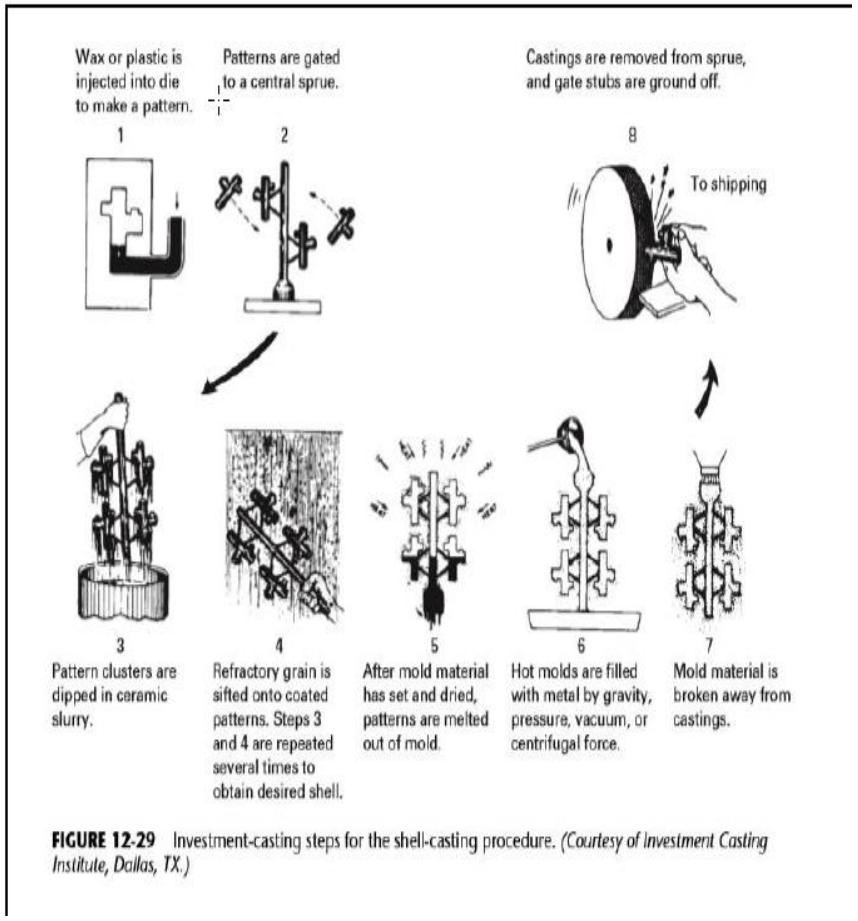


FIGURE 12-29 Investment-casting steps for the shell-casting procedure. *(Courtesy of Investment Casting Institute, Dallas, TX.)*

EVAPORATIVE PATTERN (FULL-MOLD AND LOST-FOAM) CASTING

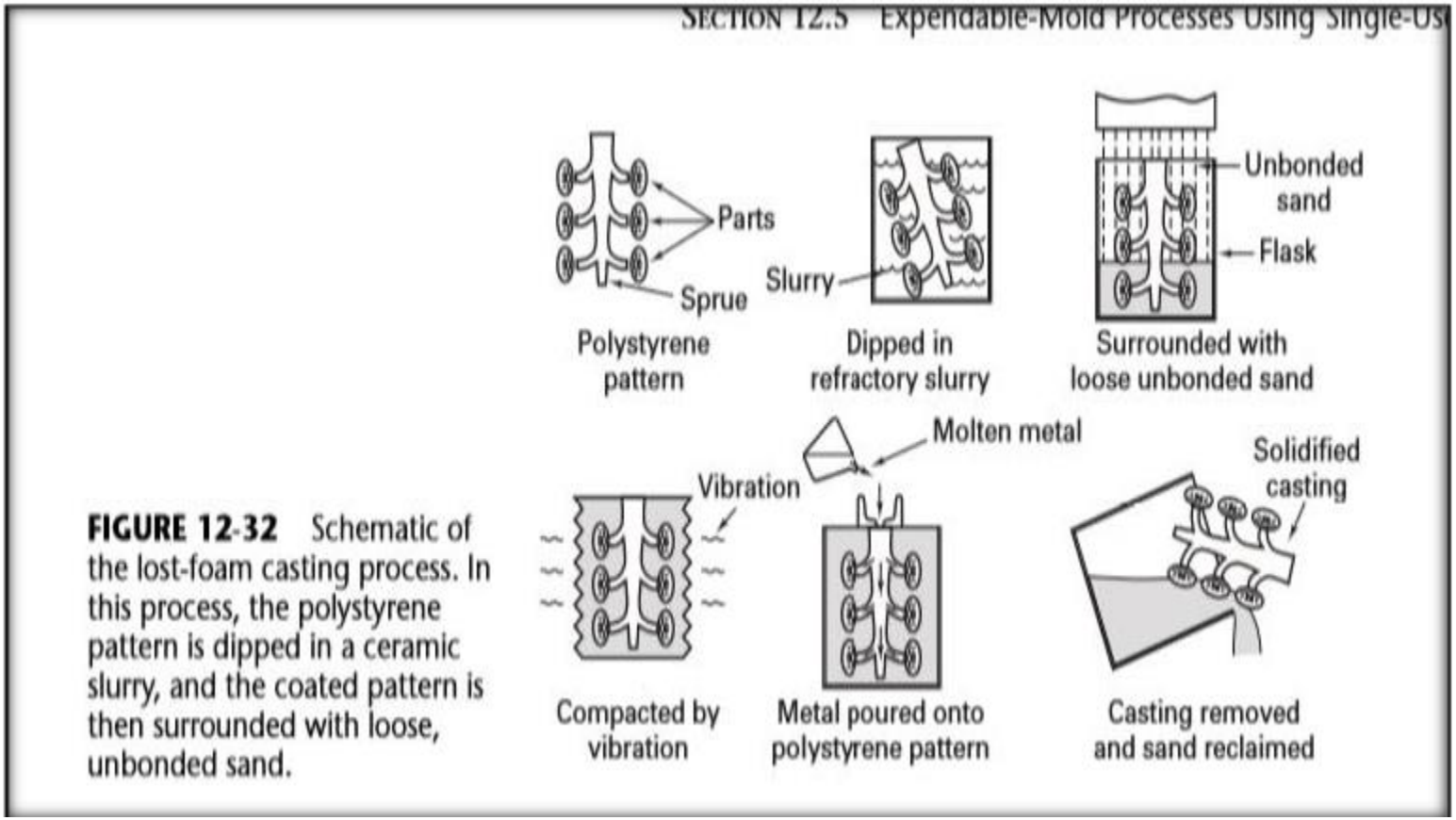
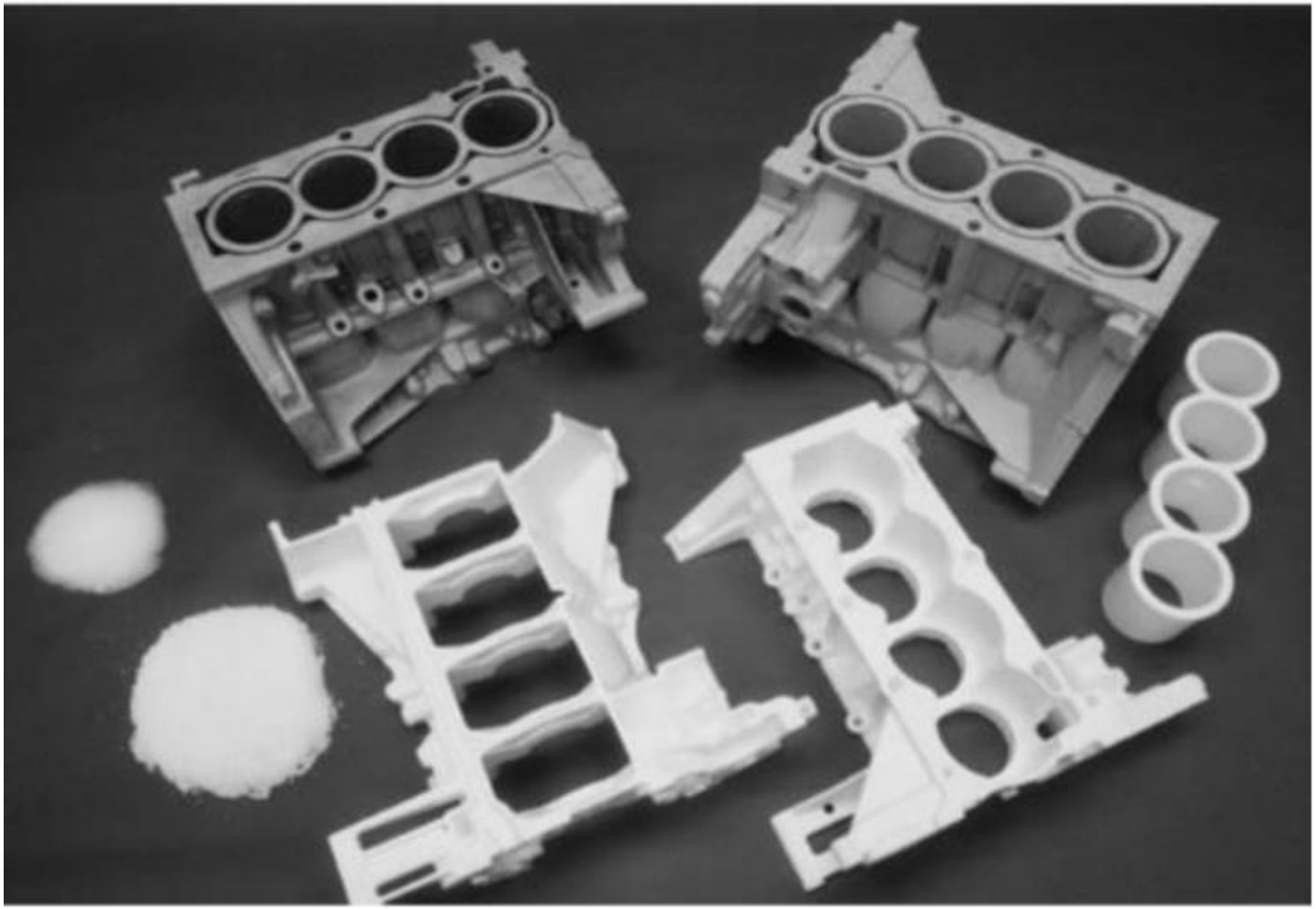


FIGURE 12-32 Schematic of the lost-foam casting process. In this process, the polystyrene pattern is dipped in a ceramic slurry, and the coated pattern is then surrounded with loose, unbonded sand.

EVAPORATIVE PATTERN (FULL-MOLD AND LOST-FOAM) CASTING



In Summary

Lost Foam Casting

1. Process: A pattern containing a sprue, runners, and risers is made from single or multiple pieces of foamed plastic, such as polystyrene. It is dipped in a ceramic material, dried, and positioned in a flask, where it is surrounded by loose sand. Molten metal is poured directly onto the pattern, which vaporizes and is vented through the sand.
2. Advantages: Almost no limits on shape and size; most metals can be cast ;no draft is required and no flash is present (no parting lines).
3. Limitations: Pattern cost can be high for small quantities; patterns are easily damaged or distorted because of their low strength.

Investment Casting

1. Process: A refractory slurry is formed around a wax or plastic pattern and allowed to harden. The pattern is then melted out and the mold is baked. Molten metal is poured into the mold and solidifies. The mold is then broken away from the casting.
2. Advantages: Excellent surface finish; high dimensional accuracy; almost unlimited intricacy; almost any metal can be cast; no flash or parting line concerns.
3. Limitations: Costly patterns and molds; labor costs can be high; limited size.

In Summary

Lost Foam Casting

4. Common metals: Aluminum, iron, steel ,and nickel alloys ;also performed with copper and stainless steel.
5. Size limits: 0.5 kg to several thousand kg (1 lb to several tons).
6. Thickness limits: As small as 2.5 mm (0.1 in.) with no upper limit.
7. Typical tolerances: 0.003 cm/cm (0.003 in./in.) or less.
8. Draft allowance: None required.
9. Surface finish: 2.5–25 microns (100–1000 µin.) rms

Investment Casting

4. *Common metals: Just about any castable metal. Aluminum, copper, and steel dominate; also performed with stainless steel, nickel, magnesium, and the precious metals.*
5. *Size limits: As small as 3 g (oz) but usually less than 5 kg (10 lb).*
6. *Thickness limits: As thin as 0.06 cm (0.025 in.), but less than 7.5 cm (3.0 in.).*
7. *Typical tolerances: 0.01 cm for the first 2.5 cm (0.005 in. for the first inch) and 0.002 cm for each additional cm (0.002 in. for each additional in.).*
8. *Draft allowances: None required.*
9. *Surface finish: 1.3–4 microns (50 to 125 µin.) rms*

COUNTER-GRAVITY INVESTMENT CASTING