

CHAPTER 15

Multiple-Use Mold Casting Processes

Review Questions

1. The major disadvantage of the expendable-mold casting processes is the requirement that a separate mold be created for each casting. Variations in mold consistency, mold strength, moisture content, pattern removal, and other factors contribute to dimensional and property variation within a production lot.

2. Since the multiple-use molds are generally made from metal, the processes are often restricted to the casting of the lower-melting-point nonferrous metals and alloys. Part size is often limited, and the dies or molds can be rather costly.

3. The reusable molds for permanent mold casting are frequently made from gray cast iron, steel, bronze, or graphite. Aluminum, magnesium, and the copper-based alloys are the metals most frequently cast.

4. Advantages of the permanent-mold casting process include: a reusable mold, good surface finish and dimensional accuracy, the possibility of controlling solidification to give desired properties, and a fast cooling rate to produce a strong structure. Cores can be used to increase the complexity of the castings.

5. Permanent molds, and ancillary equipment, have to be designed to have long lives and so tooling costs for permanent mold casting operations are high. Setup and operating costs are also high. This high process cost cannot be recovered in low part production runs.

6. Permanent mold life depends on part material related characteristics such as melting temperature and melt-mold material compatibility and process related conditions such as pouring temperature and mold temperature.

The primary mold feature that influences mold life is difference in section size through the mold. Different section sizes produce temperature gradients and so differences in mold expansion contraction and also determine the flow patterns as the melt fills the mold.

7. Permanent-mold castings are generally removed from the mold immediately after solidification because the rigid cavity offers great resistance to shrinkage. Tearing might occur if the part is restrained while cooling.

8. Permanent molds are not permeable and usually have smooth mating surface. Venting is usually implemented using slight opening between the mold halves or the addition of small vent holes and passages from the mold cavity to the outside.

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9. Slush casting can be used to produce hollow shapes with good surface detail. Wall thickness is variable, so products are largely decorative items, such as candlesticks, lamp bases, and statuary.

10. Low-pressure permanent-mold casting introduces the molten metal into the die by forcing it upward through a vertical tube. The driving force is a low pressure of 5 to 15 psi applied the molten bath.