

4. Special Casting Processes

4-a. Investment Casting Process (lost wax)

The root of the investment casting process, the **cire perdue** or “**lost wax**” method dates back to at least the fourth millennium B.C. The artists and sculptors of ancient Egypt and Mesopotamia used the rudiments of the investment casting process to create intricately detailed jewelry, pectorals and idols. The investment casting process also called lost wax process begins with the production of wax replicas or patterns of the desired shape of the castings. A pattern is needed for every casting to be produced. The patterns are prepared by injecting wax or polystyrene in a metal dies. A number of patterns are attached to a central wax sprue to form an assembly. The mold is prepared by surrounding the pattern with refractory slurry that can set at room temperature. The mold is then heated so that pattern melts and flows out, leaving a clean cavity behind. The mould is further hardened by heating and the molten metal is poured while it is still hot. When the casting is solidified, the mold is broken and the casting taken out.

The basic steps of the investment casting process are (**Figure 9**) :

1. Production of heat-disposable wax, plastic, or polystyrene patterns
2. Assembly of these patterns onto a gating system
3. “Investing,” or covering the pattern assembly with refractory slurry
4. Melting the pattern assembly to remove the pattern material
5. Firing the mold to remove the last traces of the pattern material
6. Pouring
7. cutoff and finishing.

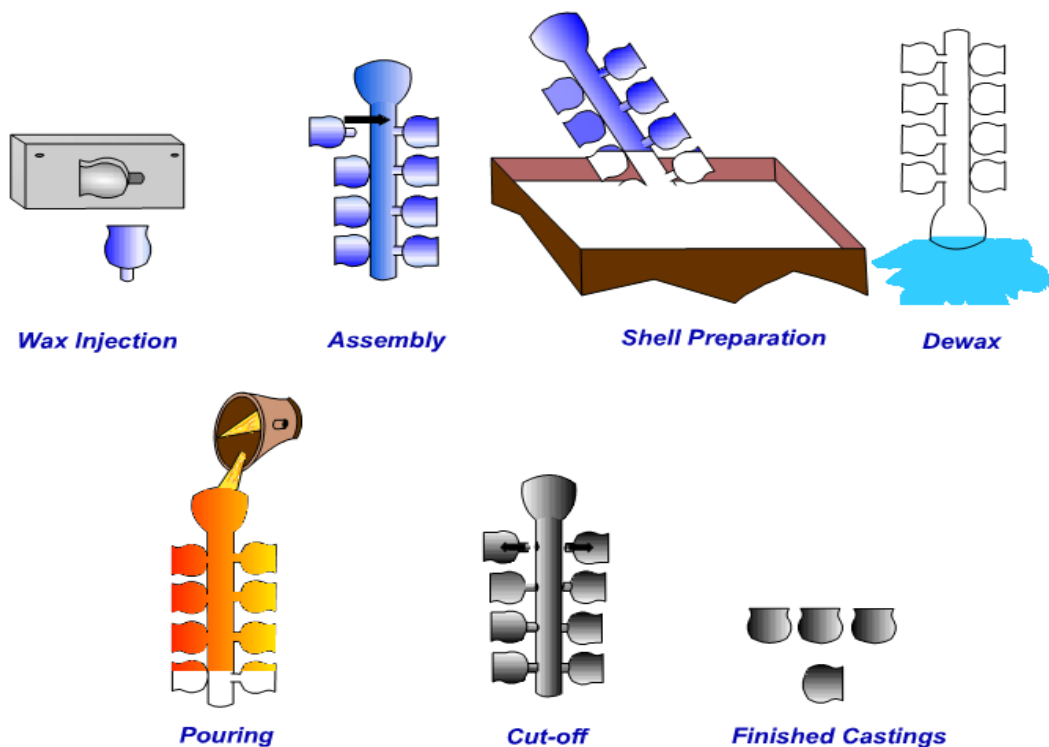


Figure 9: The Basic Steps of the Investment Casting Process

4-b. Ceramic Shell Investment Casting Process

The basic difference in investment casting is that in the investment casting the wax pattern is immersed in a refractory aggregate before dewaxing whereas, in ceramic shell investment casting a ceramic shell is built around a tree assembly by repeatedly dipping a pattern into a slurry (refractory material such as zircon with binder). After each dipping and stuccoing is completed, the assembly is allowed to thoroughly dry before the next coating is applied. Thus, a shell is built up around the assembly. The thickness of this shell is dependent on the size of the castings and temperature of the metal to be poured.

After the ceramic shell is completed, the entire assembly is placed into an autoclave or flash fire furnace at a high temperature. The shell is heated to about 982 C° to burn out any residual wax and to develop a high-temperature bond in the shell. The shell molds can then be stored for future use or molten metal can be poured into them immediately. If the shell molds are stored, they have to be preheated before molten metal is poured into them.

Advantages

- excellent surface finish
- tight dimensional tolerances
- machining can be reduced or completely eliminated