

Advantages and Disadvantages of Investment Casting

INVESTMENT CASTING

➤ Advantages:

- Parts of great complexity and intricacy can be cast
- Close dimensional control and good surface finish
- Wax can usually be recovered for reuse
- Additional machining is not normally required - this is a net shape process

➤ Disadvantages:

- Many processing steps are required
- Relatively expensive process



MULTIPLE MOLD CASTINGS

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Expendable Mold Castings

- Variation in mold strength, moisture content, pattern removal lead to dimensional and property variation.

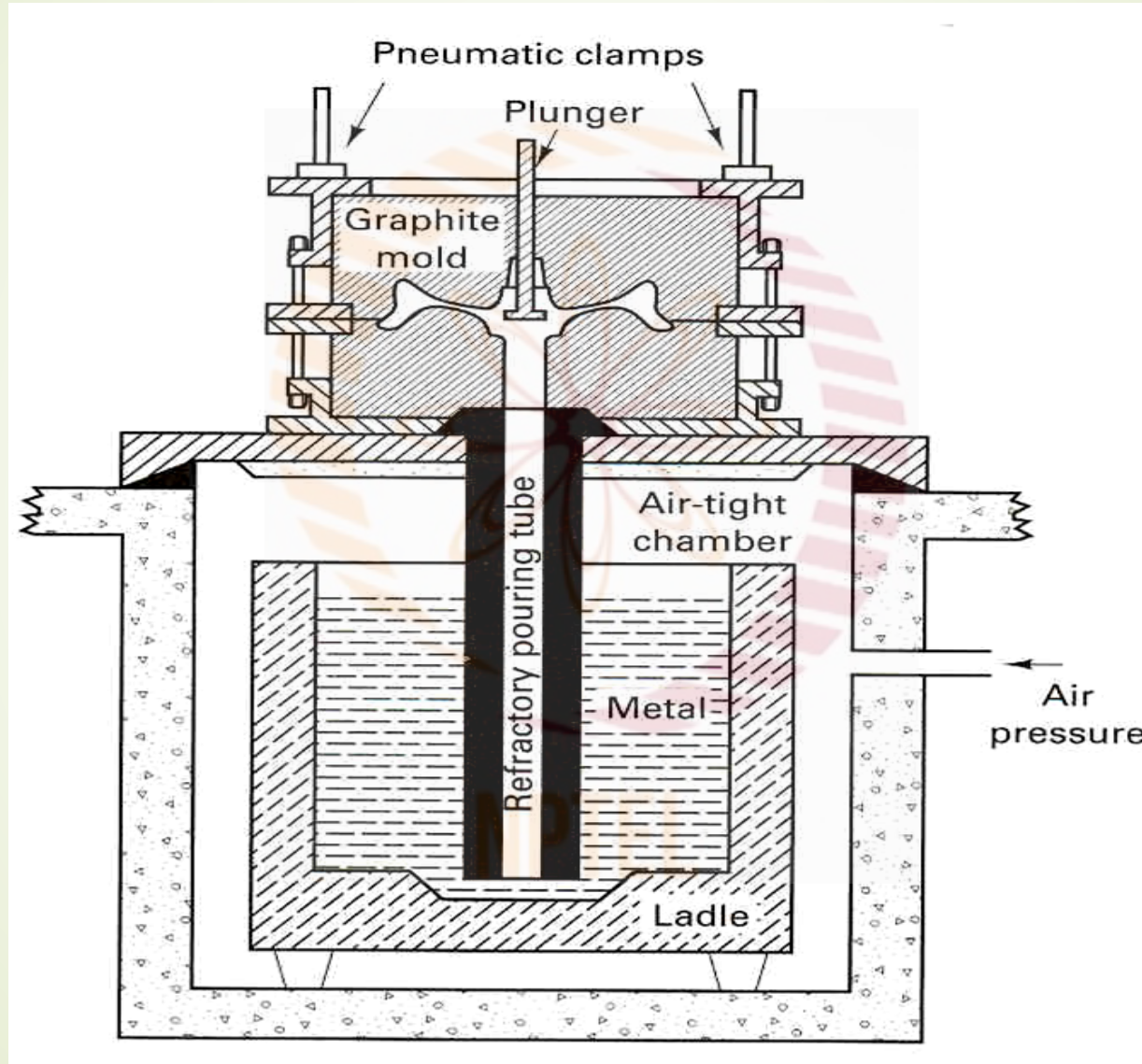
Permanent Mold Castings

- Machined mold made of cast iron, steel, graphite.
- Metal poured under gravity, vacuum, high pressure



PERMANENT MOLD CASTING

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PERMANENT MOLD CASTING

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- Metal molds are commonly made of steel or cast iron.
- The cavity, with gating system included, is machined into the two halves to provide accurate dimensions and good surface finish.
- Metals commonly cast in permanent molds include aluminum, magnesium, copper-base alloys, and cast iron. However, cast iron requires a high pouring temperature, 1250C to 1500C.
- Cores can be used in permanent molds to form interior surfaces in the cast product. The cores can be made of metal,

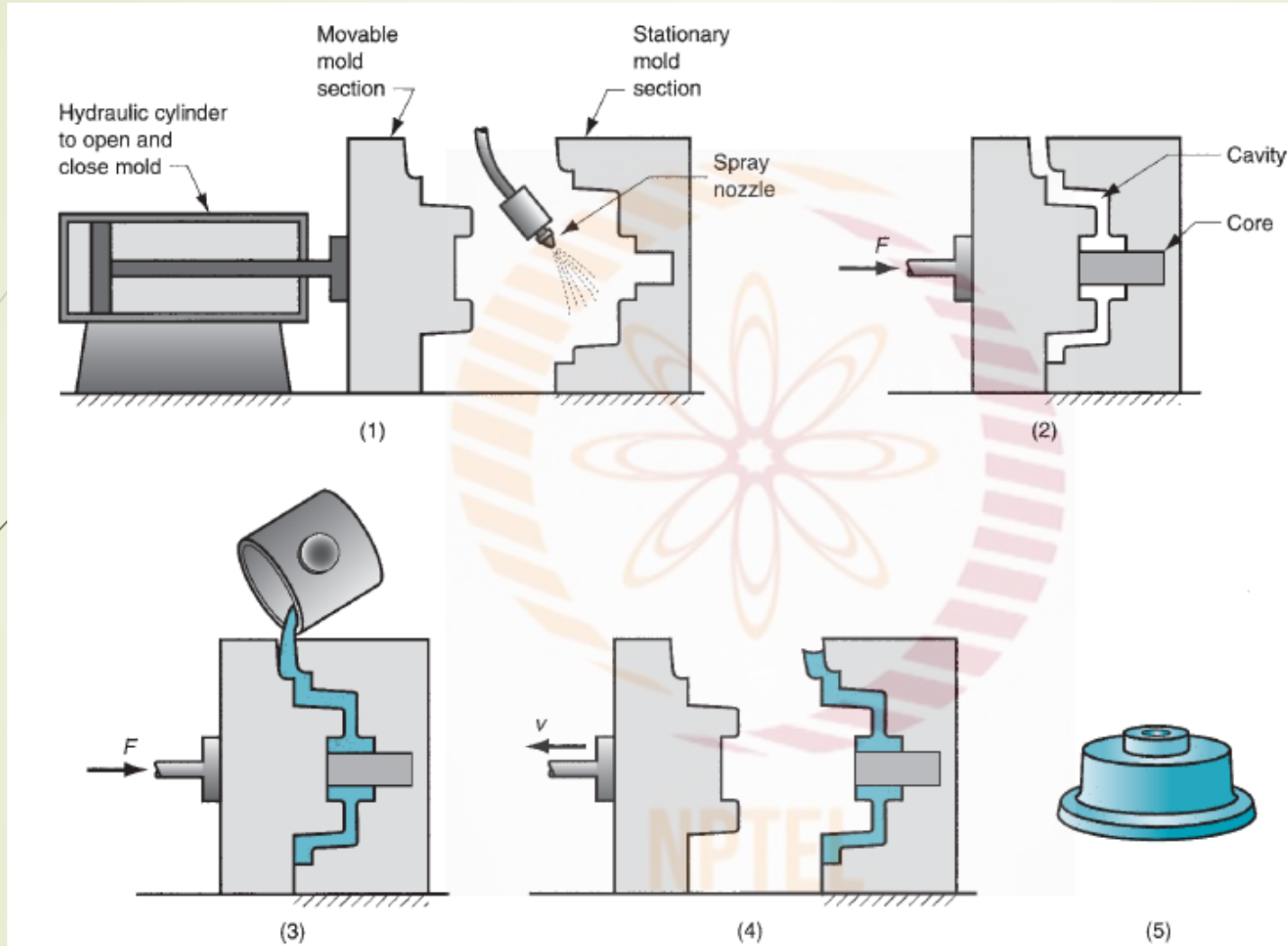
PERMANENT MOLD CASTING

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- If withdrawal of a metal core would be difficult or impossible, sand cores can be used, in which case the casting process is often referred to as semi permanent-mold casting.
- The mold is first preheated and one or more coatings are sprayed on the cavity
- The coatings aid heat dissipation and lubricate the mold surfaces for easier separation of the cast product.

STEPS IN PERMANENT MOLD CASTING

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Steps in permanent-mold casting: (1) mold is preheated and coated; (2) cores (if used) are inserted, and mold is closed; (3) molten metal is poured into the mold; and (4) mold is opened. Finished part is shown in (5).

Advantages and Limitations of Permanent Mold Casting

➤ Advantages:

- Good dimensional control and surface finish
- More rapid solidification caused by the cold metal mold results in a finer grain structure, so stronger castings are produced

➤ Limitations:

- Generally limited to metals of lower melting point
- Simple part geometries compared to sand casting because of the need to open the mold
- High cost of mold

Applications of Permanent Mold Casting

- **Due to high mold cost, process is best suited to high volume production and can be automated accordingly**
- **Typical parts: automotive pistons, pump bodies, and certain castings for aircraft and missiles**
- **Metals commonly cast: aluminum, magnesium, copper-base alloys, and cast iron**



Die Casting

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A permanent mold casting process in which molten metal is injected into mold cavity under high pressure (7 to 350 Mpa)

- **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

Die Casting

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