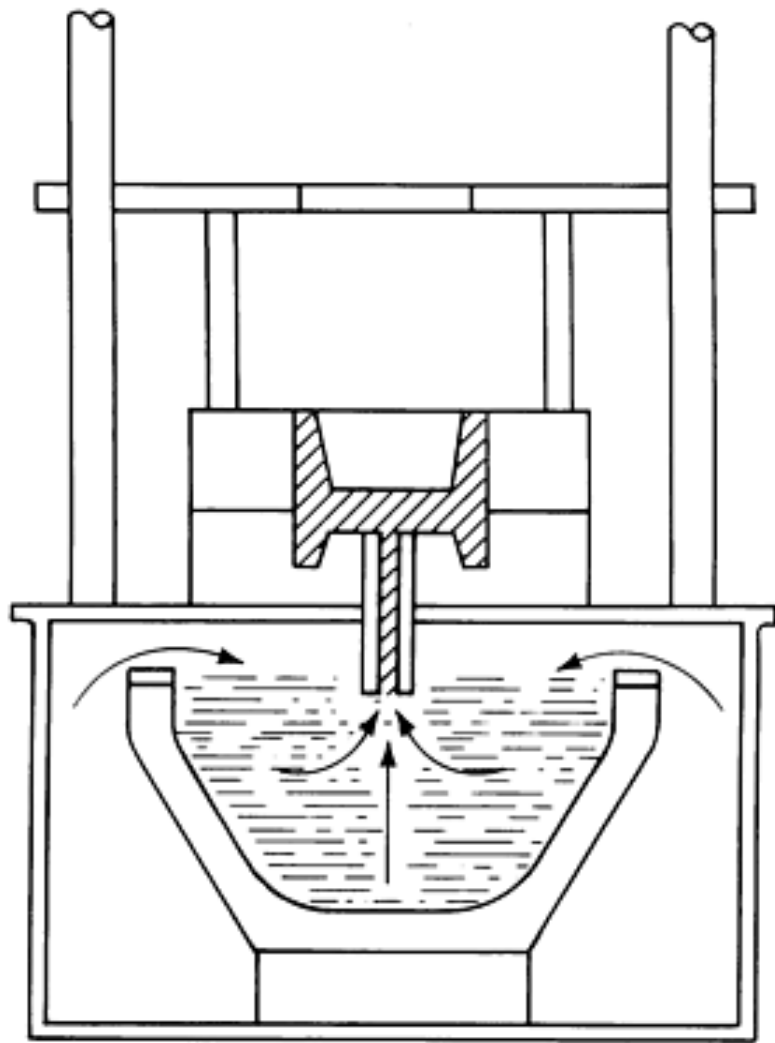


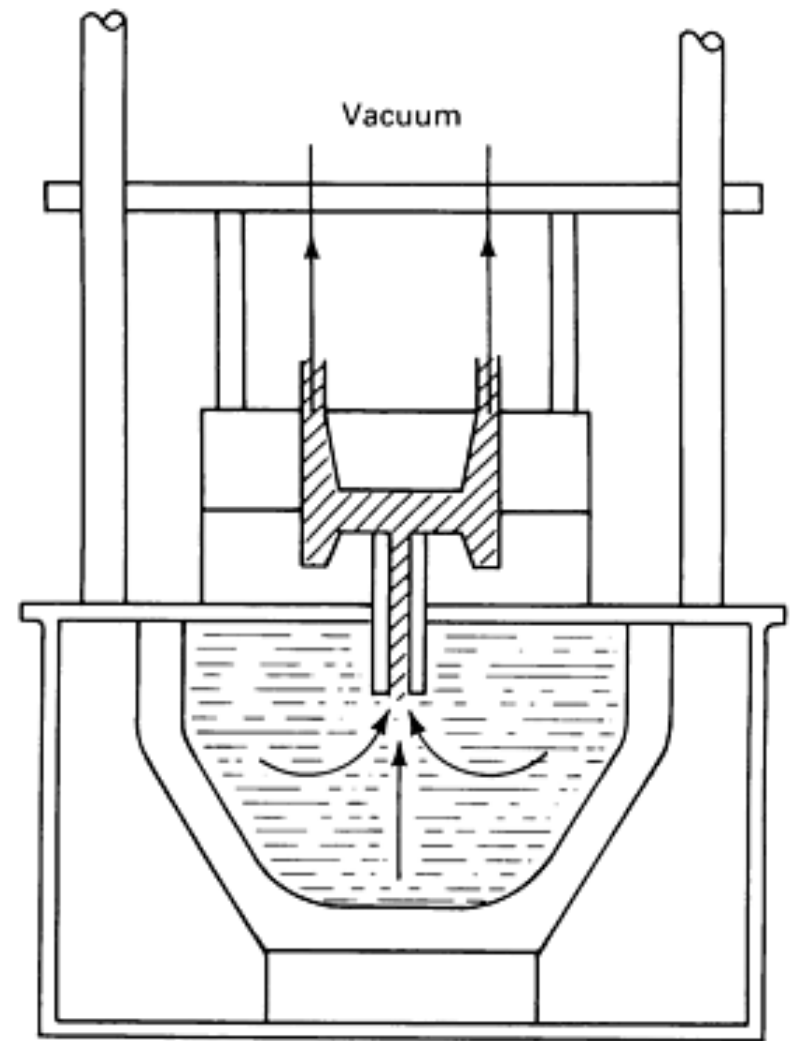
Low Pressure Die Casting

Dr. Serhat ACAR

In low-pressure die casting, the mould is placed in a casting device above a sealed airtight chamber that contains a crucible holding molten metal. A fill tube extends from the mould down into the molten metal bath. The casting is made by pressurizing the chamber and forcing the metal up into the mould. The metal in the fill tube acts as the riser; this gives low-pressure die casting very favorable casting yields. The low-pressure method lends itself to automation, and it usually runs at lower mould temperatures and with shorter cycle times than conventional gravity-poured permanent mould methods. The rapid solidification rates associated with low-pressure casting result in castings with finer grain size, smaller dendrite arm spacings, and enhanced mechanical properties.



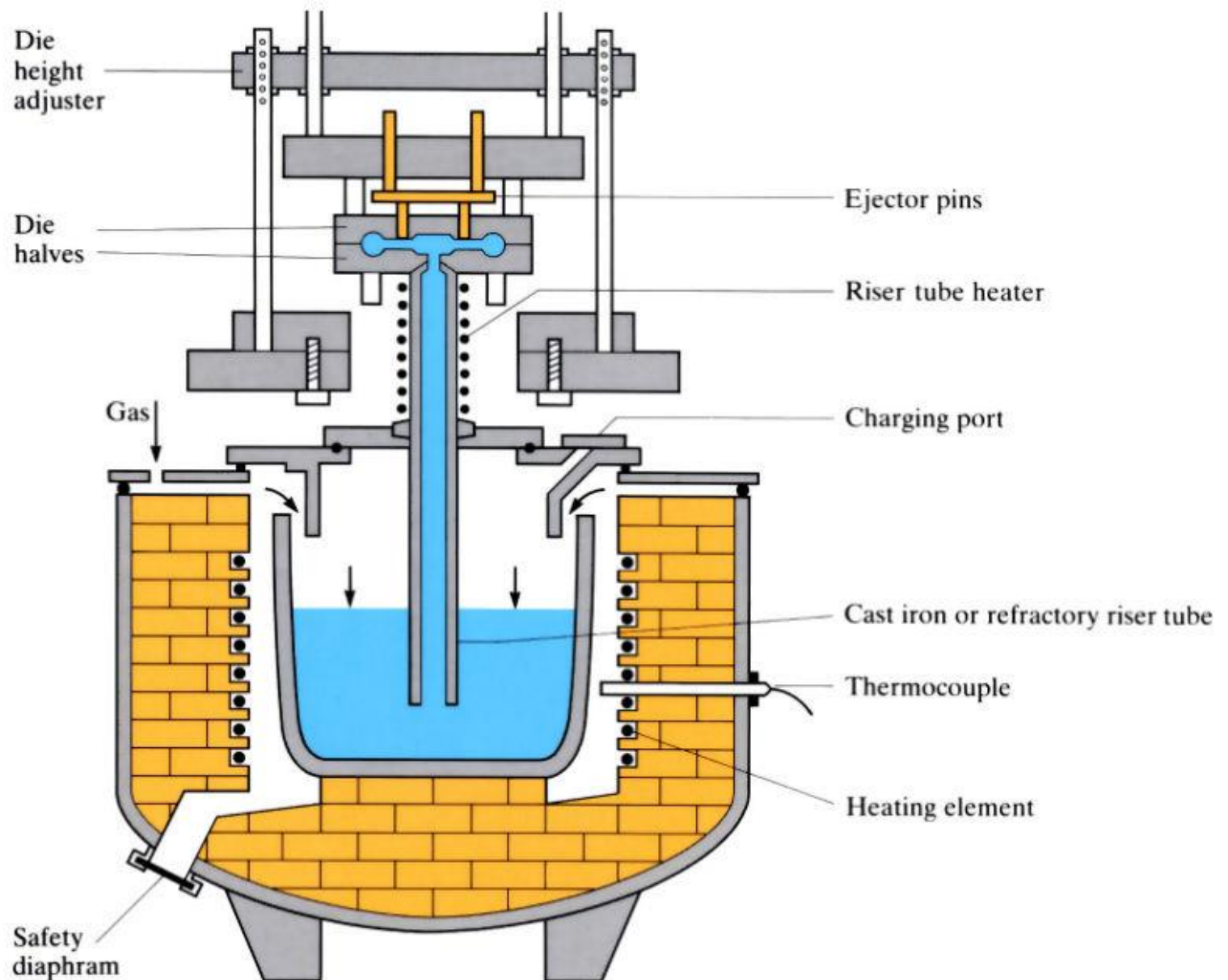
(a)



(b)

Schematics of low-pressure (a) and vacuum casting (b) units used with permanent moulds

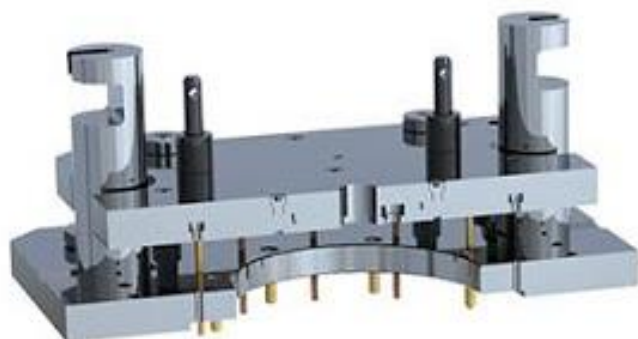
Vacuum casting is similar to low-pressure casting, except a vacuum is created within the mould cavity and the metal is pulled rather than pushed into the mould. Excellent mechanical properties and high production rates are often realized in vacuum casting because of the low mould temperatures associated with the method. As with low-pressure die casting, the metal in the fill tube acts as a riser, and excellent metal yields are obtainable. The process lends itself to automation, and the result is the ability to produce large quantities of high-quality castings at a competitive price. The process is usually associated with smaller castings and requires specialized, complex mould designs to induce the vacuum properly.

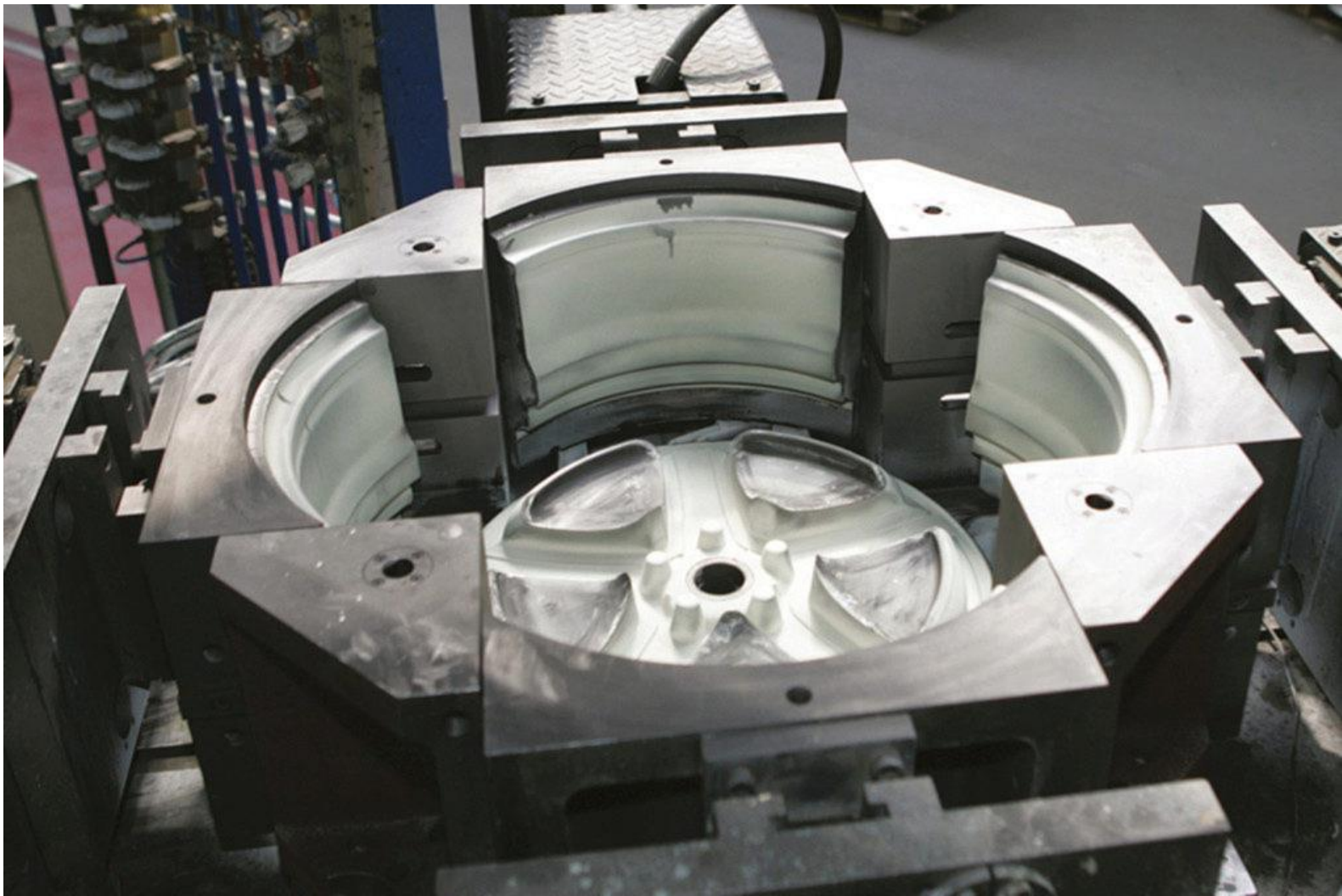




Differences from high pressure die casting

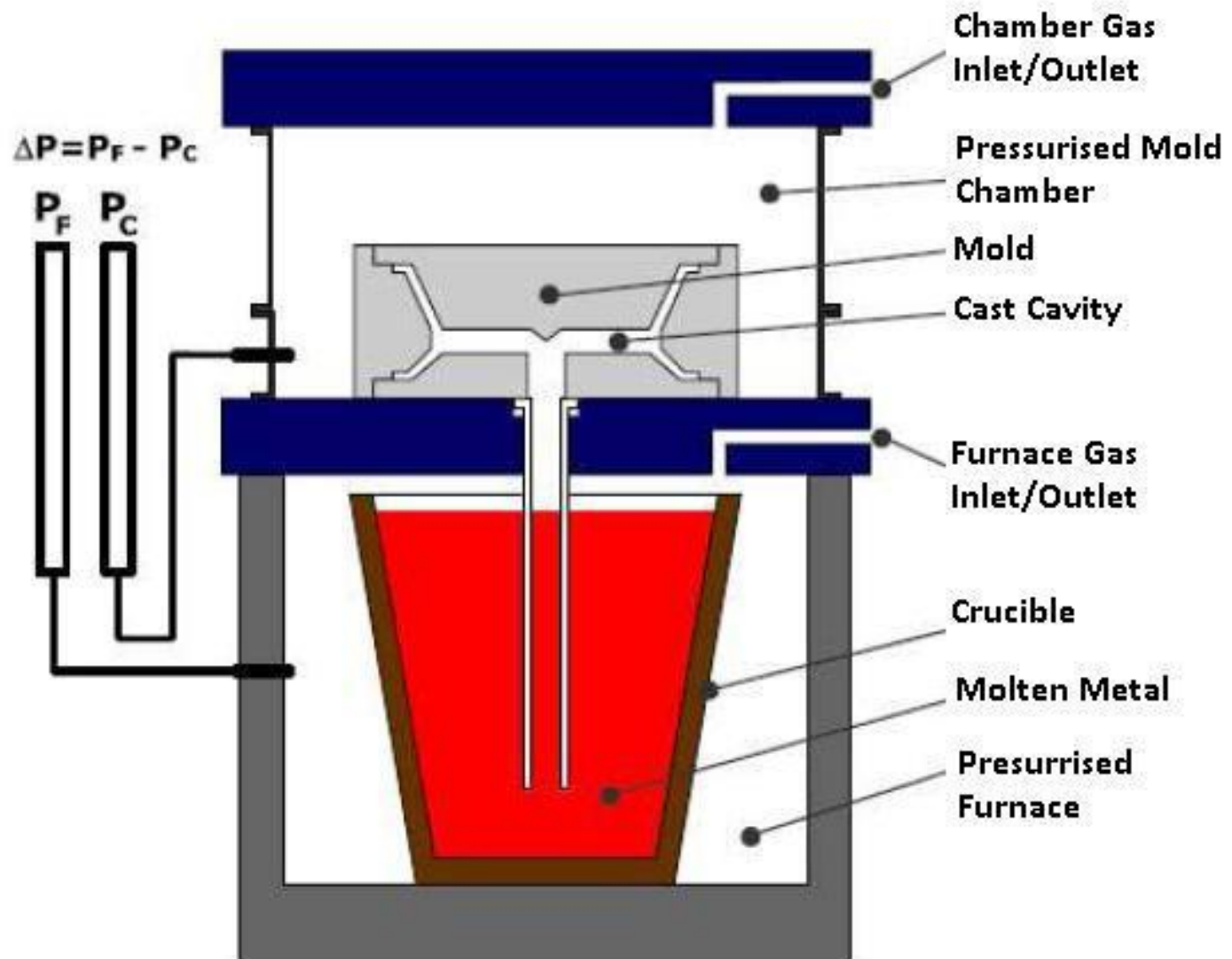
- Sand cores can be used.
- Low turbulence during mould filling. More controlled casting.
- Cleaner metal is used under the surface (or oxide layer) of crucible.
- Longer cycle time.
- Products can be cast with relatively low porosity.



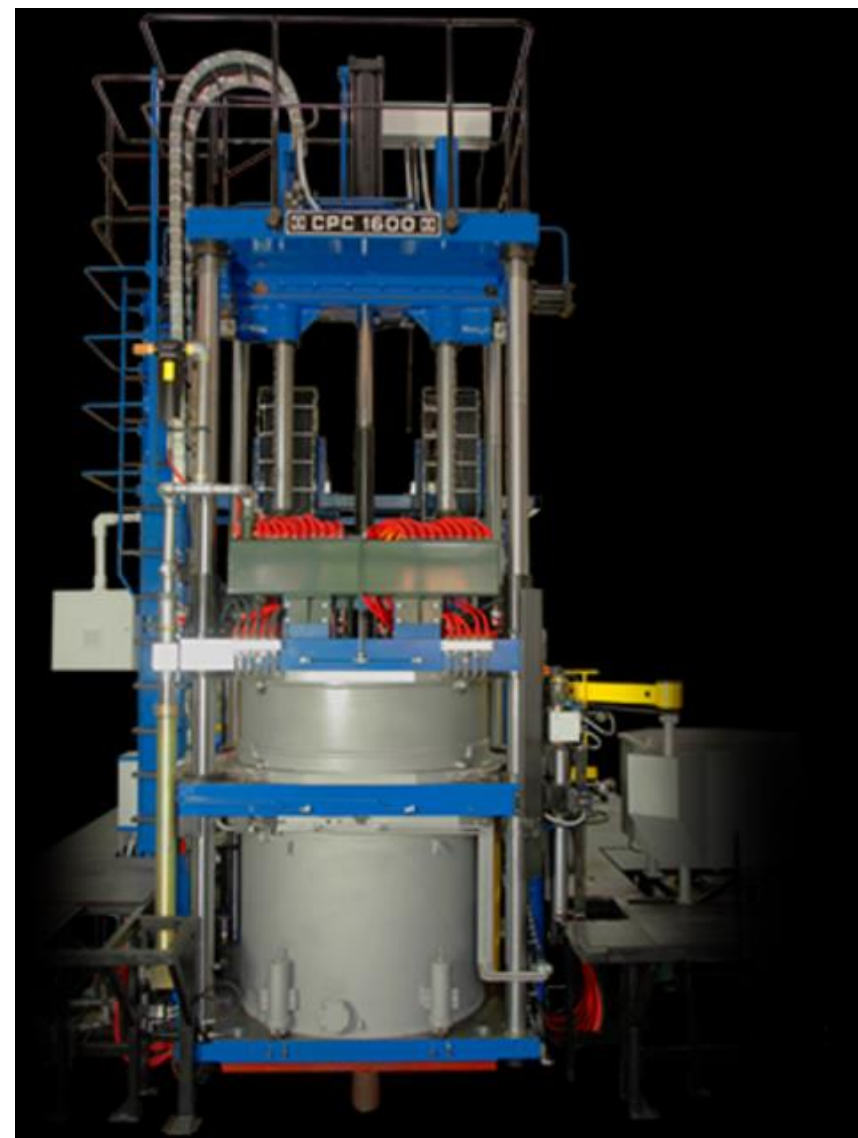
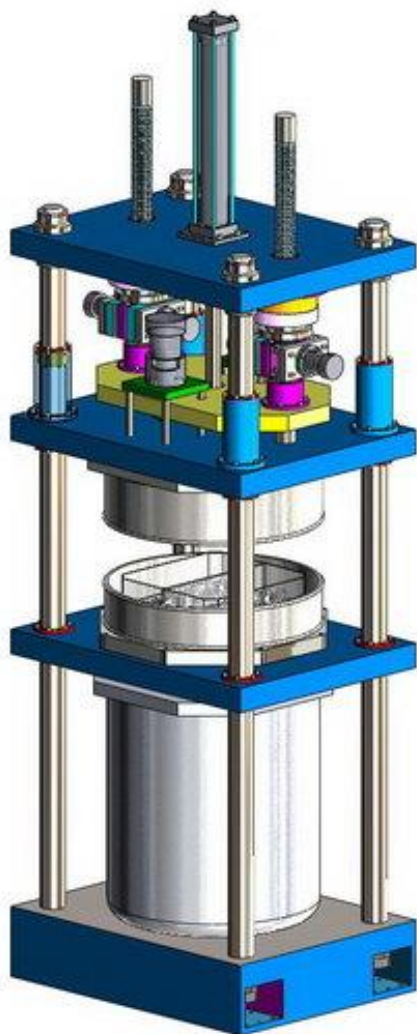


Counter Pressure Die Casting

Counter Pressure Casting (CPC) uses a similar mould positioning and sealed furnace like low pressure and vacuum low pressure processes. With CPC, the casting cavity is placed entirely inside a pressure chamber. Upon closure of the casting cavity, the casting chamber and furnace chamber are pressurized with equal pressures. The pressure in the casting chamber is slowly exhausted while the pressure in the casting furnace is increased. This allows metal to rise in the filling tubes and into the casting cavity at a controlled rate. Multiple cavities and multiple fill tubes can be used.



Solidification is controlled directionally via sequenced cooling, just as the pressure filling and intensification is monitored to give maximum feeding in shrinkage-prone regions of the casting. The pressure is maintained upon the metal bath and casting until solidification is complete and then the pressure is released.



Video links

- <https://www.youtube.com/watch?v=n4FUBQfLDW4>
- <https://www.youtube.com/watch?v=LCMs-7K8nLk>
- <https://www.youtube.com/watch?v=C6MKbSxQRaA>
- https://www.youtube.com/watch?v=0V_2NiC6vCY
- <https://www.youtube.com/watch?v=1mWK3ZJY1WE>