

PRECISION INVESTMENT CASTING (PIC)

Giving you a clear edge

APPLICATION NOTE



Where is vacuum used?

Precision Investment Casting (PIC) is a process carried out under vacuum to produce complex mechanical components such as turbine blades.

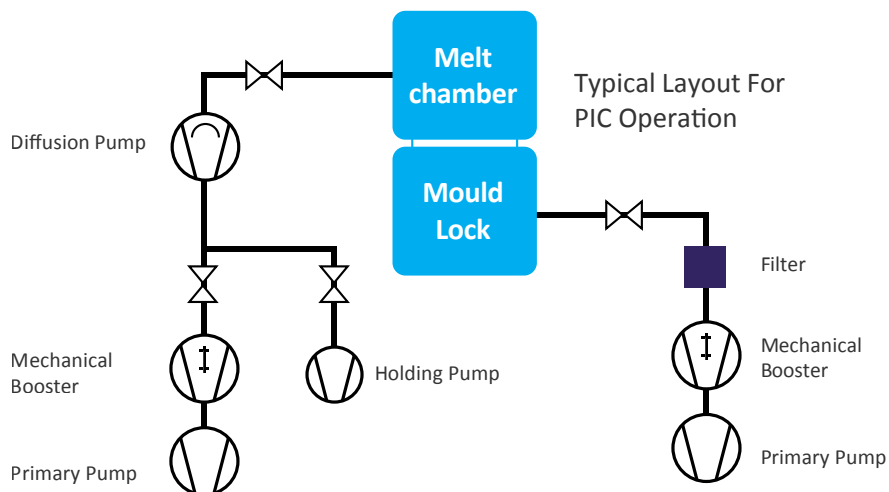
The ceramic mould is created by dipping the shaped wax into a ceramic slurry. The mould is then dewaxed by using a high pressure steam autoclave which rapidly flushes out the wax. The shell is then fired at high temperature to sinter the ceramic particles together. The metal is melted by induction and then poured into a ceramic mould with the component's shape.

Typical precision investment casting systems

PIC furnaces usually have two chambers with two independent vacuum systems:

- First a Melting chamber, where alloy is melted / poured / allowed to solidify, is equipped with a high vacuum pump system with a diffusion pump.
- Second a Mould / load lock chamber for mould introduction is equipped with a medium vacuum pump / booster combination to pump down to typically less than 0,1 mbar in a maximum of 60 seconds to avoid any temperature drop in the mould.

Both melting and mould chambers collect large quantities of dust and particulate material that can reach vacuum systems especially during fast pump down.



Solutions

Dry pumping systems - Recommended technology

GXS dry screw pumps and GMB booster combinations

- GXS160, GXS160/1750
- GXS250, GXS250/2600
- GXS450, GXS450/2600, GXS450/4200
- GXS750, GXS750/2600, GXS750/4200

Benefit: Dry pump systems substantially reduce maintenance and operating costs.

- Increased tolerance to particles created by the melt
- Clean residual vacuum
- Elimination of oil back streaming which is a source of contamination and de-gassing in the furnace
- Large water vapour pumping capacity aids drying of the new chamber lining
- Elimination of oil mist at the exhaust and external oil leaks

MAXX vacuum systems

GXS pump range is systemised with pXH mechanical boosters available in two models:

- pXH4500, displacement 6,766 m³/h
- pXH6000, displacement 8,358 m³/h

Oil Sealed pumping systems - Conventional technology

Stokes microvac rotary piston pumps with EH and 6" Stokes booster combination

- 212J
- 412J
- 612J

Diffusion pumps

- HT10
- HT16B
- HT20B

Benefit: Generally, oil sealed pumps have high operating and maintenance costs. If oil sealed technology is to be used, piston pumps are the vacuum pump of choice.

- Rugged and less sensitive to dust and vapour handling
- Low rpm operation for the longest pipe life cycle
- Efficient, time proven design to deliver ease of maintenance

Edwards' Benefits

GXS dry screw pumps

160 m³/h -750 m³/h primary pumps with pumping speeds up to 3,450 m³/h with vacuum boosters. Equipped with an intelligent on-board controller with extensive communication and automated control capabilities.

Highly reliable

Ability to handle harsh processes

Low maintenance cost

No unplanned down-time

Increased productivity

Longer intervals between services

Safe operation, consistent output

Automated control of your process



MAXX vacuum systems

The GXS pump range is complemented by the new generation of pXH large mechanical boosters for an integrated flexible modular skid design.

Variety of pump combinations ensure optimized configurations

Delivering the performance required by your processes

Easy to upgrade

Whenever you need more capacity



Microvac rotary piston pumps

Packaged with EH range or 6" series of mechanical boosters.

Value for investment

Low rotational speed enables the longest pump life cycle

Easy maintenance on site

Robust simple mechanism for high reliability and ease of rebuild

Proven, tested; peace of mind

Over 80 years of time tested proven performance



Diffusion pumps

Our Industrial, high throughput diffusion pumps are ideal for the precision investment casting application.

Increased productivity

High throughput pumping

Stable performance

High backing line pressure

Better end product quality

Low oil back streaming



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