VACUUM INDUCTION MELTING (VIM)

Giving you a clear edge

APPLICATION NOTE

Where is vacuum used?

The vacuum induction melting (VIM) process involves the melting of metals by electromagnetic induction while under vacuum.
The process involves the refining of metals and alloys and the removal of dissolved and chemical bonded impurities resulting in an end product that is clean and homogeneous.

Depending on the metallurgical process and the final product, vacuum levels during the refining phase are in a range of 10^{-1} to 10^{-4} mbar.

The key challenges faced by vacuum pumps in the process are:

- Handling of high volume chambers with very dusty environments
- Fast roughing pump down time and resistance to dust involving coarse and fine particles
- Pumping high argon concentrations >70% at typically 50 to 450 mbar

Typical Vacuum Induction Melting System

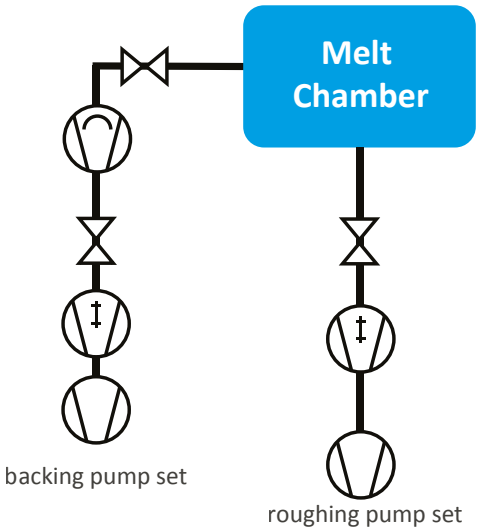
A good VIM vacuum system separates the roughing and backing lines resulting in:

- The roughing line dust being kept dry
- Containment of oil vapour to the backing line
- Elimination of the use of any holding pump
- A smaller diffusion backing pump

Major advantages include:

- Consistent vacuum performance to suit the individual process requirements
- Low operating costs
- Minimal planned maintenance

Typical Layout For
Vacuum Induction Melting



Our 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

MAXX vacuum systems

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

- pXH4500, displacement 6,766 m^3/h
- pXH6000, displacement 8,358 m^3/h

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

- Large 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 the drying of the new chamber lining
- Elimination of oil mist at the exhaust and external oil leaks

Oil Sealed pumping systems - Conventional technology

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

- 212J
- 412J
- 612J

Vapour booster

- 18B4B
- 30B5M

Benefit: Generally, oil sealed pumps have higher operating and maintenance costs. Between oil sealed technologies, piston pumps are the most suitable pump for this process as they offer several benefits.

- Rugged and less sensitive to dust and vapour handling
- Low rpm operation for longest pump life cycle
- Efficient performance, proven design and ease of maintenance

Edwards' Benefits

GXS dry screw pumps

The GXS range featuring intelligent on-board control has been developed using new variable pitch tapered screw technology for exceptional performance and reliability. Available in pumping speeds from 160 m^3h^{-1} to 750 m^3h^{-1} and when combined with GMB vacuum boosters, speeds of up to 3,450 m^3h^{-1} can be achieved.

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

For high capacity applications in Vacuum Induction Melting, the GXS pump range is complemented with a new generation of pXH mechanical boosters for an integrated flexible modular skid design. pXH booster pumps have high efficiency motors and inverter drives that integrate directly into the GXS pump control system.

Variety of pump combinations ensure optimised configurations
Delivering the performance required by your processes

Easy to upgrade
Whenever you need more capacity

Stokes Microvac rotary piston pumps

Stokes Microvac rotary piston pumps have a large installed based in the metallurgy market. They can be packaged with Edwards EH or Stokes 6” Series mechanical boosters to provide pumping packages with capacities up to 6,630 m^3h^{-1}.

Value for investment
Low rotational speed enables a longer pump life cycle

Easy on-site maintenance
Robust simple mechanism for high reliability and ease of rebuild

Proven reliability
Over 80 years of time tested proven performance and a large installed base

Vapour boosters

Our unique high throughput vapour booster pumps deliver maximum pumping speed for VIM process pressures. Available in sizes of 4000 ls^{-1} and 12500 ls^{-1}.

High reliability
High tolerance to system and process contamination

Flexible and ease of use
Adaptable to various inlet and exhaust pressures

Proven; peace of mind
Over 40 years of time tested proven performance and a large installed base

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