

VACUUM INDUCTION MELTING (VIM)

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WHERE IS VACUUM USED?

The vacuum induction melting (VIM) process involves the melting of metals by electromagnetic induction under vacuum.

The process involves the refining of metals and alloys under vacuum for 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, the vacuum levels during the refining phase fall in a 10^{-1} – 10^{-4} mbar range.

Key challenges

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

TYPICAL VACUUM INDUCTION MELTING SYSTEM

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

- Dust in the roughing line remains free from oil contamination
- Containment of oil vapour in the backing line
- Elimination of the use of any holding pump
- Use of a smaller diffusion backing pump

Major advantages include

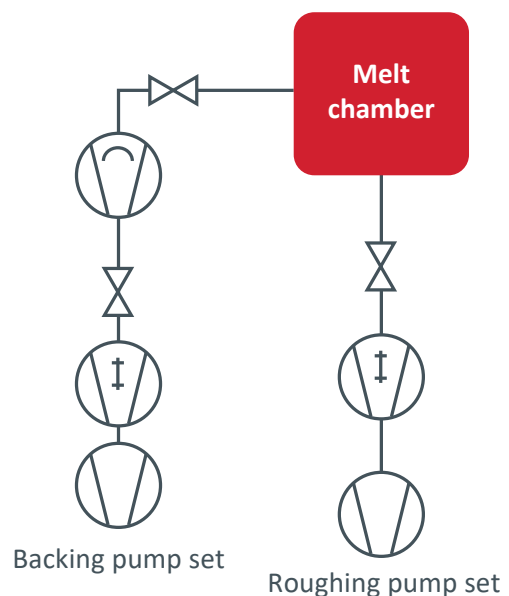
- Consistent vacuum performance to suit the individual process requirements
- Low operating costs
- Minimal planned maintenance

SOLUTIONS

Dry pumping systems – Recommended technology

GXS dry screw pumps and booster combinations

MAXX vacuum systems (GXS pump range systemised with pXH mechanical boosters)



Typical layout for vacuum induction melting

Oil-sealed pumping systems – Conventional technology

Stokes Microvac rotary piston pumps with the EH and 6" Stokes booster combination

Vapour booster

EDWARDS' BENEFITS

GXS DRY SCREW PUMPS

The GXS range featuring intelligent on-board control has been developed using the patented variable pitch tapered screw technology for exceptional performance and reliability. It is available in pumping speeds from 160 m³h⁻¹ to 750 m³h⁻¹ and, when combined with GMB vacuum boosters can achieve speeds of up to 3,450 m³h⁻¹.

Benefits:

- Increased tolerance to particles created by the melt
- Clean residual vacuum
- Elimination of oil back streaming, which is a source of contamination and degassing 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

Highly reliable

Ability to handle harsh processes

Low maintenance cost

No unplanned downtime

Increased productivity

Longer intervals between services

Safe operation, consistent output

Automated control of your process



MAXX VACUUM SYSTEMS

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Variety of pump combinations ensure optimised configurations

Delivers the performance required by your processes

Easy to upgrade

Allows a smooth upgrade whenever you need more capacity



STOKES MICROVAC ROTARY PISTON PUMPS

Stokes Microvac rotary piston pumps have a large installed base in the metallurgy market. They can be packaged with the Edwards EH or Stokes 6" series mechanical boosters to provide pumping packages with capacities up to 6,630 m³h⁻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 and tested

Less sensitive to dust and vapour handling. Proven performance of over 80 years



VAPOUR BOOSTERS

Our unique high-throughput vapour booster pumps deliver the maximum pumping speed for VIM process pressures. Available in sizes of 4,000 ls⁻¹ and 12,500 ls⁻¹.

High reliability

High tolerance to system and process contamination

Flexibility and ease of use

Adaptable to various inlet and exhaust pressures

Proven and tested

Time-tested, proven performance of over 40 years

