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
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

**Our Solutions**

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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

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

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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$^3$h$^{-1}$ to 750 m$^3$h$^{-1}$ and when combined with GMB vacuum boosters, speeds of up to 3,450 m$^3$h$^{-1}$ 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 base 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$^3$h$^{-1}$.

**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

Global contacts

**EUROPE**
UK Crawley +44 1293 528844
UK (local rate) 08459 212223
Belgium Brussels +32 2 300 0730
France Paris +33 1 4121 1256
Germany Munich 0800 000 1456
Italy Milan +39 02 48 4471

**USA**
Niagara (toll free) +1 800 848 9800

**BRAZIL**
Sao Paulo +55 11 3952 5000

**ISRAEL**
Qiryat-Gat +972 8 681 0633

**ASIA PACIFIC**
China (toll free) +86 400 111 9618
India Pune +91 20 4075 2222
Japan Yachiyo +81 47 458 8831
Korea Bundang +82 31 716 7070
Singapore +65 6546 8408
Taiwan R.O.C. Jhunan Town +886 3758 1000

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Edwards Ltd, registered in England and Wales No. 6124750, registered office: Manor Royal, Crawley, West Sussex RH10 9LN, UK

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