Vacuum Treatment of Melts with Charge Weights up to 30 tons

VID
Vacuum Induction Degassing
VID 400 – VID 3000

Elements:
- Mg
- Ti
- Cr
- Mn
- Mo
- Fe
- Ni
- Co
- Al
- H
- O
- S
- C
- N

The Solution

Company Logo
VID – Vacuum Induction Degassing

The optimal link between conventional Steel Degassing (Secondary Metallurgy) and Vacuum Induction Melting (VIM)

VID

The Vacuum Induction Degassing (VID) furnace concept has been developed for special applications in the ferrous and non-ferrous metals industry for charge weights up to 30 tons. Whenever pouring under vacuum is not specified or not required for metallurgical reasons, this bell type furnace with open-air teeming is recommended for its favourable economics.

Smaller steel shops and foundries will be able to produce with the VID furnace, within one step, high quality vacuum treated steels, whereas larger shops have to realize these qualities employing a conventional LF/VD/VOD production line. The temperature losses during degassing treatment are compensated by induction heating.

Product Application and Quality Improvement in Different Processes

<table>
<thead>
<tr>
<th></th>
<th>VD</th>
<th>LF/VD</th>
<th>VOD</th>
<th>VODC</th>
<th>VID</th>
<th>VIM</th>
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<tbody>
<tr>
<td>Low carbon steels</td>
<td>+</td>
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<td>High carbon steels</td>
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<td>Tool and die steels</td>
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<td>Fe-Ni-Alloys</td>
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<td>Nitrogen removal</td>
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<tr>
<td>Decarburization</td>
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<td>+</td>
<td>0</td>
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<tr>
<td>Vacuum carbon deoxidation</td>
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<td>+</td>
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<tr>
<td>Desulphurization</td>
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<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Inclusion removal</td>
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<td>+</td>
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<tr>
<td>Extra low carbon</td>
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<td>-</td>
<td>+</td>
<td>+</td>
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<tr>
<td>Temperature control</td>
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</table>

Basic design [1]
Vacuum tight, tiltable, charge weights up to 30 tons

Melting under vacuum [2]
Vacuum degassing/Deoxidation
Precise temperature adjustment
Decarburization/Desulphurization
Alloying and Pouring

Pouring
VID: Pouring at air [3]
VID-Pro: Pouring under protective gas [4]
VID-Oxy: Decarburization with dissolved oxygen [5]
**VID**

All important secondary metallurgy treatment steps – melting under vacuum, refining such as decarburization, desulphurization, deoxidation, removal of undesired gases like hydrogen and nitrogen, exact adjustment of chemical analysis, cleaning, alloying, heating — are done in one single unit. The melt will be cast at air.

**VID-Pro**

The modified VID-Pro furnace allows not only meltdown and vacuum-refining, but also pouring under protective inert gas. The vacuum lid stays in closed position during melting, refining and casting. Gas-pick-up during tapping can be minimized.

**VID-Oxy**

The VID-Oxy furnace is dedicated to economical production of high-chromium steel grades, accomplished by using low-cost raw materials. Soft oxygen top blowing by means of a gas lance allows additional removal of carbon. With the VID-Oxy furnace concept it is possible to carry out metallurgical work such as degassing, deoxidation, desulphurization and removal of oxide-inclusions with a reactive basic slag and chemistry adjustment under vacuum. The results are very low carbon and nitrogen contents and high chromium yield. The VID-Oxy furnace is the ideal alternative to conventional steel degassing with EAF/VD/VOD at charge weights up to 30 tons.
VID Systems and References

[1+2] VID

VID 1000 – 5 t
Kind & Co, Germany
Producer of tool-steels
Pouring at air

[3] VID-Pro

VID-Pro 2000 – 16 t
KM-Kabelmetall, Osnabrück, Germany
Pouring of copper alloys under protective inert gas atmosphere into slab caster

[4] VID-Pro

VID-Pro 400 – 3 t
Vacuumschmelze Hanau, Germany
Pouring of Fe-base alloys under protective inert gas atmosphere
VID-Oxy – 6 t
Shagang, China
Decarburization by oxygen blowing
Production of special steels and low carbon steels
VID 2000 – 141
Böhler Edelstahl, Kapfenberg, Austria
Production of special steels
Typical system configuration

<table>
<thead>
<tr>
<th>Furnace Size (metric ton)</th>
<th>Type</th>
<th>Space Requirement (in m)</th>
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</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>VID 400</td>
<td>L 10  W 10  H 8.5</td>
</tr>
<tr>
<td>4 - 8</td>
<td>VID 1000</td>
<td>L 12  W 10  H 9.5</td>
</tr>
<tr>
<td>9 - 16</td>
<td>VID 2000</td>
<td>L 14  W 14  H 10</td>
</tr>
<tr>
<td>17 - 30</td>
<td>VID 3000</td>
<td>L 25  W 16  H 12</td>
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</tbody>
</table>

VID Melt and Pouring Station

VID Furnace

Power Cables
## Technical Data

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Units</th>
<th>VID 400</th>
<th>VID 1000</th>
<th>VID 2000</th>
<th>VID 3000</th>
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<tbody>
<tr>
<td>Crucible size</td>
<td>(metric tons)</td>
<td>1 - 3</td>
<td>4 - 8</td>
<td>9 - 16</td>
<td>17 - 30</td>
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<tr>
<td>Capacity (based on Ni)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Typical cycle times</td>
<td>(h)</td>
<td>3 - 6</td>
<td>3 - 6</td>
<td>3 - 6</td>
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<tr>
<td>Fe-Cr base alloy/Fe-Ni base alloys/</td>
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<td></td>
<td></td>
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<tr>
<td>special steels</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Typical operating pressure</td>
<td>(mbar)</td>
<td>0.5 - 5</td>
<td>0.5 - 5</td>
<td>0.5 - 5</td>
<td>0.5 - 5</td>
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<tr>
<td>with mechanical pump set</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Electrical layout</td>
<td>(kW)</td>
<td>600 - 1,500</td>
<td>1,500 - 2,500</td>
<td>2,500 - 3,500</td>
<td>3,500 - 5,000</td>
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<tr>
<td>Output, melting power supply</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Connected power vacuum pump set and</td>
<td>(kVA)</td>
<td>80</td>
<td>100</td>
<td>130</td>
<td>150</td>
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<tr>
<td>auxiliary equipment (depending on</td>
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<td>scope of supply)</td>
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<tr>
<td>Cooling water</td>
<td>(m³ x h⁻¹)</td>
<td>80</td>
<td>100</td>
<td>150</td>
<td>200</td>
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<td>Total consumption (Δt=10 °C)</td>
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<tr>
<td>Floor area length (L) x width (W)</td>
<td>L x W (m)</td>
<td>10 x 10</td>
<td>12 x 10</td>
<td>14 x 14</td>
<td>25 x 16</td>
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<tr>
<td>Height</td>
<td>(m)</td>
<td>8.5</td>
<td>9.5</td>
<td>10</td>
<td>12</td>
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<tr>
<td>Recommended Crane Capacity</td>
<td>(metric tons)</td>
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<td>30</td>
<td>50</td>
<td>70</td>
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