



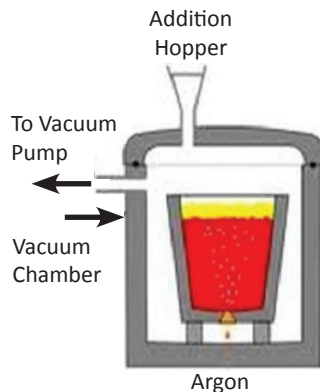
SOLBERG[®]
Filtration - Separation

Training Paper
Vacuum Degassing (VD)
Vacuum Oxygen Decarburization (VOD)



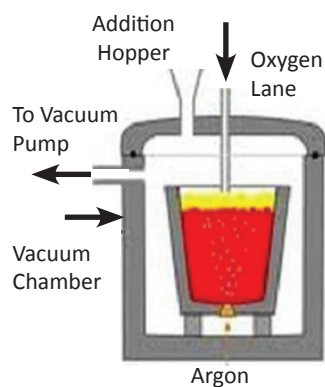
What is Vacuum Degassing / Vacuum Oxygen Decarburization

The steel degassing processes are used to provide higher quality and supply more specialty grade steels. Two main processes are vacuum degassing (VD) and vacuum oxygen decarburization (VOD). These processes require large vacuum pumping capacities and have to cope with large amounts of metallic fines and oxide dust. Historically multiple steam ejector stages were used but required a lot of maintenance and excessive amounts of steam. Today dry mechanical vacuum pumping systems offer a better solution with increased dust handling capabilities, lower energy consumption and reduced maintenance costs.



Vacuum Degassing (VD)

At 0.67 mbar much of the dissolved hydrogen and carbon monoxide gases desorb in the atmosphere above. Lighter, more volatile elements such as Pb, Sn, As, Sb, etc. can also be removed. Because of the high vacuum high pumping speed are required for which large multi-stage pump sets with vacuum boosters are used. The temperature in the ladle will be 80°C in most cases.



Vacuum Oxygen Decarburization (VOD)

By injecting pure oxygen in the molten steel at 80-200 mbar the CO converts to CO₂ at high temperature and thus reduces the carbon content without collateral losses of chromium. Pumping speed capacities are less than for VD but still require large Roots vacuum boosters. Because of the lower vacuum than VD the temperature will be around 250°C which will be important for the material selection.

In both cases alloys and other additives can be mixed in to refine the molten steel further.

Typical process parameters		
Process type:	VD & VOD or VD only	
Heat Mass (capacity):	tonnes of liquid metal	
Furnace volume:	2 - 3 m ³ per tonne	
Furnace air leakage:	up to 10 kg/h (air @20°C)	
Initial pump down time to VD:	5 - 7 minutes	
	VD	VOD
Process pressure:	0.67 mbar/0.5 torr	80-200 mbar / 60-150 torr
Suction capacity:	1 - 2 kg/h/tonne (air @20°C) 1250 - 2500 m ³ /h/ton	variable
Line diameter:	800 - 1000 mm	800 - 1000 mm
Gas dust load to pump system:	very low	can be high if filtration is poor
Gas temperature load to pump:	≤ 60°C	≤ 60°C

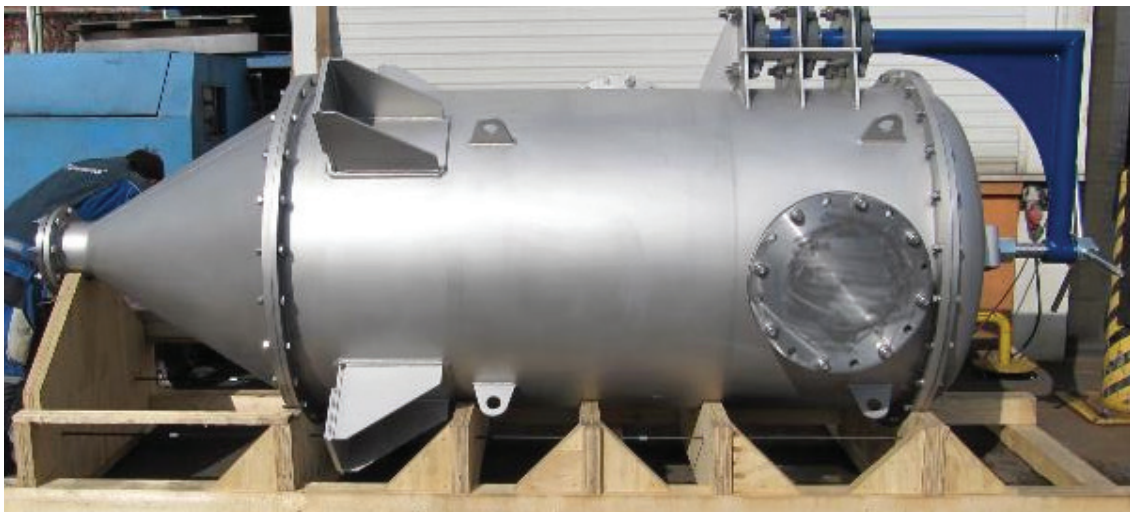
Where is Solberg Involved?

- Reverse pulse units with (multiple) TF or TG elements
- F/FS units for vacuum breaking and/or reverse pulse inlet

Application Example

Witten, Germany.

Process parameters		
Process Type:	VD & VOD	
Heat Mass (Capacity):	6 metric tons	
Filter Elements:	2 high-temperature, glass-backed PTFE media elements, 99.5% @ 0.3 efficiency	
Filter Housing:	304 Stainless Steel, Bead Blast Finish, Silicone O-rings & Gaskets, Helium leak teste 9.0×10^{-6} mbar * l/sec	
Inlet & Outlet:	DN400/PN10	
Cleaning:	Reverse pulse Nitrogen @ 1 bar absolute	
Units Installed:	2 total, 1 standby	
	VD	VOD
Air Flow:	28.000 m ³ /h @ 0.67 mbar absolute	4.000 m ³ /h @ 200 mbar absolute
Temperature:	approximate 110°C @ filter elements	approximate 150 - 250°C @ filter elements





Training Paper
Vacuum Degassing (VD)
Vacuum Oxygen Decarburization (VOD)

Kapelanielaan 8, Temse Belgium B-9140
+32 3 774 52 11 Fax: +32 3 886 93 71
BEsales@solbergmfg.com