



Revamping of steel degasser vacuum systems

Upgrade dirty and costly steam ejector vacuum systems.

Steel degassing involves removing elements like hydrogen, oxygen, nitrogen and carbon from molten steel. Degasser types are mostly of the VD (Vacuum Degassing), VOD (Vacuum Oxygen Decarburization) or RH (Ruhrstahl Heraeus) type. The required vacuum is supplied using high-capacity vacuum pump systems. These systems must continuously operate under the harsh conditions of steel plants. Dust and hot gases enter the vacuum pumping system during the degassing process.

Traditionally, such steel degassers were equipped with old-fashioned multi-stage steam ejector vacuum systems. Steam ejector pumps need to be continuously supplied with water steam of 200 °C temperature.

For decades, steel producing plants have used gas fired boilers to produce the required steam to operate the ejector systems.

The challenge: While demand for steel is increasing, the consumption of fossil fuels as natural gas or coal and

the following CO₂ emission, as well as the general efficiency of energy consumption is becoming more and more of a hot topic in the steel industry. Next to this many boiler and steam ejector system installations are aged and require renovation.

Requirements: Revamping the degassers steam-ejector vacuum system is one of the most efficient ways for modernizing “old” steel plant deficiencies in terms of gas consumption, water usage, CO₂ emissions and improving the reliability and performance of operations

Our solution: Leybold’s revamping solution for steel degasser vacuum systems is a complex solution provided by experts in vacuum and steel degassing. Within decades, Leybold has demonstrated a proven track record of success in vacuum degassing projects around the world. Total revamp solutions provide a full range of supply and services, including:

- Thorough analysis of existing vacuum systems
- Analysis of consumables and utilities
- Project scoping, including all parts of revamping project
- Gas coolers to efficiently cool down hot gases and provide protection from overheating
- Dust filters with effective filtration surfaces, including dust separation and collection systems
- Steel degassing skids – three or four-stage pumping systems based on various combinations of DRYVAC screw-type and RUVAC Roots-type pumps
- “Police filters” on exhaust lines to filter out residues passing through vacuum systems
- Flare stack and gas analysis systems for measuring gas composition of vacuum pump exhaust systems
- Intelligent control systems for “easy” integration to existing “upper” PLC
- Robust vacuum valves
- Full support upon installation and ongoing operation of steel degassing plants

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Typical operational cost steam ejector vacuum systems and mechanical vacuum systems:

Degasser type: 80t, 2 systems 8-2-2 configuration

Heats: 20 heats/day

Utilization: 280 days/year

Annual production: 448000 t

| Annual operation costs of a 80t VD system* | | Natural gas-fired boiler steam ejector | Electric-driven mechanical vacuum pump 2 x 8-2-2 | Savings after one year | Savings after 5 years |
|----------------------------------------------|----------------|----------------------------------------|--------------------------------------------------|------------------------|-----------------------|
| Utility consumption and emissions (per year) | | | | | |
| Energy | GWh | 33,6 | 2,37 | | |
| CO ₂ emissions | t | 8,960 | 940 | 8,000 | 40,100 |
| Water | m ³ | 44,800 | 6 | | |
| Costs | | | | | |
| Tax to be paid for CO ₂ emissions | € | 313,600 | 32,900 | 280,700 | 1,320,000 |
| Cost of energy | € | 4,032,000 | 982,600 | 3,050,400 | 15,247,000 |
| Cost of water | € | 112,000 | 16 | 111,984 | 560,000 |
| Total saving in € | | | | 3,443,084 | 17,215,420 |



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