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Diversified Mechanical Vacuum Pump Solutions for VD/VOD

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INTRODUCTION

Today mechanical vacuum pump systems are state-of-the-art for new refining stations, the advantages over steam-ejectors are well-known. There are various options in both, mechanical pump size/model and systems concept, as the design requirements are diverse: Footprint, productivity, production-flow, available service/maintenance/operations personnel, as well as process specification.

Small degassers require dis-proportionally larger performance per ton of produced steel.

Whilst the mega trend Green-Steel will lead to ever larger VD/VOD stations requiring different solutions than the prior Ruhrstahl-Heraeus-systems.

This paper will give insights into field experience of various global installations and conclude the factors for optimal selection of the individual vacuum solution.

DISCUSSION

Introduction to the Architecture of Mechanical Vacuum Pump Systems

The base of any mechanical vacuum system is the so-called atmospheric stage, vacuum pump(s) compressing from vacuum to atmospheric pressure. Today the dry screw pump mechanism is state-of-the-art. The two screw type rotors compress the gas effectively in multiple stages with every rotation and -depending on the design- achieve inlet pressures down to 0,01 mbar. It is the stage with the highest workload in a vacuum system, consuming most of the power and in addition collecting all incompressible particles like dust. Furthermore, the atmospheric pressure supports condensation of water out of the process gas, as soon as temperature reaches 20°C. Either upstream in the exhaust stack or after the system is switched off and cooled down.

To increase the systems performance towards lower pressures with minimal additional invest, power consumption and footprint, a mechanical booster pump layer is added at the inlet of the screw pump (s). And then again, another booster layer on top to increase performance further, this can go up to 4 additional mechanical booster layers or so-called stages.

