

# Fitting the Right Vacuum Equipment Into Your Plans

Equipment selection is a complex, iterative and demanding process.

*Selecting the right technology is vital to achieving an efficient, productive process. There are many types of vacuum equipment available — ejector systems, liquid ring vacuum pumps, dry vacuum pumps and vacuum process condensers. These systems are not interchangeable as each type of service has different requirements. Characteristics, such as capital costs, utilities, environmental impact, installation and maintenance, must be considered. All options must be understood to choose the correct piece of equipment.*

## Ejector Systems



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According to *Process Vacuum System Design and Operation*,<sup>1</sup> “A vacuum condenser is the most energy-efficient and most-effective vacuum pump ever developed.” A vacuum process condenser is positioned between a process vacuum vessel and a vacuum system. Its main purpose is to reclaim fluids as condensate before they enter the vacuum system. That

A vacuum process condenser can be direct contact or surface type. Direct contact is when a cooling fluid directly contacts the process vapors to be condensed. Surface type, normally shell-and-tube, has condensation occurring on a heat transfer surface that separates the process vapors and condensate from the cooling fluid. Shell-and-tube type units

may have condensation in the tubes or on the outer tube surfaces. Although referred to as the shell-and-tube type, they are by no means a typical process heat exchanger. Thermal and hydraulic design is complicated, and commercially available software does not accurately model pressure drop when operating pressure is below 40 torr.

A vacuum system, such as an ejector system, liquid ring pump or dry pump,

must back up a vacuum process condenser to remove noncondensable gases. It is important to integrate a process vacuum condenser into the vacuum system design

as they operate in unison. A properly optimized process sets up the vacuum condenser and vacuum system as a complete unit, ensuring maximum recovery of product, minimum utility consumption, limited pressure drop and minimal capital cost.

reduces the capital and operational cost of the vacuum system, reduces waste treatment cost and recovers valuable product for re-use.

## Summary

When evaluating a new process or potential revamping strategies, assess the vacuum equipment options. Consulting with vendors that have complete vacuum equipment product lines allows for a thorough analysis. There may be more than one technical answer for a given process requirement, but there is only one engineering answer that is completely optimized and factors in all relevant aspects important to your process. Be certain to assess the options based on:

- ✓ Operating cost ✓ Maintenance cost ✓ Cleanability ✓ Serviceability ✓ Solvent recovery ✓ Effect on process
- ✓ Handling of upsets ✓ Purchase price ✓ Materials of construction ✓ Waste generation ✓ Pollution abatement
- ✓ Emission reduction ✓ Operating range