CASE STUDY

SOLVENT HANDLING AND DRY VACUUM PUMPS

SOLVENT VACUUM APPLICATIONS

Vacuum systems are used to pump solvent vapors in many chemical and pharmaceutical applications wherever excess solvents must be removed such as processes involving drying, distilling, chemical reactions, synthesis of compounds, separation and purification, cleaning, etc. Many organic solvents need to be recovered either due to their toxicity, flammability, or environmental impact and dry vacuum pumping systems provide a green vehicle for doing so. Dry vacuum systems have no internal sealing liquid that could be contaminated by incoming solvents or contaminate the outgoing solvents that need to be recovered. The solvent vapors are passed through the dry vacuum system and then usually condensed at the exhaust that provides a closed loop for containing and recovery with no contamination.

A typical system would consist of a dry vacuum pump with a shell and tube condenser at the exhaust. If higher capacities are required a booster/dry pump combination could be used.

SOLVENT VACUUM SYSTEMS

Kinney® offers three different series of rotary screw dry vacuum pumps to select from depending upon the application:

- SDV series horizontal flow rotary screw dry pump with variable pitch rotors for reduced power consumption and lower exhaust temperatures and C-Face motor are standard. PTFE internal coating is optional.
- KDP series horizontal flow rotary screw dry pump with constant pitch rotors for simplicity and reliability, and PFA coated internals are standard.
DRY SCREW VS LIQUID RING PUMPS

Liquid ring and dry vacuum pumps are normally used for solvent handling applications but the dry vacuum systems offer the advantage of reduced power consumption, decreased coolant usage (lower bhp/acfm and cooling water flow), smaller footprint, and better control of maintaining the solvent as a vapor while passing through the pump so that condensing occurs where desired. Dry pumps are also more easily controlled by using variable frequency drives (VFD) for process pressure control compared to liquid ring pumps where the minimum rpm is determined by the collapsing of the fluid ring. Dry vacuum systems are also capable of handling volatile organic solvents such as methylene chloride, acetone, or methanol where the higher vapor pressures could cause problems for a liquid ring pump.

Maintaining a leak tight system that avoids the entrance of air to avoid flammable mixtures or the leaking of process fluid to the environment is more easily handled with a dry vacuum system. Because of the elevated discharge temperatures of the dry vacuum pump the solvent’s auto-ignition temperature should always be greater than the dry pump’s maximum discharge temperature which normally occurs at the lower inlet pressure range. Kinney can provide complete dry vacuum systems consisting of dry boosters if necessary backed by any of its three series of rotary screw dry pumps equipped with inert gas purges or with knock out traps, after condensers, protective instrumentation and electrical controls if desired to suit solvent recovery processes.