Pharmaceutical Processing

Vacuum pumps play a vital role in the pharmaceutical industry for the manufacturing of bulk drugs, intermediate products or active pharmaceutical ingredients (API). The production of pharmaceutical products are subject to high quality demands. The applications listed below operate under vacuum for separation without thermally degrading the products, and the inlet pressures vary by the process, anywhere from 0.01 Torr to 50 Torr.

Drying

Drying is an operation to separate liquids from solids. The moisture has to be evaporated by introducing heat into the wet products. In order to prevent heat sensitive media from being thermally degraded, vacuum drying is used to maintain low temperatures.

Freeze Drying (A.K.A. Lyophilization or Sublimation)

Sublimation is a process whereby a solid is transformed to a gas phase without going through the liquid phase. This allows for the removal of excess material without creating a degraded condition for the end products. Freezing of the starting dilute solution to sub ambient temperatures induces solidification, first of the solvent, followed by solidification of the remaining solutes from a more highly concentrated composition. An environment of reduced pressure while the product is maintained at sub ambient temperature promotes sublimation, converting the ice directly to water vapor, avoiding the return of the composition to the liquid state. This allows drying while retaining the attributes of the frozen preparation.

Degassing

Degassing is the removal of dissolved gases in liquid or solid products. Vacuum pumps are used for extraction of the unwanted gases from the product.

Vacuum Distillation

Distillation is the thermal process to separate different solvents from a liquid mixture. Each solvent differs in temperature, pressure and composition. To separate different solvents from each other, the vapor has to be removed from a boiling liquid mixture and re-condensed after the evaporation. Vacuum pumps are used for removal of non-condensable, water and light solvents.

Crystallization

This is an evaporation and cooling process of supersaturated liquid to form crystals. Vacuum pumps are used to control the evaporation and cooling rates at various pressure ranges.

Sterilization

Sterilization is a process designed to remove or destroy all viable forms of microbial life, including bacterial spores. Widely used methods are Steam and Ethylene Oxide (ETO) sterilization. A vacuum pump is used to evacuate the sterilization chamber and handles the inert gases like Nitrogen and flammable gas ethylene oxide.
Vacuum Solutions from Tuthill

In the pharmaceutical industry, vacuum pumps come into contact with solvents, vapors and various gases. Therefore, end users are seeking a vacuum pump with reliable performance and durability. Custom vacuum design for this industry should consider the following:
1) Material of construction of the vacuum pump and system
2) Process compatible solvents for sealing medium for liquid ring pumps
3) Staging vacuum systems that consist of booster/air ejector/roughing pump
4) Dry vacuum pump with flushing and purging options
5) System design with knock out pot, Pre condensers & Post condensers
6) Explosion-proof electrical
7) Automation and controls

Tuthill Vacuum & Blower Systems provides comprehensive engineering solutions and products solutions to cover the wide spectrum of inlet pressures and suction capacity for the chemical and pharmaceutical markets.

Advantages of Tuthill Vacuum Pumps

• Kinney® A series liquid ring pumps are available with a choice of materials and sealant selection depending on the process
• Tuthill dry vacuum pumps have straight pitch and variable pitch screws configuration and distinct coating options
• Vapor recovery package consisting of oil sealed and liquid ring pump for temperature sensitive high vapor load
• Process suitable vacuum solution with wide range of vacuum products, pre & post auxiliaries, instrumentation and controls utilizing in-house application engineering
• Tuthill vacuum pumps and systems are manufactured at its ISO 9001 certified facility in Springfield, MO USA