

Horizontal Dry Vacuum Pumps Save Space on the Plant Floor

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Because plant floor space is valuable, there is increasing pressure to make the most efficient use of the area available. Pumps used in chemical applications can often be bulky, but new compact dry pump technology in Europe typically halves the footprint over other designs.

Dry pumping is well established as a vacuum pump technology in the chemical and pharmaceutical industries. Its benefits of reducing environmental waste, improved processing and reduced maintenance are well understood by the industry.

A dry vacuum pump eliminates oil from the swept volume, resulting in a number of significant advantages. Primarily, it reduces the effluent, oil or water that traditional vacuum pumps can produce, which minimizes disposal or treatment costs. Using dry vacuum pumps minimizes potential contamination of the process that can affect the quality of the final product. Dry pumps are not affected by vapor or dust particles in the same way as oil-sealed pumps, so they last longer and require less maintenance.

Used in applications such as biofuel production and distillation processes, a key requirement for dry vacuum pumps has been their ability to handle liquid carry-over from the process—a common result of process upset (for example, a blocked inlet condenser). For this reason, the more robust designs were vertically orientated so that they were self-draining in the event of liquid entering the pump.

However, many process industry applications require either a higher pumping speed, or a lower operating pressure than can be achieved with a single dry pump. To achieve this, the dry pump is typically combined with a mechanical booster to give capacities in excess of 5,000-m³/hr or to reach pressures below 0.01-mbar. With a vertically oriented pump, this usually means that the booster is mounted on a separate frame alongside the pump (see Figure 1, which



Figure 1

shows a typical dry pump/booster system).

While this combination creates a high capacity pumping system, it still significantly increases the floor space occupied by the pumping system.

A Compact Package

Now a more compact package is available, offering typical space savings of 50 percent over alternative designs. This new horizontal pump design has been developed so that the mechanical booster mounts directly on top of the dry pump, with the booster exhaust connected directly into the inlet of the dry pump. This is seen in Figure 2, which shows the pump skid.

This pump design is a horizontal version of the well-established “claw” chemical dry pumps. When combined with a high capacity mechanical booster, this pump system has a much smaller footprint than alternative designs. It provides a compact pumping package for applications where high pumping speeds are required, but more advanced functionality of alternative vertical pumps is not needed.

Either of two pumps can be used in this system: a chemical dry pump with a 250-m³/hr throughput or one with a 400-m³/hr capacity. Both offer pumping speeds from atmospheric pressure down to an ultimate pressure of less than 0.5-mbar. Both are available as pre-engineered pump and booster combinations, with a range of mechanical boosters that give a compact package with pumping speeds up to 400-m³/hr and a low ultimate pressure well suited to applications such as biodiesel production.

This pump design has also been designed with “plug and play” installation in mind. All the utility connections are placed on a single service panel so they can be easily connected during installation. A number of standard purging options are available to meet the process requirements:

- Nitrogen shaft seal purge for use when flammable vapors or gases are being pumped
- Gas ballast for applications where high vapor loads are being pumped, and condensation in the pump or exhaust line is to be prevented
- Inlet purges where corrosives are being pumped and start up and shut down purge routines are recommended, or where there are high dust loads which need to be kept from accumulating in the pump

A key consideration for safe working in the chemical industry in Europe is that the pumps comply with the European ATEX legislation. This new pumping system has been designed to be compliant for the safe pumping of flammable vapors.

At the core of the safety policy for ATEX is *constructional*



Figure 2

safety, which means the design of the pump has been independently certified as inherently safe and failure modes have been designed out that could possibly result in the pump mechanism causing a spark leading to a fire or explosion.

As a result, both 50-Hz and 60-Hz versions have been certified to Ex II 2 c IIB T4. Although no equivalent exists yet in the United States, many global chemical and pharmaceutical companies are adopting the principles of ATEX legislation worldwide as part of their risk management process.

Space Saving Solution

Developments in pumping technology are bringing a new level of efficient, compact dry systems to the chemical industry's plant floor, which is resulting in a space saving of typically 50 percent over alternative designs.

This new chemical dry pump series offers a simple solution compared to traditional vertical alternatives, where functions such as advanced liquid handling and temperature management applications are not necessary.

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