

Driving Green to Brand-New Levels

Seal-less drive technology takes energy reduction and environmental protection to a whole new level—all the while without sacrificing performance.

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Throughout the world today, high energy prices pose an unprecedented profit-robbing threat to every manufacturing operation, large or small. Left unmanaged and unchecked, rising energy expenditures can quickly and quietly erode a company's stability, performance, productivity and, ultimately, its competitiveness and viability.

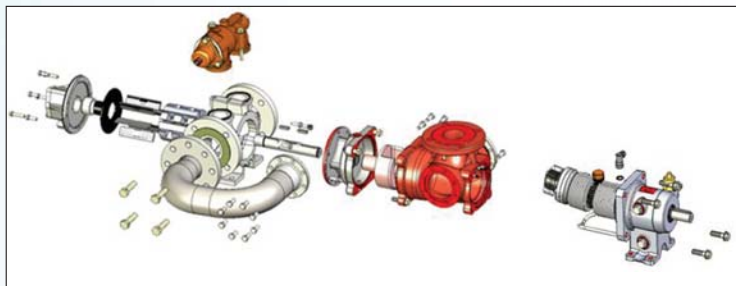
Confronted by these rising energy costs, manufacturing operations are implementing energy-management processes and procedures that seek to:

- Drive product improvements that increase financial performance.
- Control energy expenses by reducing power consumption (without compromising output), while simultaneously increasing production levels.
- Increase operational reliability and process integrity by emphasizing the use of energy-efficient technologies that also support enhanced mechanical efficiency.
- Reduce vulnerability to energy price volatility.

To address energy consumption, many regions around the globe are developing and implementing new climate and energy policies that are designed to modify behaviors to moderate energy usage. In March 2007, as an example, the European Union's (EU's) Heads of State Government announced a series of targets that must be met by 2020. This climate and energy package was agreed to by the European Parliament and Council in December 2008 and became EU law in June 2009. They are:

- EU greenhouse gas emissions must be reduced by at least 20 percent below 1990 levels.
- 20 percent of EU energy consumption must come from renewable resources.
- Energy efficiency must be improved by achieving a 20 percent reduction in primary energy use compared with projected levels.

Similarly, 2005's Energy Policy Act (EPAAct) in the United States elevated the profile and increased discussion of energy use and conservation in the



Pictured is an exploded view of the Mouvex SLP25i seal-less sliding vane pump.

country. Since the inception of EPAAct, there have already been enviable gains in energy conservation in the industrial sector thanks to a series of energy-efficiency assessments that were conducted at more than 400 of the nation's largest manufacturing plants.

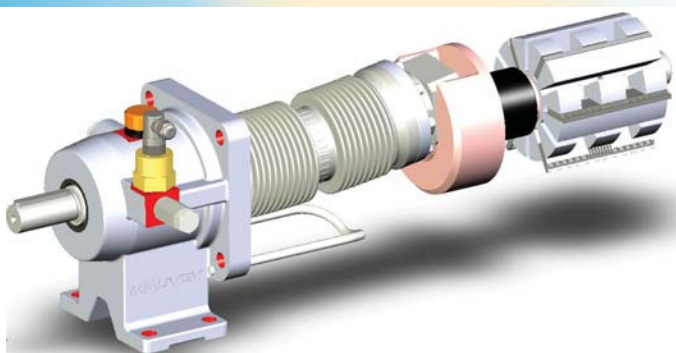
These assessments showed that it is possible for the industrial sector to improve its energy intensity by 25 percent by the end 2017 or an average of 2.5 percent per year leading up to that deadline. The key to meeting this goal is instituting a systems approach to energy efficiency and conservation in manufacturing plants, i.e. turning the focus away from individual components and, instead, analyzing both the supply and demand sides of the system as a whole.

However, while it is easy to establish thresholds for energy consumption, identifying and implementing the most efficient means to meet those thresholds can be much more problematic. For instance, since pumps account for anywhere between 27 and 33 percent of the total electricity used in the global industrial sector, improvements in pump system performance can play an important role in minimizing energy costs.

The Challenge

At their most basic, poor design and improper system operation are the root causes of inefficient pumping systems. As rotating equipment, pumps are subject to wear, erosion, cavitation and leakage. Moreover, these problems can be exacerbated through improper pump selection and operation. If they are not selected or operated properly, pumps can waste enormous amounts of energy, as well as require considerable maintenance.

This pump selection process can be complicated by the fact that many different types of pumps can be applicable in a single operation. And when making the final choice in type of pump, the list of crucial factors that need to be taken into account can be daunting: required flow rate, differential pressure, temperature, viscosity, shear sensitivity, corrosiveness of the liquid being handled, etc. In addition, facility managers have a tendency to resort to lowest-common-denominator thinking when outfitting their pumping system and just choose to go with oversized pumps. While installing an oversized pump ensures that the needs of the system are met under all operating conditions, the added energy cost inherent in operating oversized equipment is generally ignored.



Instead of magnets, Mouvex SLP pumps have double stainless steel bellows that house an eccentric shaft. This shaft, which is rotated by a crank system, drives the bellows in a circular movement.

As manufacturers work to align their energy-efficiency initiatives with their business goals, pump system improvements will play an increasingly important role. Since there is no “one pump fits all” solution, particular attention to proper pump selection will become more important to not only deliver the expected productivity gains, but also work equally as well at controlling energy consumption.

With this in mind, positive-displacement sliding vane pump technologies, by virtue of their inherent energy-efficient designs, are uniquely suited to offer manufacturers immediate benefits in fulfilling their energy-saving initiatives.

The Solution

Of the leading positive-displacement technologies, sliding vane pumps are generally among the most energy efficient. Design advancements have given sliding vane technology a decisive advantage over gear pumps, specifically with regard to optimized performance, low-shear capability, lowest lifecycle cost and best energy efficiency. This is due in part to the self-adjusting vane that eliminates energy-robbing slip and promotes high volumetric efficiency—even after substantial time in service.

This design makes sliding vane pumps much more efficient than gear pumps. Gear pumps mesh gears to pump fluid by displacement. Because of this style of operation, they wear from day one because their gears must mesh together in order to move fluid. This constant wear increases the internal clearances between the gear teeth—and in the process—reduces flow capacity and volumetric consistency, while increasing the possibility of slip. All of these deficiencies result in not only decreased pump performance and the need for more maintenance, but also in wasted energy use, which can additionally increase costs.

On the other hand, sliding vane pumps operate through the use of a number of vanes that are free to slide into or out of slots in the pump rotor when it is driven by the pump driver. The turning of the pump forces the vanes to move outward and ride against the inner bore of the pump casing, simultaneously forming pumping chambers. As the rotor revolves, the fluid enters the pumping chambers from the suction port. The fluid is then transported around the pump casing until it reaches the discharge port where it is forced out into discharge piping.

This type of design guarantees fixed displacement volume with minimal pressure variance, meaning that energy-wasting slippage and turbulence are minimized and high volumetric efficiency is maintained.

While the technology behind a sliding vane pump delivers the energy-conscious operation that manufacturers seek, one area in their construction that has traditionally remained problematic has been in pump shaft sealing. Though often ignored, pump shaft sealing can have a direct influence on a pump’s power consumption in a variety of ways:

- By its basic design, the more friction a pump generates, the more of a “power eater” it is. From that standpoint, shaft packing is a less efficient solution.
- In many cases, a pump’s shaft-sealing system may need additional cooling, either by a separate fluid (a mechanical seal flush, for instance) or by diverting part of the pumped liquid flow (magnetic drive). This extra cooling requires more energy to work and decreases the pump’s energy efficiency.
- Most shaft-sealing solutions are heat generators and can dry-run for only short periods of time, or maybe not at all. When choosing a pump shaft seal, this parameter must be mastered, especially in a potentially explosive atmosphere. Therefore, temperature sensors, flowmeters and power monitoring must frequently be added, thereby generating other energy consumption concerns.

However, when shaft packing or a basic mechanical seal cannot be used for any reason in a pump’s design, the main alternatives are:

- A double-flushed mechanical seal.
- A magnetic drive.
- A seal-less drive.

Seal of Approval

Realizing that the most energy-efficient solution to the pump shaft sealing challenge is a seal-less drive, Mouvex® has developed the SLP Series sliding vane pumps. The SLP Series is the first rotary positive-displacement pump that is not based on a magnetic drive, but rather, a seal-less leak-free design that eliminates magnets, mechanical seals and packing.

Instead of magnets, these pumps incorporate a double stainless steel bellows that houses an eccentric shaft. This shaft, which is rotated by a crank system, drives the bellows in a circular movement. This design addresses each of the concerns of shaft sealing that are mentioned above:

- The seal-less drive is needle- or roller bearing-mounted with separate sources of lubrication, meaning that frictions are reduced to a minimum.
- The pump’s entire flow rate crosses the seal-less drive chamber, signifying that the shaft does not need any additional cooling, while none of the flow rate is diverted.
- In most cases, power monitoring is not necessary, although an optional temperature sensor is available for extreme cases.

The result is a decrease in energy consumption with a corresponding increase in operational efficiency, all without the associated installation complexity. Compared to magnetic-drive pumps, these pumps create up to a 40 percent reduction in absorbed power and up to a 20 percent higher return in energy efficiency.

Sliding vane technology is being used worldwide to reduce energy costs and consumption, and create a more efficient pumping system. While world-renowned for its ability to offer increased suction, reduced product shear and consistent volumetric efficiency, sliding vane technology keeps being taken to the next level.

Simply put, seal-less drive technology offers even more advantages over gear pumps in the quest to reduce energy consumption and cost without sacrificing performance and reliability, making them a perfect positive-displacement pump choice in these increasingly energy-conscious times. **CI**

For more information, please e-mail Cardon at cardon@mouvex.com, or visit www.mouvex.com or www.pumps.com.

Mouvex has designed its seal-less leak-free SLP Series pump to not only provide a solution to product loss and health risks, but also to further energy savings.

