A Matter of (Eccentric Disc Pump) Principle

The eccentric disc principle utilized in Mouvex® A Series pumps has operators in the global chemical, oil and food industries moving away from lobe and gear pumps

By Paul Cardon

Mouvex® A Series Eccentric Disc Pumps have been a trusted solution for safe solvent transfer since 1965.

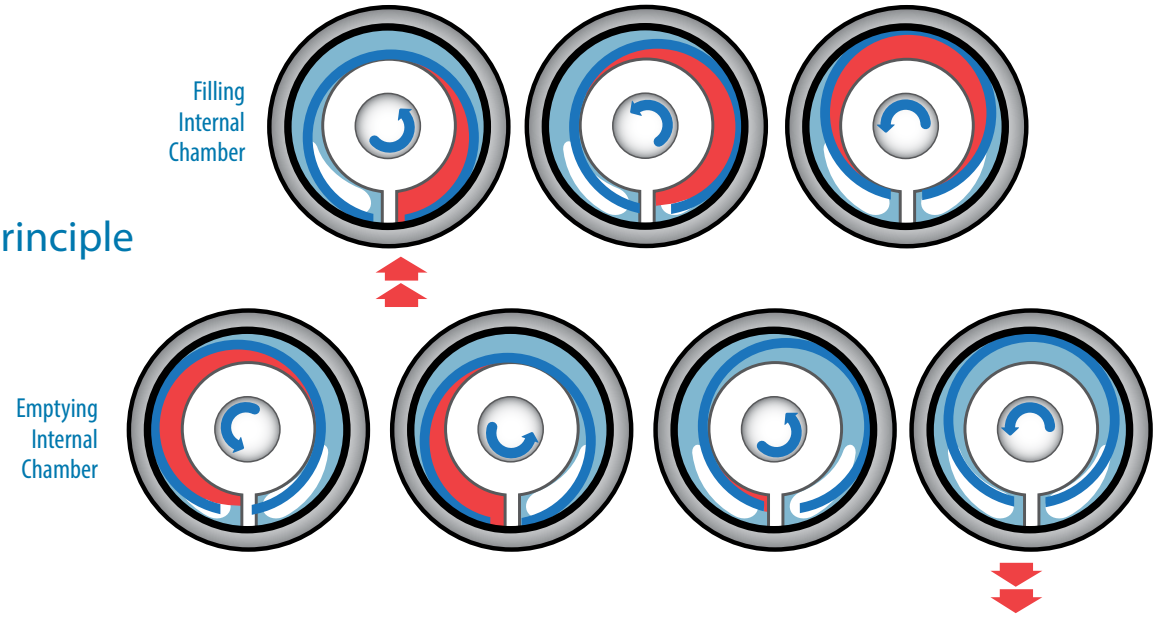
Eccentric disc technology has gained legendary status in Western Europe as the pump style that measures its success over decades rather than just years. One specific eccentric disc pump style that was introduced in 1965 boasts the type of robustness that has led to tens of thousands of units sold in Western Europe alone. Many of these units have provided 30 or 40 years of service with virtually no maintenance.

Eccentric disc pump technology was originally tailored specifically for the Western European oil and chemical markets due to its unique design, which enables the pump to transfer viscous, non-lubricating, volatile and delicate materials without any risk of shearing. This includes the safe handling of emulsions, inks, adhesives and resins in the chemical industry; and crude oil, waste oils and many different types of traditional or alternative fuels in the petroleum markets. Over time, food manufacturers in Western Europe began implementing these types of pumps to handle molasses, cooking oil and cocoa butter, to name a few.

While this technology has forged a readily acknowledged reputation for unmatched durability in these markets, that reputation remained somewhat of a Western European secret for many years. But over time, word has spread about the value of this technology in a variety of applications, and as commerce traditionally dictates, supply eventually needed to meet growing global demand.

The pumping technology, eccentric disc, is the vision of French engineer Andre Petit. He had been working in gold mines when he took a closer look at the prevailing processes for transferring water and other liquids out of the mine and set out to improve upon them, which he did with the invention of eccentric disc technology for pump operations in 1906. To improve these operations, Petit first needed to improve upon existing pump-design inefficiencies.

Mouvex Principle



Eccentric disc pumps consist of a cylinder and pumping element mounted on an eccentric shaft. As the eccentric shaft is rotated, the pumping element forms chambers within the cylinder, which increase in size at the intake port, drawing fluid into the pumping chamber. The fluid is transported to the discharge port where the pumping chamber size is decreased. This action squeezes the fluid out into the discharge piping.

A Series Eccentric Disc Pumps are self-priming, ensuring strong suction even after the pump runs dry, which is critical in applications such as paint and coatings.

Fixing Design Inefficiencies

Part of Petit's motivation to improve fluid-transfer in mining operations centered around the inefficiencies of the two prominent pump technologies at the time: internal gear pumps and lobe pumps. Specifically, he noted that gear pumps' style of operation leaves them susceptible to decreased flow capacity. This starts with the meshing of the gears, which pump fluids by displacement, forcing the gears to contact each other as they turn. This causes the gears to wear and results in increased clearances between the gear teeth, which leads to a loss of volumetric consistency. As they wear, gear pumps are also forced to run at higher speeds to maintain desired flow rates. The overall result: decreased performance and reliability with a corresponding increase in operating and maintenance costs.

Lobe pumps may offer continuous flow and run-dry capabilities, as well as the ability to handle a wide range of liquids, solids and slurries, but they wear constantly due to design deficiencies, as well. When a lobe pump wears, the internal clearances become greater, resulting in reduced flow capacity and volumetric consistency over time, along with an increase in efficiency-robbing product slip.

Lobe pumps also feature two shafts that need to be sealed, which doubles the potential for leakage. Lobe pumps must also operate at decreased speeds to handle high-viscosity liquids and can deliver poor performance when handling low-viscosity liquids.

Recognizing the inherent deficiencies in the operation of gear and lobe pumps, Petit set out to create a pumping technology that remedied these design shortcomings, and his innovation would eventually become an important cog in the manufacturing and liquid-handling wheel for a wide array of global industries.

Sustainable Innovation

In Petit's design, eccentric disc pumps feature a disc that is placed inside a pump cylinder. The disc is driven by an eccentric bearing that is installed on the pump shaft. This creates two distinct pumping chambers that increase and decrease in volume as the disc is moved by the eccentric bearing, producing both suction and discharge pressures as the chambers move in pairs that are 180 degrees apart. This ensures that the fluid passes through the pump at a constant flow rate.

During operation, the pump's disc is driven by the eccentric movement of the shaft, which allows products to flow through the pump's inner and outer chambers. This eliminates any possibility of pulsation within the pumped liquid and any slip is negligible.

The eccentric disc design also enables self-priming, which ensures strong suction even after the pump runs dry. This is in contrast with other pump technologies. When other pumps run dry, they continue to operate even after the material has been transferred in order to clear the lines. As a result, the pump's components can potentially burn and seize, which can result in costly damage to the pump internals. Eccentric disc pumps, by comparison, have the ability to run dry for a limited time without risk of pump damage.

The eccentric disc design also ensures gentle product handling with low shearing and has the ability to self-compensate for mechanical wear, guaranteeing consistent flow rates over time. Petit's eccentric disc pump design features high vacuum and compression effect for strong line-stripping ability, and a reduced number of components for quick and easy disassembly and reassembly. The eccentric disc principle allows these pumps to continually run in reverse, which enables the back-pumping of liquids.

International Expansion

While eccentric disc pumps offered the gentle handling, reliability and operational efficiency needed on a global landscape, the technology remained relatively unknown outside of Europe. Upon his creation of the eccentric disc operating principle, Petit created Mouvex®, which was originally based in Paris, France, but moved to its present 100,000-square-foot facility in Auxerre, France, in 1970. Mouvex became a part of global pump company Pump Solutions Group (PSG®), Oakbrook Terrace, IL, USA, in 2008. This partnership opened up a variety of global opportunities for the once regionally focused company.

The A Series has been upgraded to include ductile-iron construction and differential pressure to 10 bar (145 psi) – double what was previously possible with the original A Series.

Sharing Petit's tradition for innovation with the world was a priority for Mouvex after it became a part of PSG, including one of its standard-setting pump models: the A Series.

Launched in 1965, the Mouvex A Series Eccentric Disc Pump quickly built a reputation for robustness, delivering up to 40 years of virtually maintenance-free service in some of the most demanding applications in the chemical, food and oil industries. But for years, the A Series remained strictly within the purview of Western European manufacturers, with thousands of installations in this targeted demographic. Technological advancements in evolving industrial applications necessitated design enhancements, and those design enhancements have enabled the A Series to take its place on the international stage.

Modernization

To prepare the A Series for use in global markets, Mouvex channeled the innovation of its founder, starting with a critical modification to the A Series pump's flanges. Previously, the A Series was available only with non-standardized flanges, but in its new design, ISO PN16/ ANSI 150 flanges are available. Utilizing flanges certified by the International Organization for Standardization (ISO) and American National Standards Institute (ANSI) enables Mouvex to supply flanges that meet applicable operating standards around the world.

Another critical part about the A Series is its mechanical seals. The mechanical seal is positioned behind the piston to provide shaft sealing. Previously, operators could only use the A Series with Mouvex mechanical seals, but it now offers the A Series with Mouvex or standardized seals. This helps expedite installations worldwide as end-users no longer have to wait for seal delivery from France.

Eccentric disc technology, seen here in the A Series pump, addresses the inefficiencies found in internal gear and lobe pumps.

From a performance perspective, the redesigned A Series has doubled its maximum differential pressure from 5 bar (73 psi) to 10 bar (145 psi), allowing it to be used in many new applications. The A Series pumps are now available in ductile-iron construction. Previously, the A Series was available in cast-iron construction only. This material enhancement is critical as more and more companies in the petrochemical industry are moving away from cast-iron construction.

A Series pumps enable product transfer up to 150°C (302°F), as well as the use of heating or cooling jackets with products that can solidify at ambient temperatures. The pumps are ATEX-certified and can run dry for up to three minutes in potentially explosive environments.

Conclusion

The first step to achieving true greatness is pursing a dream that no one can see but you. Andre Petit chose to pursue greatness and, despite being surrounded by the darkness of gold mines, he saw a light at the end of tunnel. That light was the eccentric disc principle in pump operations, a principle that eclipsed early 20th-century pump technologies in terms of of efficiency, reliability and durability.

Over the years, Petit's company, Mouvex, has continued pursuing that dream and, as a result, global manufacturers in the chemical, oil and food industries are embracing the eccentric disc pumping principle, seen in pumps like the A Series, that improves their liquid-handling operations and gives them peace of mind.

About the Author:

Paul Cardon is the Mouvex® Industrial Products Manager with Pump Solutions Group (PSG®). He can be reached at Paul.Cardon@psgdover.com or +33 (0) 3 86 49 86 92. Headquartered in Auxerre, France, Mouvex® is a leading manufacturer of positive displacement pumps and compressors for the transfer of liquids and dry-bulk products worldwide, and is an operating company within Dover Corporation's Pump Solutions Group (PSG®). PSG is comprised of several of the world's leading pump brands including Abaque®, Almatec®, Blackmer®, Ebsray, Griswold™, Neptune™, Maag, Mouvex®, Quattroflow™ and Wilden®. You can find more information on Mouvex at www.mouvex.com and more on PSG at www.psgdover.com.