

Binder Transfer in Paint and Coatings

MOUVEX® SEALLESS ECCENTRIC DISC PUMP PROVIDES LOW SHEAR, CIP AND HIGH VOLUMETRIC EFFICIENCY FOR BINDER TRANSFER APPLICATIONS

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By Christophe Jovani



The Challenge

A paint and coatings plant that produces both cationic paste with pigments and cationic binders without pigments for truck shipment to automotive OEMs was experiencing difficulties when transferring the compounds from mobile tanks to trucks.

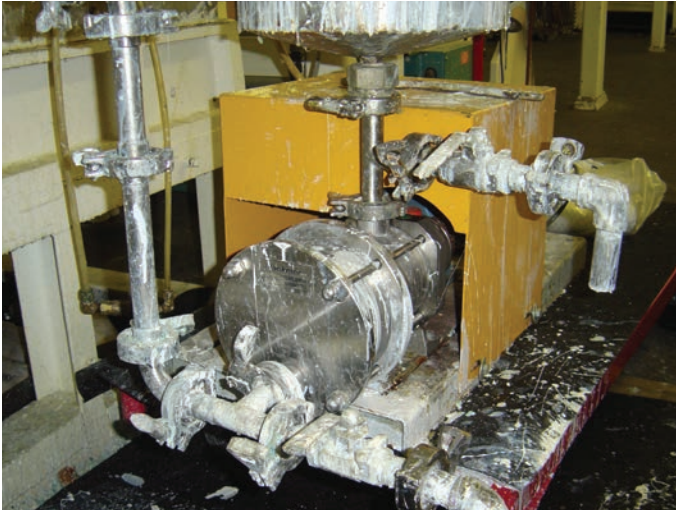
In particular, the types of pumps that were being used were incapable of totally draining the pipes, hoses and mobile tanks used in the process, leading to wasted time and materials, as well as an increase in the probability of leakage occurring.

Because the trucks are loaded with cationic binder from mobile tanks, meaning frequent human involvement, the plant operators were looking to upgrade to a style of pump that would make the overall operation cleaner and more efficient.

Because of the unique types of binders that are handled, as well as the operators' requirements for clean, time-sensitive performance, a versatile pump needed to be incorporated, one that is sealless, provides low shear, clean-in-place capabilities and high volumetric efficiencies.

The Solution

The new pump selected for this type of application was one that featured eccentric disc technology. With that in mind, a Mouvex® C-Series Sealless Eccentric Disc Pump—Model C18i, specifically—was installed at the plant. Four years after installation, the pump is still working perfectly. Key to its operation, at the end of the loading process the pump totally drains the inlet hose, mobile tank and outlet pipe, and since the C18i does not have a mechanical seal, there is no risk of product leakage.



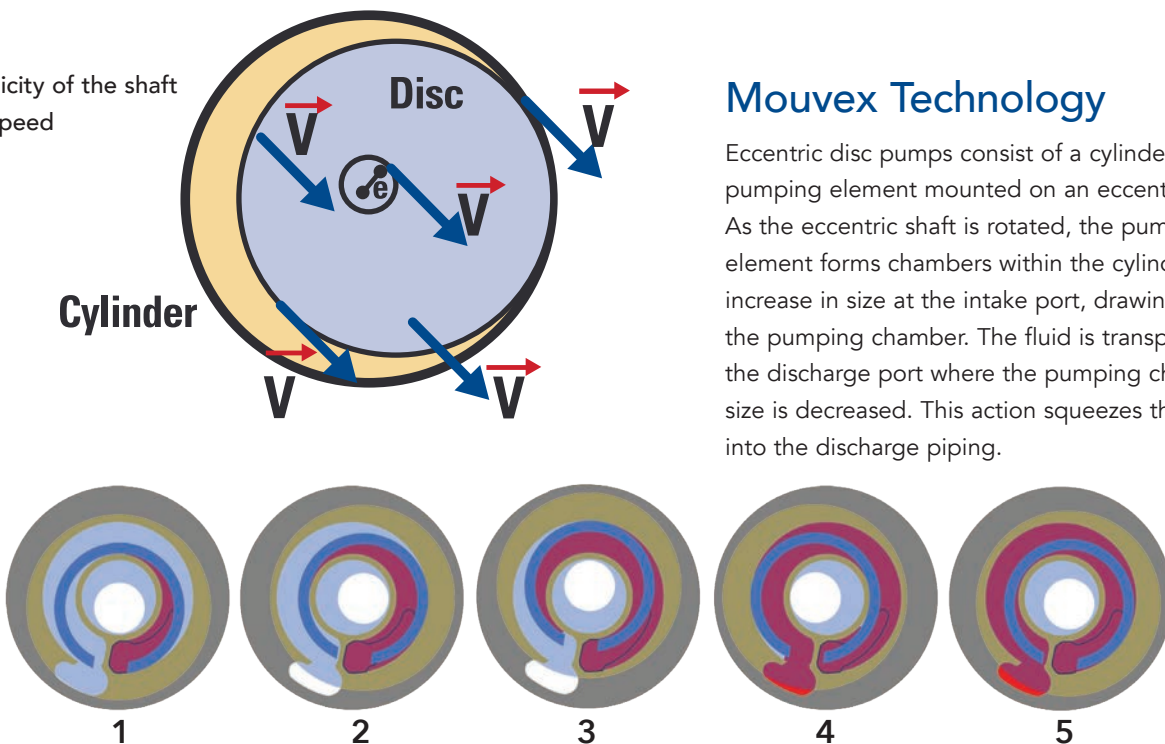
The Mouvex C-Series Eccentric Disc Pump.

A Mouvex C-Series pump was ideal for this application because of these important design benefits:

- Sealless design in which there are no mechanical seals, magnets, rubber or PTFE diaphragms
- Low shear handling of products with low slip, lower internal velocities and ultra-low agitation
- Clean-in-place capability that allows the pump to be completely drained, flushed and cleaned without disassembly
- High volumetric efficiency that is able to maintain a constant flow rate at a given viscosity throughout its pressure range
- Good compression performance and the ability to run dry (up to 10 seconds) enable excellent self-priming capabilities and complete line stripping of suction and discharge lines
- Self-adjusting operation that maintains delivery/pressure performance over time through the use of a self-adjusting disc/cylinder

Because of the latter characteristic, eccentric disc pumps can be used as dosing pumps (Figure 1). Since the pump is automatically self-adjusting, it maintains greater efficiency and repeatability over time than traditional lobe or gear pumps.

e: eccentricity of the shaft
V: linear speed



Mouvex Technology

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.

Figure 1

Mouvex Principle

All Mouvox C-Series pumps have a shear rate of rate of sec-1 = 0.9 rpm, which is lower than other types of pumps used in paint and coatings applications. This is due in part to the gentle, low velocity action of the disc and cylinder, and the extremely low slip rate of the pump. Unlike other technologies, eccentric disc pumps do not have required clearances that can cause slip, which is the portion of the pumped product that is forced back to the suction side of the pump due to pressure through the clearances. In C-Series pumps, the discharge pressure exerts itself against the eccentric disc in a way that assists in maintaining axial contact with the cylinder, thus mitigating the usual effect that discharge pressure has on slip in pumps. It

Movement and Flow for CIP

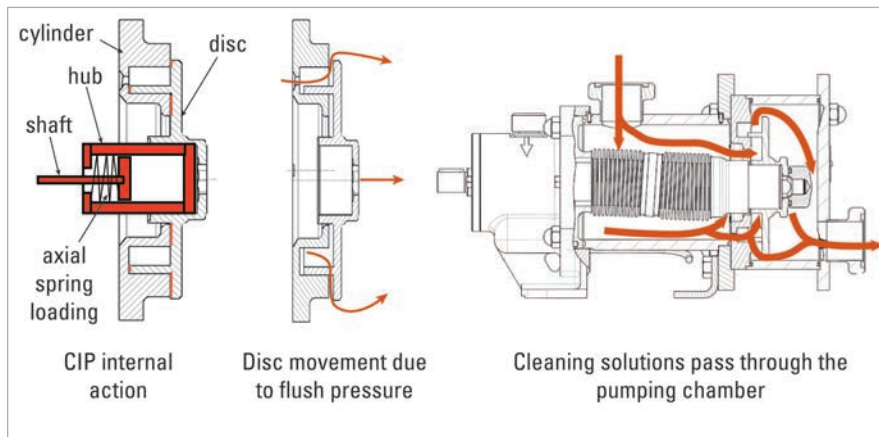


Figure 2

is this low slip between the disc and cylinder that gives the C-Series the ability to self-prime and line strip. Mouvox C-Series pumps are capable of handling viscosities of up to 10,000 Cp, working pressures up to 130 psi (9 bar), capacities of 4 to 158 gallons per minute, operating temperatures up to 176°F and a particle-size range of 1 to 3 millimeters.

Regarding Mouvox's clean-in-place technology, the Mouvox C-Series holds 3A Approval Certification and is designed per European Hygienic Equipment Design Group (EHEDG) specifications to be flushed and cleaned in place.

When installed for clean-in-place (CIP) operation, unlike rotary lobe pumps, it experiences no loss of performance due to

vertical drain porting. When cleaning, pressure is introduced to the back of the eccentric disc through the pump chamber (Figure 2). When the flush pressure overcomes the spring, the disc moves away from the cylinder, allowing the cleaning solution to pass through the pumping chamber. This feature allows a relatively large volume of cleaning fluid to sweep through the pump, providing a thorough cleaning and often eliminating the need for bypass piping for the CIP mode.

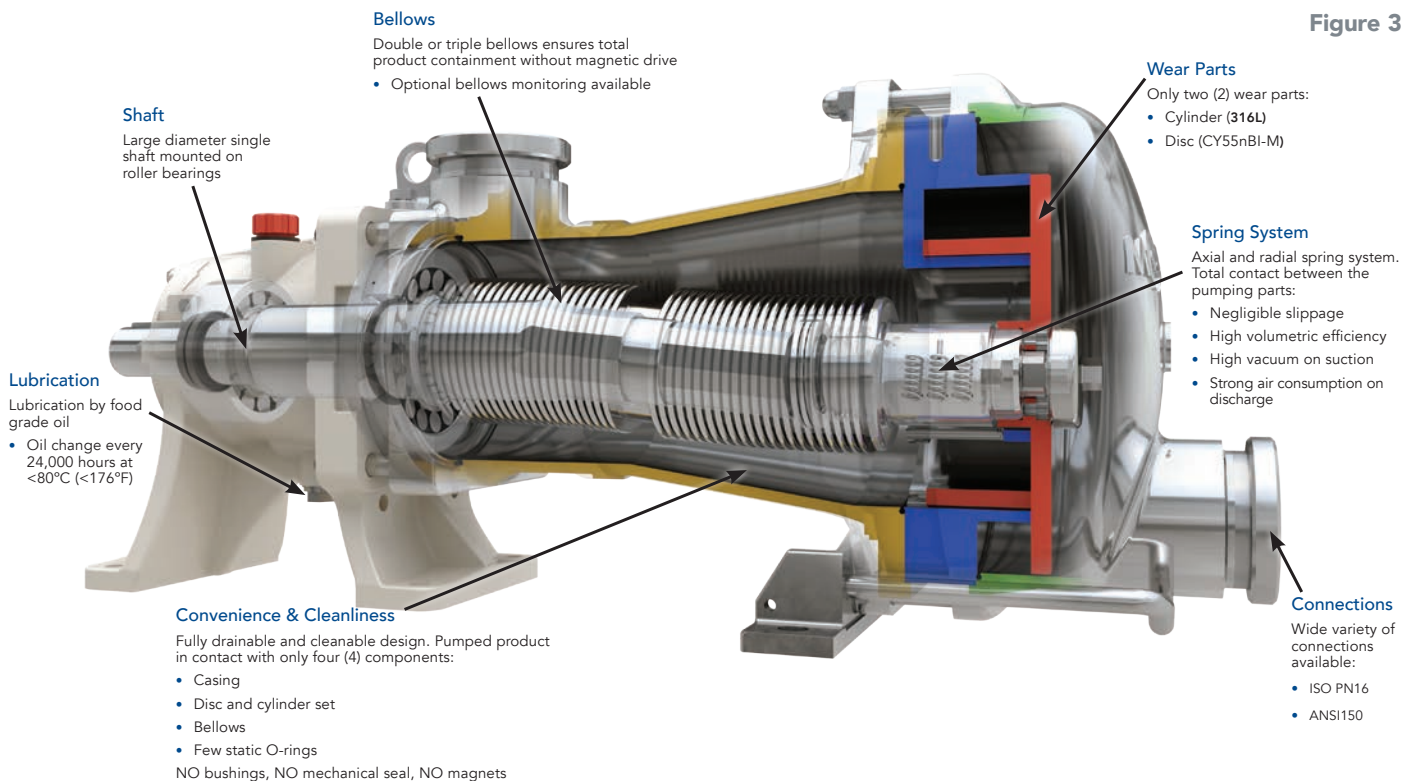


Figure 3

Where maintenance is concerned, Mouvex C-Series eccentric disc pumps consist of very few parts (Figure 3). The cylinder-disc assembly can be replaced without disturbing the suction piping or drive components.

Eccentric Disc Technology vs. Others

Because of all of these characteristics, Mouvex C-Series eccentric disc pumps are able to supply important benefits that pumps traditionally utilized in the paint and coatings market sector cannot:

- **Air-Operated Diaphragm (AOD) Pumps.** AODs have traditionally been the pump of choice in the paint and coatings market because of their low initial purchase cost. However, some types of AOD pumps are inefficient and require high maintenance increasing their total cost of ownership.
- **Gear Pumps.** The second-most popular pump choice behind AODs due to their capability of handling higher viscosity ranges. The weaknesses of gear pumps include excessive seal leakage; inability to self prime; a flow rate that is jeopardized when wear begins; high internal velocities that affect fluid dynamics, resulting in shear; and clearances that result in slip as pressures increase and viscosities decrease.
- **Centrifugal Pumps.** The primary drawback of centrifugal pumps is their high rate of slippage. Centrifugal pumps typically have lower efficiencies than eccentric disc pumps.
- **Lobe Pumps.** Lobe-type pumps perform like gear pumps, meaning they have many of the same drawbacks that gear pumps have. Also, the need to seal two shafts doubles the expense of seals and the potential for leakage.



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Conclusion

A final benefit of the Mouvex C-Series Eccentric Disc Pump is that it is a multi-use piece of equipment, meaning that it can be used in many applications. In the paint and coatings industry, that could include the pumping of pigments, resins, solvents and additives. These capabilities help make eccentric-disc technology the perfect solution when faced with the challenges of addressing pump seal, suction, product shear and volumetric efficiency concerns. Through the incorporation of such unique benefits as leak-free operation and line-stripping capabilities, the eccentric-disc principle makes the pump extremely flexible, allowing the pumping of low-viscosity, high-viscosity and highly abrasive materials within a single process—all with the same pump. This makes the C-Series not only a longer-lasting, more efficient piece of equipment, but a multi-tasking one, as well—and possibly the answer for many difficult pumping applications in the Paint and Coatings industry.

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