

Vane pump technology and its S&D manufacturing applications

Bill Bohr

Over the past several years the manufacture of soap and detergents has become a more complex process with changes in raw materials, the introduction of new chemicals, changes in ingredients, expensive fragrances, colorants and preservative additives, and advanced soap-making processes. With this in mind, traditional pumping technologies no longer meet the demands of reliability, product loss prevention, environmental protection, and process efficiencies. However, as the processes have evolved, sliding vane technology has emerged as the technological leader, and the preferred pump choice in soap and detergents manufacturing.

Sliding vane pumps are used in a wide variety of soap and detergents applications and have the ability to be used at several stages throughout the manufacture of nearly all products in the soap and detergents industry—moving natural and synthetic raw material feedstocks from petrochemical and oleochemical processing facilities to storage and transports, then throughout the blending, filling, and bottling processes within the detergent manufacturing facility or the batch or continuous process at soap plants. Sliding vane pumps also have the ability to handle a wide variety of raw materials, including all types of high-purity

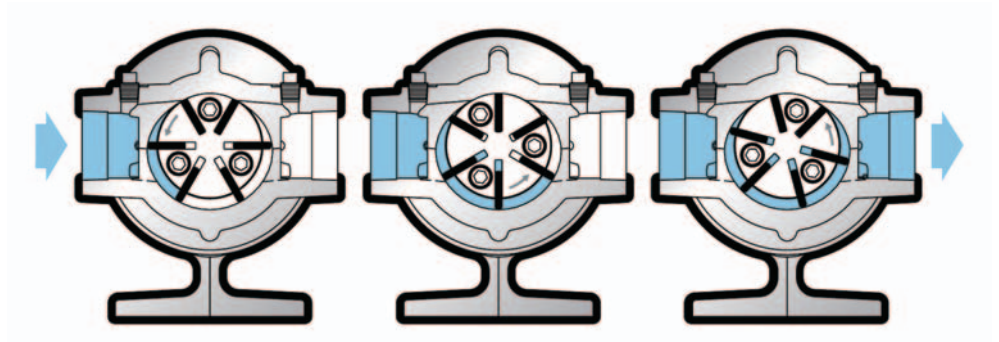


FIG. 1. The typical action of a Blackmer sliding vane pump. Sliding vane pumps have a number of vanes that are free to slide into or out of slots in the pump rotor. Each revolution of a sliding vane pump displaces a constant volume of fluid. Variance in pressure has minimal effect. Energy-wasting turbulence and slippage are minimized, and high volumetric efficiency is maintained. Image courtesy of Blackmer.

chemicals, additives, enzymes, acids, surfactants, glycerin, and concentrated perfumes and dyes, to name a few.

Sliding vane technology has always offered the advantages of high-efficiency and low-maintenance over traditional gear and lobe pumps. These are important factors in today's era of high energy costs, lean personnel staffs, and high demand for increased profitability. But these reasons alone are only part of a much bigger picture.

For even greater flexibility, efficiency, and productivity, advanced vane pump designs include motor speed technology, advanced "designed-in" features such as a hydrodynamic journal bearing, and one mechanical seal. These innovative features serve to further improve the fundamental pumping process in the manufacture of soap and detergents.

Sliding vane pumps are designed with unique "self-adjusting" vanes that allow them to maintain near-original volumetric performance during the life of the pump—meaning these pumps are not subject to efficiency-robbing slip that occurs from wear in gear and lobe pumps. In addition, vane

pumps are designed around the bearings and seals, so they offer longer life and greater product loss prevention than other technologies. Therefore, by virtue of their design, vane pumps are ideal for handling expensive, fine chemicals and fragrances where other pumps may experience seal difficulty.

Sliding vane pumps have a number of vanes that are free to slide into or out of slots in the pump rotor. When the pump driver turns the rotor, centrifugal force, rods, and/or pressurized fluid causes the vanes to move outward in their slots and bear against the inner bore of the pump casing forming the pumping chamber. As the rotor revolves, fluid flows into the area between the vanes (hydraulic segments) when they pass the suction port. This fluid is transported around the pump casing until the discharge port is reached. At this point the fluid is squeezed out into the discharge piping. Each revolution of a sliding vane pump displaces a constant volume of fluid. Variance in pressure has minimal effect. Energy-wasting turbulence and slippage are minimized, and high volumetric efficiency is maintained.

Constructed with long-lasting, non-metallic composite vanes that automatically adjust clearances and sustain the highest levels of flow performance and efficiency over time, sliding vane pumps eliminate slip, capacity loss, and downtime for clearance adjustments. The self-adjusting vanes offer exceptional suction and dry priming capabilities, while being able to run dry for short periods of time.

Advanced sliding vane technologies include pumps with a hydrodynamic journal bearing—a unique fluid boundary-forming principle—that eliminates shaft-to-bearing contact. The shaft hydroplanes above the bearing surface on a cushion of liquid. In this hydrodynamic condition there is no metal-to-metal contact or wear, and bearing life can be indefinite. These pumps are engineered to achieve hydrodynamic mode (full film operation—the point offering the lowest bearing friction and least wear) faster than any other pump in their class to preserve bearing life. Optimum bearing characteristics are also maintained, even under a wide range of operating conditions. Reduced shaft/bearing contact minimizes friction and results in higher mechanical efficiency and energy cost savings.

Advanced sliding vane pump technology today includes cavitation/noise suppression liners that control the effects of cavitation and reduce noise levels up to 15 dbA. This liner is replaceable, giving the pump added protection and extended service life.

In addition, the advanced pumps include one mechanical seal and sealed-for-life bearings that significantly reduce the chance of leaks and product loss potential of expensive raw materials, concentrated dyes, and fragrances. In addition, an advanced shaft and rotor configuration incorporating a heavy-duty shaft and rotor offers high fatigue and bending strength, minimizing shaft and vane stress.

Sliding vane pumps can be completely rebuilt with piping attached, allowing for quick and easy maintenance. If a vane becomes damaged, replacing it can be accomplished by simply removing the outboard head assembly, sliding out the old vanes, inserting the new ones, and reinstalling the head. In a matter of minutes, the pump can

be back in operation. Simple vane replacement requires no special tools.

An optional relief valve is also available to help protect the pump in a high-pressure buildup situation. Capable of holding pressure under variable flow and pressure conditions, the valve offers an additional level of protection for pump operation.

For soap and detergents applications—from high-purity chemicals to concentrated dyes and perfumes—sliding vane technology is being used worldwide to solve seal, suction, product shear, and volumetric efficiency problems, as well as to offer unique benefits such as leak-free assurance, line-stripping capabilities, metering and nonpulsating flow.

Its sliding vane principle offers efficiency at low flow rates and allows for higher operating speeds and pressures on low-viscosity fluids compared with other types of positive displacement pumps. These pumps are capable of low-flow, high-head applications on low-viscosity fluids where centrifugal pumps cannot run. Sliding vane pumps offer superior priming and suction capabilities for clearing tanks and stripping lines and pump chambers when making in-line soap and detergents material changes.

Designed without a gear reducer, advanced sliding vane pumps offer upfront equipment, installation, and energy cost savings, and a smaller footprint than that of a conventional pumping unit. Many types of sliding vane pumps are available to handle difficult pumping applications in the soap and detergents industry.

Bill Bohr is the director of Product Management at Blackmer (Grand Rapids, Michigan, USA), a leader in the design and manufacture of high-quality flow technologies, including rotary vane, eccentric disc, and peristaltic hose positive displacement pumps, centrifugal pumps, screw compressors, air elimination systems, and sliding vane and reciprocating compressors for the transfer of liquid and gas products. Contact him by phone at +1-616-241-1611 or e-mail: bohr@blackmer.com. For more information visit netlink: www.blackmer.com.

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