Biodiesel Transport Demands the Right Balance of Pump Efficiency and Material Compatibility

HOW SLIDING VANE PUMP TECHNOLOGY, COMPATIBLE ELASTOMERS AND PROPER SEAL SELECTION HELP OPERATORS SAFELY AND EFFICIENTLY TRANSFER BIODIESEL BLENDS THROUGHOUT THE FUEL DISTRIBUTION PROCESS.

by Ron Crouch



One of the main challenges found in incorporating biodiesel into the nation's motor-fuel pool is one of transportation. Since most biodiesel is produced in relatively remote areas, the most common shipping methods for biodiesel are railcar and transport truck. Blackmer® Sliding Vane Pumps have been proven to be the most efficient, reliable and environmentally safe options for transporting biodiesel.

Introduction

Since the passage of the Energy Policy Act of 2005, biodiesel has become an established component of the U.S. motor-fuel supply. Produced from renewable feedstocks such as vegetable oils, animal fats and recycled cooking oils, biodiesel offers an alternative to petroleum diesel while providing benefits such as improved fuel lubricity and reduced lifecycle greenhouse gas emissions.

Biodiesel is commonly blended with petroleum diesel at concentrations such as 5% (B5) and 20% (B20). Pure biodiesel (B100) is also used, primarily as a blending component, although higher concentrations require additional consideration for fuel handling and equipment compatibility.

According to the U.S. Energy Information Administration (EIA), domestic biodiesel production totaled approximately 1.15 billion gallons in 2025, down from 1.67 billion gallons in 2024. Consumption also declined, from 1.93 billion gallons in 2024 to 1.11 billion gallons in 2025. Despite these declines, biodiesel remains part of the nation's transportation fuel supply, making efficient and reliable handling throughout the distribution process essential.

The Challenge

No matter the amount of biodiesel produced and consumed in the United States, one of the main challenges found in incorporating it into the nation's motor-fuel pool is one of transportation. This challenge is divided into two areas. The first is one of logistics. Railcars and transport trucks play important roles in moving biodiesel between production facilities, storage terminals and distribution points.

These modes of transportation lead us to the second part of the challenge – the equipment that is used to transfer the biodiesel from production plant to railcar or truck, and from railcar to truck. Because biodiesel has better lubricating properties and a much higher cetane rating than traditional low-sulfur diesel fuels, the use of biodiesel in diesel engines can reduce fuel-system wear and increase the life of the fuel-injection equipment that relies on the fuel for its lubrication.

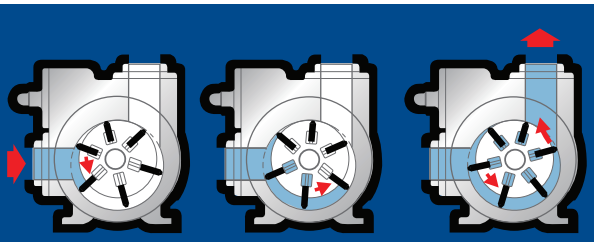
However, while biodiesel use can improve engine performance for the end-user, its properties can have a deleterious effect on the equipment that is used to transport it from point to point along the supply chain. With that in mind, studies have shown that although B20 is well-suited for use with most diesel technology, B100 and other higher biodiesel blends require special handling with equipment that has been engineered to be compatible with the fuel. Specifically, B100 will degrade, soften or seep through hoses, gaskets, seals, elastomers, glues and plastics that have been made with nitrile rubber, polypropylene and polyvinyl materials. Non-metallic materials that have been shown to be compatible with B100 include PTFE, fluorocarbons (FKM), high-density polyethylene (HDPE), fluorinated plastics and nylon. Metals that are compatible with B100 include ductile iron, stainless steel, carbon steel and aluminum, while brass, bronze, copper, lead, tin and zinc are incompatible.

The Solution

Taking into consideration the material-compatibility concerns that are inherent in the handling and transportation of biodiesel, especially in its higher concentrations, Blackmer®, a PSG brand, has developed a complete line of sliding vane pumps that have been proven to be the most efficient, reliable and environmentally safe options when transporting biodiesel.

The key pump components to consider when handling biodiesel are the elastomer seals. All Blackmer sliding vane pumps for biodiesel applications feature elastomer seals that allow for compatibility with all biodiesel blends. Existing FKM elastomers have been upgraded to a high-grade compound to allow for much broader material compatibility. These elastomers are also UL-listed and approved for all biodiesel blends, including B100. The enhanced FKM seals also ensure proper sealing and volumetric output, even after significant in-service time.

Even before the introduction of the upgraded, biodiesel-compatible elastomers, Blackmer Sliding Vane Pumps offered high efficiency and low maintenance advantages over traditional gear and lobe pumps when it came to handling thin liquids like biodiesel. These are important factors in today's era of rising energy costs, lean personnel staffs and high demand for increased profitability.



Inside Sliding Vane Pump Technology

The vanes that slide into or out of slots in the pump rotor are one of the secrets behind a sliding vane pump's enviable operational characteristics. The pump's rotation draws liquid in behind each vane, through the inlet port and into the pumping chamber. As the rotor turns, the liquid is transferred between the vanes to the outlet where it is discharged. Each vane provides a positive mechanical and hydraulic displacement of the liquid. Vanes are actuated by three forces:

1. centrifugal force from the rotor's rotation
2. push rods moving between opposing pairs of vanes, and
3. liquid pressure entering through grooves and acting on the rear of the vanes

Each revolution of a sliding vane pump displaces a constant volume of fluid; variances in pressure have a negligible effect. Energy-wasting turbulence and slippage in the pump are minimized and high volumetric efficiency is maintained. The sliding vane technology also results in superior priming and suction capabilities, making the pumps the perfect choice for line-stripping, the evacuation of heels and pumping from underground or top unloaded storage tanks. Sliding vane pumps for biodiesel applications are available with capacities from 1 gallon per minute to 2,300 gallons per minute.

The vanes that slide into or out of slots in the pump rotor are one of the secrets behind a sliding vane pump's enviable operational characteristics. When the pump driver turns the rotor, centrifugal force, push rods and 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. Therefore, each revolution of a sliding vane pump displaces

a constant volume of fluid, maintaining high volumetric efficiency and resulting in a minimal variance in pressure and the minimization of energy-wasting turbulence and slippage.

In addition to the advantages offered by sliding vane operation, all Blackmer sliding vane pumps place seal and bearing life as the primary design emphasis, leading to a pump that eliminates the most problematic challenges of light-liquid transfer. This also gives the pumps seal and bearing integrity, the ability to offer flow rates from 1 gpm to 2,300 gpm, superior self-priming, line-stripping and suction capabilities, and maintenance characteristics that allow the pump to be completely rebuilt with the piping attached.

Application Examples

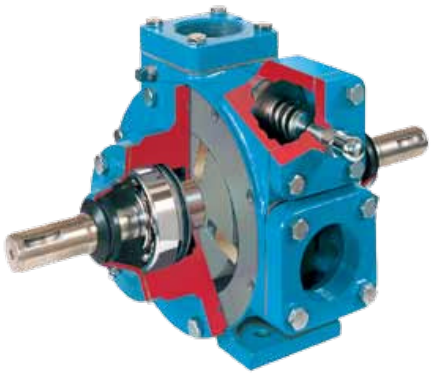
Blackmer sliding vane pumps have been used in a number of biodiesel applications, both big and small, by producers who wish to maximize the return on their biodiesel production, while also ensuring that the fuel is delivered in a safe and effective manner. For example:

- In 2002, Dennis K. Burke, Inc., Chelsea, MA, USA, became the first supplier of biofuels, including biodiesel, in the Northeast. To ensure the safe and efficient transfer of its entire product line – which includes gasoline, low-sulfur diesel, biodiesel, heating oil, kerosene, racing fuels, motor oils and other lubricants – Dennis K. Burke outfitted its 70-plus truck fleet with Blackmer TXD2.5A Series and TXD3E Series sliding vane transport pumps that have been designed for use in truck-mounted delivery applications of all types of motor fuels, including biodiesel.

- Like many biodiesel pioneers, Scott Johnson began making biodiesel in his garage in 2005. Since then, his dream has grown into the GEN-X Energy Group, Inc., Burbank, WA, USA, and a biodiesel production plant that could someday produce as many as 40 million gallons of the alternative fuel per year. To help keep the GEN-X operation running smoothly, Johnson relies on Blackmer XL Series sliding vane pumps for high-speed truck loading and transfer.

- Cincinnati-based Peter Cremer North America LP became the first BQ-9000-certified producer of biodiesel in the United States in 2002, and in 2006 completed a plant expansion that allows it to produce 30 million gallons of biodiesel per year. To meet this demand, Peter Cremer utilizes Blackmer NP2 and NP4 Series sliding vane pumps for a wide variety of plant operations, from moving product from production to storage, to unloading raw materials from railcars, to loading finished products onto trucks for delivery.

- In 2005, the Minnesota state legislature passed a mandate that all diesel fuel contain at least 2% biodiesel. Since then, as much as 15% of the deliveries made by Kane Transport, Sauk Centre, MN, USA, now consist of biofuels, with a significant portion being biodiesel from B2 to B100. With an expansive network of 11 company-operated terminals and a rolling fleet consisting of nearly 200 tractor trucks and more than 250 transport trailers, Kane Transport has turned to Blackmer TXSD3E Series sliding vane pumps for all of its biodiesel deliveries





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All Blackmer sliding vane pumps for biodiesel applications feature UL-listed and approved elastomer seals that allow for compatibility with all biodiesel blends, including B100.

Conclusion

With biodiesel production and consumption continuing to be a major component of the motor-fuel pool in the United States there is a profound need for materials and equipment that are capable of handling its production, transportation, handling and storage. With a century-old history of efficiently and safely handling thin liquids, sliding vane technology from Blackmer is the obvious choice for the pumping requirements found in a biodiesel plant, tank truck and railcar fleet, or storage facility.

About the Author

Ron Crouch is a Product Management Director for Blackmer and PSG. He can be reached at ron.crouch@psgdover.com. For more information on the full line of Blackmer pumps and compressors, please call +1 (616) 475-9352 or visit blackmer.com. Blackmer is a product brand of PSG, a Dover company, Downers Grove, IL, USA. PSG is comprised of several leading brands, including Abaque, All-Flo, Almatec, Blackmer, Ebsray, em-tec, Griswold, Hydro, ipp, Malema, Mouvex, Neptune, PSG Biotech, Quantex, Quattroflow and Wilden. PSG products are manufactured on three continents – North America, Europe and Asia – in state-of-the-art facilities that practice lean manufacturing and are ISO-certified. PSG is part of the Pumps & Process Solutions segment of Dover Corporation. For additional information on PSG, please visit psgdover.com. PSG: Where Innovation Flows.