Total Terminal Transfer

SLIDING VANE TECHNOLOGY PROVIDES THE SUCTION NEEDED TO OPTIMIZE PRODUCT TRANSFER AT LIQUID-TERMINAL OPERATIONS

By Ted Ratcliff

Throughout the supply chain, it's common for a small amount of a specific shipment to miss its final destination. This is because a "heel" is often left in the barge, railcar or tanker. While it is nearly impossible to get every last drop out of the delivery vessel, sliding vane pump technologies can remove as much of the shipment as possible during delivery.

Introduction

We're all familiar with the children's relay race that involves a bucket of water. Teams of four or five kids start with a full bucket of water and take turns carrying it to the next person in line before handing it off. The catch is that, invariably, some of the water will slosh out. The winning team is the one whose bucket has the most water remaining in it when it reaches the last person, since it is virtually impossible for the bucket not to lose at least a little water.

The shipping and transfer of liquid commodities around the world follows a similar "relay race" type of pattern. While there is generally no spillage, not all of a specific shipment makes its way to the final destination. Profitable and responsible transfer relies on both speed and the complete transfer of product. For example, let's take a look at petroleum products.

Crude oil is shipped by barge to a refinery "feedstock" storage tank. After the oil is refined into its various marketable forms, those products are shipped to "finished goods" storage tanks. From there, they are taken by barge, railcar or tank truck to intermediate bulk-storage facilities. When needed, they are transferred into railcars or tanker trucks for shipment to the end-user.

With each transfer, it's common for a small amount of a specific shipment to miss its final destination. This is because a “heel” is often left in the barge, railcar or tanker. The heel is the amount of product that can’t be lifted out of the delivery vessel by the pumping system that is used at the business end of each link in the supply chain. While it is next to impossible to get every last drop out of the delivery vessel, there are pumping technologies available that can guarantee that as much of the shipment as humanly possible is removed during delivery.

This white paper will focus on the technologies that have been designed to leave delivery vessels and storage tanks as “dry” as possible after the transfer of a wide array of liquid commodities.

Bang For The Buck

In any transaction, whether it’s buying a pack of gum or a new home, you want to get what you pay for. The same principle holds true in the purchase of bulk petroleum products. If a gasoline-station operator buys 6,000 gallons of premium unleaded, he wants 6,000 gallons of premium unleaded delivered into the underground storage tanks at his site.

The supplier wants to deliver the full 6,000 gallons because he doesn’t want to be known as someone who doesn’t deliver what is promised. He also wants to empty his tanker as completely as possible because he might use it to ship a variety of products. If so, any remaining fuel in his truck or piping could potentially contaminate the next shipment it is scheduled to handle.

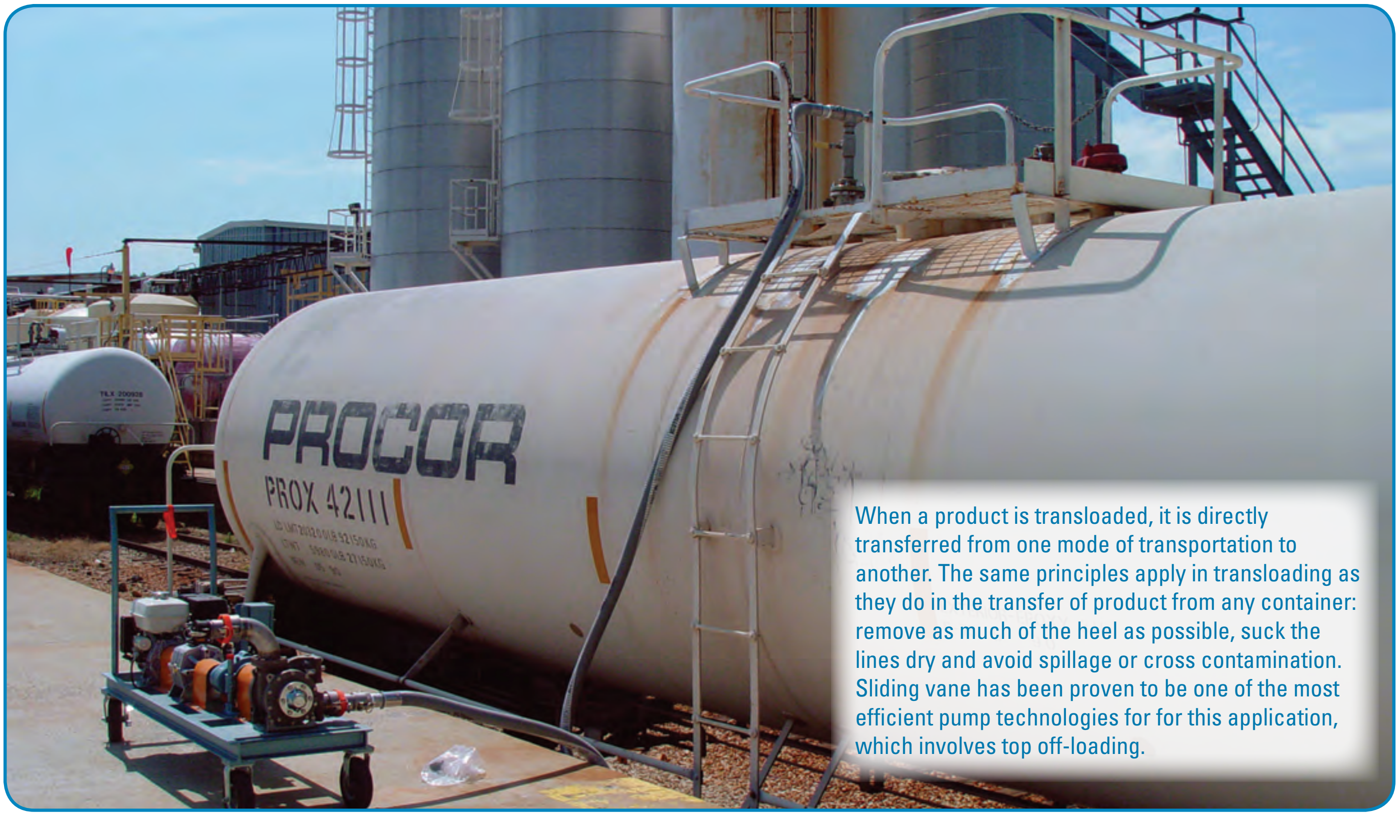
Another concern with product transfer is the discharge hoses and piping that are used as the middlemen when the product is being moved from a storage tank to a delivery vehicle, or vice versa. Operators need a pumping system that is capable of clearing those discharge lines at the end of the transfer process, not only to ensure that all of the product is delivered, but also to prevent spills, increase safety and ensure that no product cross-contamination can take place. Additionally, no driver wants to have to “walk down “ the delivery hoses to ensure all of the product has been cleared from the lines.

Terminally Versatile

When most people think of liquid-storage terminals, the enduring image is one of the giant 500,000-gallon holding tanks that dot the landscape at a petroleum refinery. In reality, refinery storage is just the tip of the iceberg in the liquid-storage terminal universe. Tank farms serve as an essential link in the distribution of a wide variety of other products, including mainstream and niche chemicals (solvents, fertilizers, pesticides, acids, etc.); alternative fuels (ethanol and biodiesel); vegetable oils for food products; animal fats and oils for cosmetics; molasses; LPG; and LNG.

In short, any liquid that can be transported in bulk, whether by barge, railcar or tank truck, at some point in its life is transferred into and out of a storage tank and delivery vehicle, often at numerous points along the supply chain. There is also growing popularity in a process known as “transloading.” When a product is transloaded, it is directly transferred from one mode of transportation to another, for example, from a railcar to a tank truck, which eliminates the intermediate stage of transferring the product into a storage tank. The same principles apply in transloading as they do in the transfer of product from barge to storage terminal: remove as much of the heel as possible, suck the lines dry and avoid spillage or cross-contamination.

The pumping technology used in liquid-terminal applications—again, using petroleum production as an example—is put under the most stress at the head of the supply chain, where the barge or ship loaded with crude oil arrives at the refinery. The first very large crude carrier (VLCC) was built in 1966. Since then, more than 1,000 of these behemoths—which can carry more than 2 million barrels of oil at one time—have been built to traverse the world’s oceans as they ship crude oil to refinery locations around the globe. These types of supertankers were designed to be an economical way to deliver large shipments of oil throughout the world.



When a product is transloaded, it is directly transferred from one mode of transportation to another. The same principles apply in transloading as they do in the transfer of product from any container: remove as much of the heel as possible, suck the lines dry and avoid spillage or cross contamination. Sliding vane has been proven to be one of the most efficient pump technologies for for this application, which involves top off-loading.

When they do arrive at port, however, they need to be unloaded. Again, the same unloading parameters apply: the heel must be minimized, the threat of spillage must be eliminated and cross-contamination must not occur.

The Solution

Over the years, many pump technologies have been utilized in the effort to optimize liquid transfer from ship, barge, railcar or tank truck into storage terminals. The one pump technology that has repeatedly been proven the most effective in this application—for all of the many different products that are handled in this fashion—is the positive displacement sliding vane pump.

Sliding vane technology was invented in 1899 by Robert Blackmer as an alternative to the inefficient gear-type pumps that dominated the market at the time. Just by their operation, the flow rate and efficiency of a gear pump will erode over time as the pump's gear teeth wear. On the other hand, sliding vane pumps feature vanes that slide out of the pump rotor as they wear, meaning there is no drop in flow rate and volumetric efficiency as the pump ages.

Realizing that he had found the solution to the liquid-handling needs of a wide variety of industries, Blackmer incorporated his company in 1903. Today, Blackmer® is headquartered in Grand Rapids, MI, USA, and remains the world leader in sliding vane pumps used in the transfer of liquids.

Blackmer is the standard-setter in sliding vane pump technology. These pumps contain a series of vanes that freely slide into or out of slots in the pump rotor. 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.

The vanes are actuated by three forces: centrifugal force from the rotor's rotation; push rods that move between opposing pairs of vanes; and the liquid pressure that enters through the vane slots and acts on the bottom of the vanes. Therefore, each revolution of a sliding vane pump displaces a constant volume of fluid with variances in pressure having a minimal effect. This minimizes energy-wasting turbulence and slippage, while the pump's high volumetric efficiency is maintained.

Further, since the vanes constantly adjust to accommodate for wear, the pumps maintain near-original and consistent volumetric performance over time. A key consideration for the liquid-terminal storage industry is that sliding vane pumps are able to create a tremendous amount of dry suction. This suction capability results in a pump that can most effectively strip pipes and hoses while removing as much of the heel as possible from barges, railcars and tank trucks. Also, the ability of a vane pump to move air allows

Blackmer® remains the world leader in sliding vane technology for the transfer of liquids within storage terminal applications.

it to “blow down” the discharge lines. The operational ability of sliding vane pumps also makes them the ideal solution for transferring highly viscous liquids.

Realizing the growth in “green” operations and the increased concern for the environment, Blackmer designs its pumps and compressors to be the among the most energy-efficient in the industry. This Smart Energy™ Flow Solutions program is designed to enable pump users to gain a competitive business advantage through the deployment of energy-saving positive displacement sliding vane pump technology. At its most basic, Smart Energy means controlling energy expenses, increasing operational reliability, reducing vulnerability to energy-price volatility and driving productivity improvements.

Conclusion

The liquid-terminal industry is one of the most crucial in the world. Every day, millions of gallons of raw materials and finished products in a wide array of industries are transferred into and out of liquid terminals around the globe via a variety of delivery vessels. The terminal operator has a large number of challenges: make sure the product is loaded and unloaded safely, for both terminal personnel and the environment; enable the product to be transferred in the most energy and time-efficient manner possible; remove as much of the heel from the barge, railcar or truck as possible; guarantee that no product cross-contamination occurs; and do it in an environmentally-friendly manner.

For more than 100 years, positive displacement sliding vane pump technology from Blackmer has set the standard in meeting these parameters. That is why more and more savvy terminal operators are turning to the sliding vane pumps offered by Blackmer as the solution to the product-transfer needs at their liquid-storage terminals.

Ted Ratcliff is the Senior Product Specialist in Energy for Grand Rapids, MI, USA-based Blackmer, an operating company within Dover Corporation’s Pump Solutions Group (PSG™). He can be reached at (817) 460-1369 or ratcliff@blackmer.com. Downers Grove, IL, USA-based PSG is comprised of six leading pump companies—Wilden®, Blackmer®, Griswold™, Neptune™, Almatec® and Mouvex®. You can find more information about Blackmer at www.blackmer.com and PSG at www.pumpsg.com.

Blackmer A DOVER COMPANY

www.blackmer.com

World Headquarters
1809 Century Avenue SW
Grand Rapids, MI 49503-1530 USA
T 616.241.1611 F 616.241.3752

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