# Eccentric Disc Pump Technology Used in Food Processing

David Kirk

**Leak-free operation optimizes waste-reduced food production capabilities.**

Mankind reached its latest population milestone on October 31, 2011, when the United Nations Population Fund estimated that a baby boy born in the Russian city of Kaliningrad became Earth's seven billionth resident. That meant that only 11 years were needed to add another billion people to the world's population since the six-billion threshold was reached in 2000, while the population has doubled from 3.5 billion in the early 1970s. Even with fertility rates declining, the U.N. predicts that the world's population will continue to grow and reach eight billion in 2025 and 9.2 billion by 2050.

Any way you look at it, that is a lot of mouths to feed. The challenge, then, for food producers around the globe is to put into place systems that not only grow, raise or fabricate enough food to meet the needs of the worldwide population but to do so in the most efficient, cost-effective manner and with the smallest amount of spoilage or waste possible. Because of this, a 2008 report commissioned by the Stockholm (Sweden) International Water Institute should have been an eye-opener for food producers everywhere. In the report, titled "Saving Water: From Field to Fork—Curbing Losses and Wastage in the Food Chain," the authors noted that the most often quoted estimate on global food waste is that "as much as half of all food grown is lost or wasted before and after it reaches the consumer."

This article will show how an innovative pump technology can help food producers, processors and packagers optimize operations on the front end. This will result in waste reduction that will benefit the growing world population and the production company's bottom line.

## The Challenge

When it comes to sanitary food-processing applications, lobe/circumferential-piston pump technologies—the designs of which force the pumped material to flow around the interior of the pump's casing—has often been a top choice of plant operators. The popularity of lobe/circumferential-piston pumps in these types of operations stems from their continuous-flow and dry-run capabilities, which affords them the ability to handle the wide range of solids, slurries, pastes and liquids that are found in sanitary food production and packaging operations.

The plant operators who rely on these pumps are, however, forced to live with a series of operational inefficiencies that are inherent to the pump. These inefficiencies come not only in the form of decreased reliability over time, but an increase in energy consumption and cost, which is becoming a more crucial consideration for production-plant operations worldwide as "green" energy initiatives take hold.

Because of their method of operation, from day one, lobe/circumferential-piston pumps will wear constantly. This wear means that the internal clearances in the pump's housing will become greater, resulting in reduced flow capacity and volumetric consistency over time, along with the increased possibility that product "slip" will occur. These conditions will combine to produce an overall reduction in the pump's efficiency and a corresponding increase in the cost of operating it due to the increased speeds required to maintain the desired volumetric consistency.

Other shortcomings of lobe/circumferential-pump operation that food processors must be aware of include:

- The need to seal two shafts, which doubles both seal expenses and the potential for leakage
- Chronic seal failures that can cause products to solidify inside the pump
- Self-draining that requires vertical porting, which can decrease volumetric efficiency by 20 percent or more
- Greatly reduced speeds required to handle

**This new type of eccentric disc pump is sealless and uses a unique stainless steel bellows that results in increased performance.**

high-viscosity liquids
- Diminished performance when handling low-viscosity liquids

## The Solution

Eccentric disc pump technology is becoming a growing option for food production. When looking for an acceptable alternative to lobe/circumferential-piston-style pumps regarding optimized performance, highest volumetric consistency, lowest life-cycle costs and the best energy efficiency, eccentric pumps are the solution.

The versatility, reliability and sanitary operation of this technology make it ideal for an array of food-production applications—including the handling of yogurts; ice cream; custards and chocolate; beverages such as fruit juices and milk; confectionary items like glucose and aromas; sauce-type liquids such as tomato sauce, mayonnaise, mustard and baby food; and many semi-abrasives.

The eccentric disc (or movement) principle was invented by French engineer André Petit more than a century ago. Basically, the eccentric disc pumping principle has produced a family of pumps that does not need mechanical or dynamic seals to operate. This makes eccentric disc pumps perfectly suitable for the sanitary/hygienic operating conditions that are the hallmark of food production, processing and packaging.

Eccentric disc pumps do not require mechanical seals because, even though they are driven by a standard rotating drive, the disc is rotated by an off-center shaft that produces its eccentric movement and allows each point of the disc to move at the same speed. This means that the drive end of the pump's shaft is located on a different plane than the tip end of the shaft that actually drives the pumping mechanism. Attached to the shaft are bearings that are enclosed in a hermetically sealed metal bellows or rubber boot. So, when the shaft rotates, the bellows or rubber boot does not rotate, but, rather, flexes in an eccentric circle.

This gives the eccentric disc pump an operation that is similar to that of a peristaltic pump, but without the need for any hoses, which can often fall victim to their own inefficiencies. During operation, the pump's disc is driven by the eccentric movement of the shaft allowing product to flow through both the pump's inner and outer chambers. This style of operation eliminates any possibility of pulsation within the pumped liquid, and since the pump does not depend on clearances to facilitate product flow, any slip is negligible. Additionally, with the pump needing no mechanical seals, there are no surfaces present where products that are difficult

to seal and prone to crystallization—such as corn syrup, liquid sugar and glucose—can adhere and cause damage, which eliminates a maintenance concern.

Speaking of maintenance, eccentric disc pumps also feature clean-in-place operation that does not require the vertical drain porting that robs lobe and circumferential-piston-style pumps of a good portion of their efficiency. When cleaning an eccentric disc pump, pressure is introduced to the back of the disc through a pumping chamber. When the flush pressure overcomes the spring, the disc moves away from the cylinder, and the cleaning solution passes through the pumping chamber. This allows a large amount of cleaning solution to travel through the pump, resulting in thorough cleaning and the elimination of the need for bypass piping.

All these features combine to make eccentric disc pumps as much as 30 percent more efficient than their lobe/circumferential-piston-style counterparts, resulting in increased productivity and reliability and reduced cost for the food-plant operator.

## From The Field

Recently, a large, private-label food processor and packager located on the west coast of the U.S. came to the conclusion that the lobe-style pumps being used to fill sauces, dressings and marinades into 6- and 9-ounce plastic pouches were becoming increasingly unable to meet the strict weight requirements of the packaging operation. Specifically, the rejected packets were as much as 24 grams over or underweight, a difference of more than 8/10 of an ounce above or below the required volume.

This meant that as much as 400 pounds of barbecue sauce, for example, were being rejected in a single eight-hour shift, which is enough to fill a 55-gallon drum. The result was thousands of dollars a day in wasted product.

"We were experiencing a loss of around 15 to 20 percent, depending on the product, due to the cavitation of the lobe pumps," says the facility's production manager. "There was just too much variation in the pumps, and they weren't able to consistently inject the proper amount into the packages."

The solution to this costly situation was the installation of an eccentric disc pump for use in the plant's packet-filling operation. Improved results were noticed immediately.

"As soon as we installed the Mouvex, we were down to under 2 or 3 percent of product loss for over and underweight pouches during an eight-hour shift. We simply don't need to throw away packets anymore," said the production manager. "Besides saving money, saving time and reducing the amount of wasted product, I can say I highly recommend the Mouvex C-Series pump. It is better than any other pump we've ever used."

In addition to the sauces, dressings and marinades that the west coast food processor specializes in, the company also proudly packages what are known as Challenge Dairy Product pouches. These pouches are filled with highly viscous dairy-based products that are used in humanitarian-aid programs, such as those offered by UNICEF and USAID, specifically as a way to provide malnourished children with the dairy protein they need to help their brains function, mental and physical growth and organ development.

**This eccentric disc pump in a hygienic application provides consistent performance that does not change over time.**

In an application as important as filling the Challenge Dairy Product pouches, waste cannot be tolerated at any level. By introducing the eccentric pump to its packaging operation, the facility has also optimized the packet weight in this crucial operation.

## Conclusion

As the world's population continues to grow, the only way it will be sustained is if the capabilities to meet humanity's expanding food needs are delivered by global food producers. That puts the burden on them to develop and implement food-production systems that minimize food waste in their operations. One way that food producers, processors and packagers can do that is by introducing the most efficient, reliable and energy-conscious pumping technology into their plants.

In many cases, this means turning to positive-displacement eccentric disc pump technology. For more than a century, this technology is capable of handling a unique array of liquids and semi-solids in food production and will continue to set the standard in consistent, leak-free operation that will help result in optimized, waste-reduced food-production capabilities around the globe.

**P&S**

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