

Sealing in Precision Syringe Pumps

Jerome Zawada

The Project: Resolve a problem with a premature seal failure on a pump.

The Solution: Using a slightly modified but pre-existing design, an integrated polymer dynamic seal in the syringe assembly resulted in a seal that substantially outperforms its predecessor.

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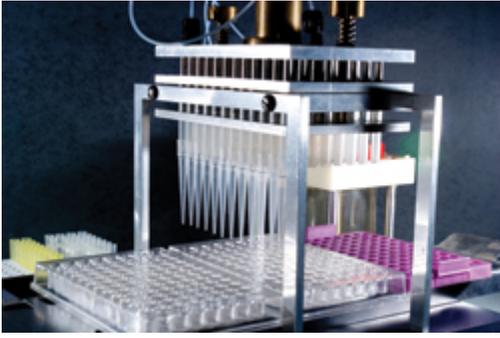


Syringe pumps, sometimes called syringe drivers, are used in the life sciences, biotechnology, pharmaceutical, and chemical industries. In life sciences, they are used to slowly administer fluids or medications to patients. They are invaluable instruments as they can continuously administer, among other things, pain killers and anti-nausea medications to critically ill people. Additionally, the levels of medications are controlled, and the use of orally-given medicines can be eliminated for those who have trouble swallowing. The pumps can also manage IV medications.

In pharmaceutical development and research, *in vitro* diagnostics, and other industries, syringe pumps are used in analytical equipment rather than for drug infusion into patients. This diagnostic equipment is used in numerous applications, including testing blood and urine samples for things like drug, hormone, and vitamin levels. Large clinical and research labs, such as those found in pharmaceutical company R&D labs, run such a large quantity of tests, they require automated liquid handling workstations to help prepare the samples for testing. These types of workstations often require numerous syringe pumps. The pumps are typically designed to be modular so each workstation can be customized.

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Sealing in syringe pumps can be challenging. Plastic-type plungers made of a variety of materials are often required, and these act as pistons that ride in bores generally made of glass or ceramic. Seals are incorporated into the tips of the plungers, resulting in one-piece components. Metal spring-energized seals are often used in these types of applications; however, there are cases in which the metal spring can adversely affect test results.

TriContinent Scientific, a leading manufacturer of syringe pumps used in the *in vitro* diagnostics industry, was developing a new syringe pump to improve on existing designs.

One of their customers was experiencing problems with a competitor's pump due to premature seal failure, resulting in significant instrument down-time. The seal and ceramic piston that were being used in the competitor's design were beginning to fail because the reagents were adhering to the ceramic pistons and, in turn, deteriorating the seal material.



TriContinent was asked by their customer to develop a more reliable pump and sealing technology to address the issue. Faced with this challenge, TriContinent turned to Trelleborg Sealing Solutions for assistance. Using TriContinent's own seal

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design, engineers at Trelleborg Sealing Solutions Broomfield were able to modify the seal and solve the problem. The solution was an integrated polymer dynamic seal in the syringe assembly with a HiMod 550 non-slantcoil, custom-shaped energizer within a custom UHMWPE jacket. The result was a seal that substantially outperforms its predecessor, giving much better force on the sealing lip, and much longer seal life.

"The success of this syringe pump design hinged on finding the perfect seal material and configuration," says Mik Bajka, engineering manager from TriContinent. "We could not have asked for a better outcome. Our reputation is built on delivering high value, reliable, and innovative products to our customers, and we were able to do that here. Working with Trelleborg Sealing Solutions engineers, we solved our customer's problem and produced another quality component for the critical *in vitro* diagnostic industry."

Online

For additional information on the technologies and products discussed in this article, see *MDT* online at www.mdtmag.com [2] and the following websites:

- www.tricontinent.com [3]
- www.tss.trelleborg.com [4]

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