A cut above the rest

In short...

- Flow International sought a better sealing system for its waterjet cutters
- Trelleborg Sealing Solutions tested products for Flow in its labs
- Trelleborg's Turcon® M12 allows Flow to market its products as having zero defects

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Flow International has zero tolerance for leaks. So when the company experienced occasional failures in its low pressure oil seals, it turned to Trelleborg Sealing Solutions for a product known to perform: Turcon® M12.

Flow International makes waterjet cutters, dynamic tools that can take on anything from paper to carbide. When water is pressurized in a HyPlex pump to 55,000 pounds per square inch/ 380 MPa and forced through a tiny opening to become a jet the diameter of a human hair, cutting soft materials such as food, paper, baby diapers, rubber and foam is easy. Add abrasive particles to the jet stream, and it is capable of cutting virtually any hard material, including metals, composites, stone, hardened ceramics and glass.

It's this versatility that makes waterjets so useful—and it's Flow's technology that makes their waterjets so desirable.

Since 1974, Flow has delivered more than 10,000 waterjet and abrasive waterjet systems to customers in more than 45 countries. With the largest market share, Flow is the world leader in the development and manufacturing of waterjet technology.

Flow's direct drive pumps, like the HyPlex, utilize rod seals to keep low pressure oil in the crankcase. But these rod seals would occasionally leak upon startup, or shortly afterward.

Water jet cutting a motorcycle fender

Replacing and retesting a rod seal was time consuming. Flow wanted consistent performance, with zero leakage, so they turned to Trelleborg.

"We had several 'commodity' type seal vendors and were looking for a partner that could bring more to the relationship," says Flow International's Product Manager, Sean Schramm, who is overseeing the pump project. "Flow's products provide an exceptional value to our customers, and we were looking

for a supplier that could do the same for us. Trelleborg's products are technologically advanced, can be purchased worldwide, and are affordable. We also required engineering support to provide custom products to tackle our demanding requirements. Trelleborg met those requirements."

A challenge and a custom solution

The team set out to enhance the reliability and optimize the performance of Flow's HyPlex and JetPlex direct drive pumps, which have a maximum generated pressure of 415 MPa/ 60,000 psi and an operating pressure of 380 MPa/ 55,000 psi.

These pumps employ exclusive technology, such as a Patented Automatic Control Valve (Pac-V), which ensures a quick response when changing operating pressure or opening and closing the flow of water through the cutting head. The pumps are also very efficient; they use a triplex style crankcase with three pistons to transmit power from an electric motor to the high-pressure assembly, where high-pressure water is generated. The crankcase pistons reciprocate at both high speeds and frequencies as well as in a reverse direction.

The temperature of the rod exceeds +93°C/ +200°F. This rod temperature combined with a rod velocity of 284.5 cm/ min/ 112 in. / min and a stroke length of 4.45cm/ 1.75 inches meant that a single sealing element and scraper were inadequate to meet the high expectations that Flow demanded—optimal operation and low-maintenance designs.

Flow provided Trelleborg Sealing Solutions with historical and test data demonstrating their experience with past seals. They tried an off-the-shelf solution from Trelleborg, but it didn't perform up to either company's expectations. So Flow sent several crankcases for Trelleborg to use as test beds for their engineering laboratory. And now they have a promising solution.

Turcon® M12 to the rescue

Trelleborg created a redundant combination sealing system for optimal leakage control using a configuration of Turcon® and Zurcon® sealing elements, including Turcon® Stepseal® 2K and a Zurcon® Rimseal. The Turcon® Stepseal® 2K made of Turcon® M12 material is used as the primary seal and provides a back-pumping function. The Zurcon® Rimseal is used as the secondary seal to ensure reliable sealing on a thin oil film at low pressure. The sealing system also includes a Turcon® Excluder® 2 to hold back any residual oil on the extending rod and provide a scraping action to keep contaminants out.

Turcon® M12, from Trelleborg Sealing Solutions, is a PTFE based sealing material with unrivaled performance in key hydraulic sealing parameters such as friction, wear and high-pressure operation. Extensive testing has shown that Turcon® M12 is resistant to virtually all media, including a broad range

A water jet from Flow International was used to create this design on a motorcycle fender.

Flow International's JetPlex (shown) and HyPlex pumps employ a combination sealing system, including seals in Turcon® M12, for optimal leakage control.

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of lubricants. This results in extended seal life and offers a wide operating window for temperature, pressure and velocity.

The sealing system was tested in the Trelleborg Sealing Solutions Americas Research and Development facility in Fort Wayne, Indiana. A direct drive pump, comprising three stations, was set up and run under continuous operating conditions for 120 hours. The results yielded zero leakage from all stations, with radial wear averaging less than 0.003cm/ 0.001 inches.

“We are in the process of testing and implementing the Trelleborg solution and are optimistic that the unexpected rework will disappear,” says Schramm. Flow International customers will benefit from a crankcase with a technologically advanced sealing solution, complementing the performance of the rest of the pump.

About Flow International

Company Information

Flow International Corporation provides technologically advanced, environmentally sound solutions to the manufacturing and industrial cleaning markets. It is the pacesetter in the development and manufacture of ultra high pressure (UHP) waterjet technology, and a leading provider of robotics equipment.

Flow’s roots date back to the early 1970s, when former research and development scientists from Boeing founded Flow Research. The first technology commercialized by that company was the use of an ultra high pressure waterjet as an industrial cutting tool. Flow later invented, patented and perfected the world’s first abrasive waterjet system to cut hard materials up to 30 cm/ 12 inches thick.

From our corporate headquarters in Kent, Washington, U.S., Flow now has approximately 600 employees in offices in Indiana, U.S., Canada, Brazil, Germany, the UK, Spain, Italy, France, Taiwan, Japan and China.

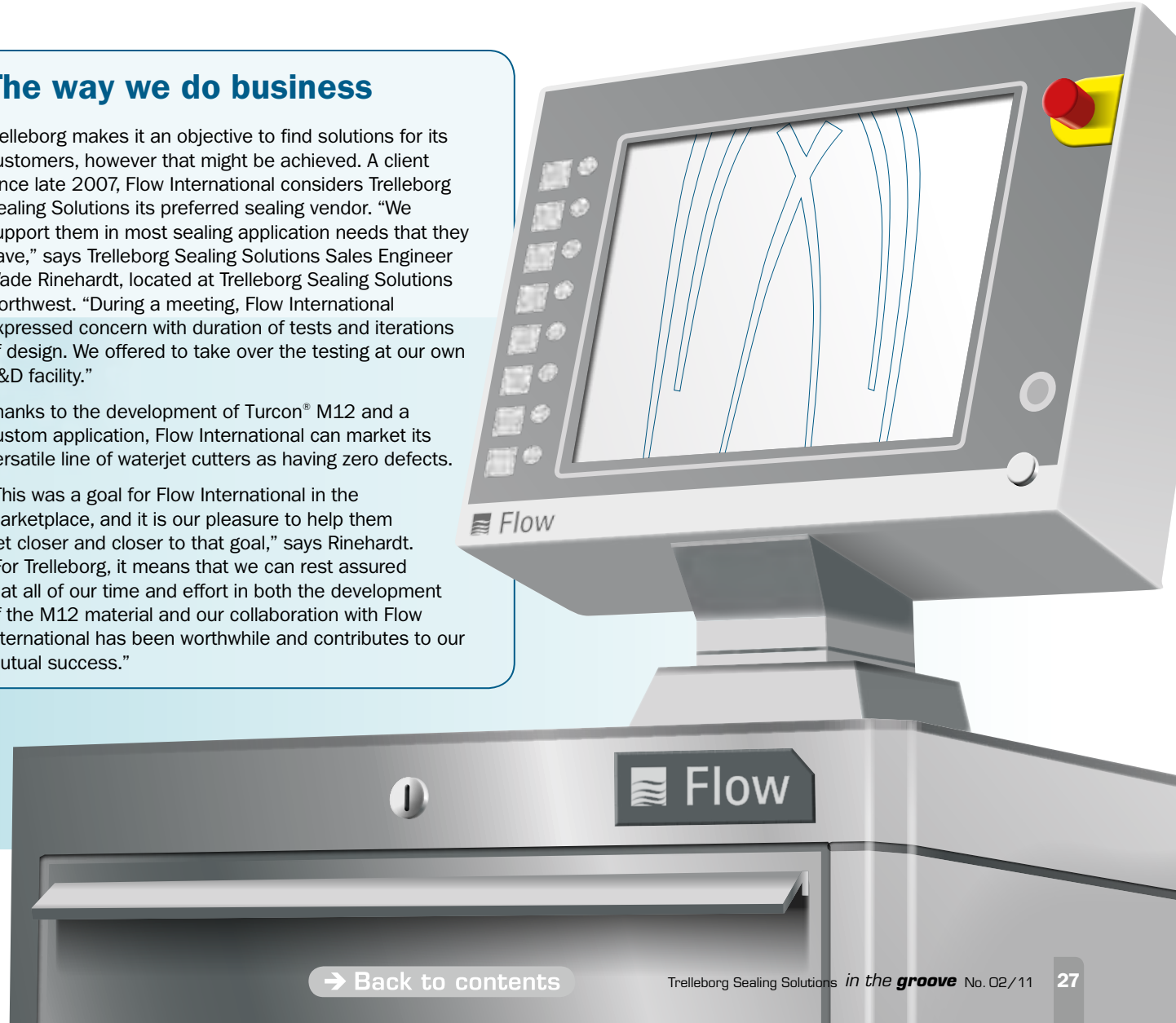
Learn more at www.flowwaterjet.com

The way we do business

Trelleborg makes it an objective to find solutions for its customers, however that might be achieved. A client since late 2007, Flow International considers Trelleborg Sealing Solutions its preferred sealing vendor. “We support them in most sealing application needs that they have,” says Trelleborg Sealing Solutions Sales Engineer Wade Rinehardt, located at Trelleborg Sealing Solutions Northwest. “During a meeting, Flow International expressed concern with duration of tests and iterations of design. We offered to take over the testing at our own R&D facility.”

Thanks to the development of Turcon® M12 and a custom application, Flow International can market its versatile line of waterjet cutters as having zero defects.

“This was a goal for Flow International in the marketplace, and it is our pleasure to help them get closer and closer to that goal,” says Rinehardt. “For Trelleborg, it means that we can rest assured that all of our time and effort in both the development of the M12 material and our collaboration with Flow International has been worthwhile and contributes to our mutual success.”



The making of a material

Turcon® M12, released earlier this year, resulted from another challenge: Bring to market one sealing material that combines the specific advantages of several existing materials.

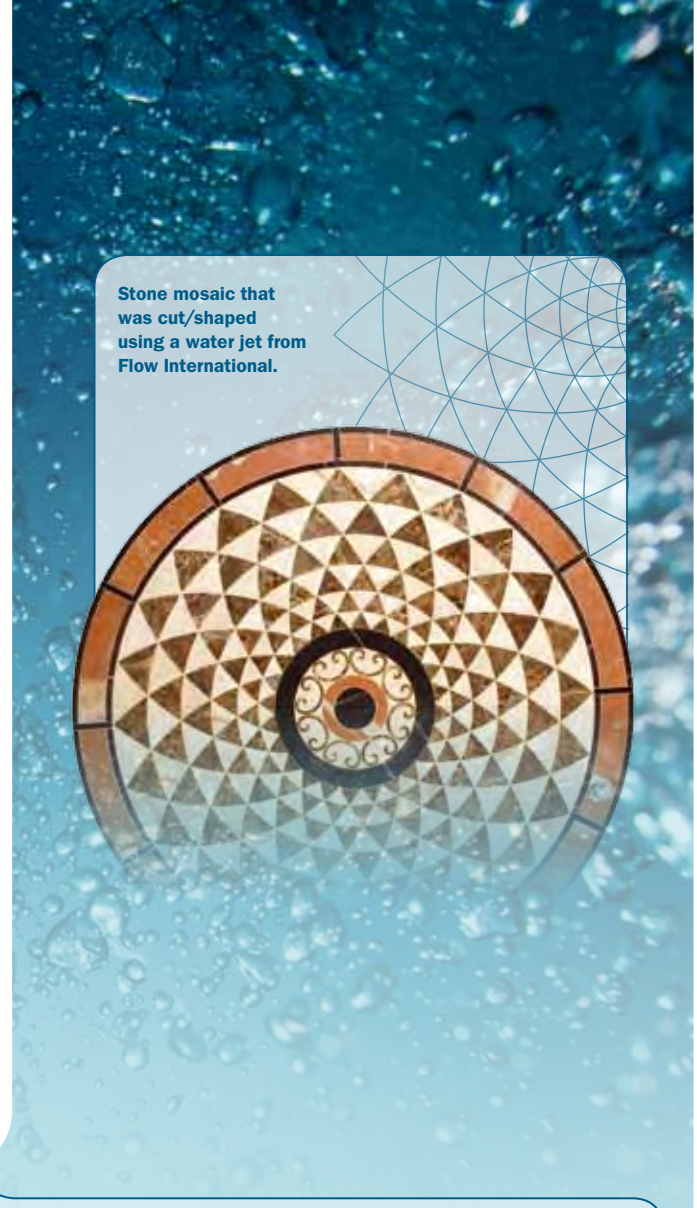
"The task presented to R&D was to develop a Turcon® material for linear seals and scrapers that would combine high seal efficiency with low friction, low wear on seal and hardware, and extrusion resistance up to 40 MPa/ 5,800 psi," says Trelleborg Sealing Solutions Product Manager at Fort Wayne, U.S., Nancy Getz. "Needless to say this was no easy task, and it took years of analysis, testing and evaluation to develop the final candidate for field testing."

You can find further information about Turcon® M12 on the Trelleborg Sealing Solutions website at

www. **tss.trelleborg.com**

There you can download the Turcon® M12 brochure and

watch our film about the material.



Stone mosaic that was cut/shaped using a water jet from Flow International.

Turcon® is the Trelleborg Sealing Solutions brand of proprietary Polytetrafluoroethylene (PTFE based) sealing materials. The Turcon® M12 matrix is medium-filled with a complex mix of non-abrasive mineral fibers combined with additives.

Features and benefits of Turcon® M12 include:

- Resistant to virtually all media including a broad range of lubricants
- Outstanding wear resistance and friction characteristics
- Provides extended seal life
- Operates in wide temperature, pressure and velocity ranges
- Minimal abrasion of hardware, preventing damage to counter surfaces
- Robust for harsh environments
- Good resistance to extrusion
- Reduced environmental impact as it does not include bronze fillers
- Sealing material for universal use in hydraulic applications
- Lower stock holding and fewer items to handle
- Cost-effective solution