



Superior Extrusion keeps press running *faster than ever* with drop-in hydraulic solution from Bosch Rexroth.

CASE STUDY

Hydraulics Upgrade Provides Unexpected Benefits for Aluminum Extrusion Press

Learn how Bosch Rexroth's drop-in hydraulics solution gave one manufacturer measurable improvements immediately.

Challenge:

Engineer a drop-in hydraulic pump solution that matched the way older components operated while lowering machine downtime.

Solution:

The retrofit immediately produced measurable results, including increased productivity, reduced downtime and decreased energy use.

Overview

The extrusion press is the workhorse of manufacturing. Long valued for its ability to produce high-quality parts, it can operate productively for many decades with proper maintenance and life-cycle management. However, this longevity is now leading to some issues in the industry: Many extrusion presses are using outdated, inefficient and unreliable hydraulic pumps.

Superior Extrusion found itself confronted with this situation. In 1996, the company purchased a used 1,650-ton Farrel press. In use since 1971, the seven-inch press has since produced over 200 million pounds of aluminum extrusions for the Michigan-based manufacturer. The press currently runs one 10-hour shift per day, with plans to move to two shifts in the near future.

Planning the upgrade

In an aluminum extrusion press of this size, hydraulic components are under significant – and constant – wear and tear. Decades of production of light truck accessories, roof racks, commercial building products and military materials had taken its toll on the variable-displacement legacy pumps driving the press. Maintenance of the hydraulic elements became increasingly expensive.

A key, decades-old hydraulic component on the press is the hydraulic pump. Like many customers using similar model pumps on other presses, repairing and maintaining these older pumps in operating condition usually requires rebuilds, and doing so became a challenge for Superior. Parts became obsolete and qualified technicians became harder to find. Furthermore, rebuilds do not always deliver the same quality and service as the original unit. And, in many cases, the parts being replaced were rebuilds as well.

“Bosch Rexroth invested a lot of effort before we even hit the ground. Every aspect – from the expertise to the effort to the engineering – was very well planned out. On a scale of one to 10, I'd give this project a 10.”

- Bradley Couture, President and CEO, Superior Extrusion



The drop-in solution yielded a 14% productivity increase after a weekend shutdown.

One major consequence of the pump's aging condition was that hydraulic fluid leaks became increasingly problematic. Oil leaks increased costs for the company, which logged 65 to 70 hours of downtime every year to repair these leaks. From constant welding to fabricating new pipes, the cost and hassle of downtime take its toll. "When a race car has 500 laps to go, if your car is sitting in the pits, getting worked on, it's not winning races," said Superior Extrusion President and CEO Bradley Couture.

Designing a drop-in solution

The importance of the press required careful planning that would identify the right solution and minimize downtime during installation. Superior approached Bosch Rexroth to help develop the solution since they worked together on other hydraulic projects in the past, both for new systems and equipment upgrades. "Bosch Rexroth has been around for years, and they have a reputation for quality and service. That was important to us because when a part goes down, you can't just run to the hardware store to buy a new one off the shelf," Couture said.

The nature of the original pumps required an engineered solution that would match the way older components operated. Leading the project was Michael Kramer, press application engineer at Bosch Rexroth. According to Kramer, the original pump sat on top of the tank, drawing oil up from the reservoir and supplying it to the system through two supply ports.

Most modern pumps operate with just one supply port, so installing a new pump would require careful planning and reconfiguration of the hydraulic system. At the same time, Superior and Bosch Rexroth both wanted to design an approach that would provide a relatively simple and straightforward upgrade solution.

Prior to working with Superior, the Bosch Rexroth team recognized that this pump style was becoming obsolete. In response, the engineers in Bethlehem, PA, collaborated with associates in Germany to develop a unique system to directly replace the old, expensive and inefficient pumps. The initiative involved the design and engineering of a pump/manifold/controls solution and prototype construction.

Then, the prototype underwent 150 hours of testing at the Bethlehem facility and over 2,000 testing hours in production on a customer's 2,400-ton extrusion press. "We instrumented the test unit with many types of pressure transducers and flow meters to record data. Our team also completed a 100-hour test at full pressure. That was followed by a complete teardown of the internals so we could document the wear and tear," Kramer said. The results confirmed the drop-in solution met the company's performance and reliability standards.

Superior Extrusion's project was the first opportunity to apply the tested drop-in concept. At the solution's heart was a Rexroth A4VSO 500 axial piston pump.

"By adding a check valve at the bottom of the suction pipe and injecting a partial filling volume into the pipe, we could ensure that the pipe inlet was full upon startup or under minimal flow conditions," Kramer said.

The Bosch Rexroth team also incorporated a custom manifold circuit designed to replicate the two-way function with two pressure ports in the exact same location as the legacy pump. Two-way cartridge valves (type LC and LFA) then directed the oil to the correct port. The solution conserved as much of the existing configuration as possible so that it bolted directly to the existing piping. The new Bosch Rexroth pump manifold deckplate preserves all of the existing press piping.



The Bosch Rexroth team worked closely with Superior Extrusion to design a drop-in solution comprised of Rexroth A4VSO 500 axial piston pump, custom manifold, Rexroth LC and LFA logic valves and custom-programmed HACD digital electronic control.



Oil is directed to the correct port with type LC and LFA two-way cartridge valves.

To control flow through the pressure ports, an HACD digital electronic control was configured to take the existing analog signals that previously controlled the legacy pumps and use those outputs to control both the A4VSO pump and the LC and LFA valves. This significantly simplified the controls challenge of swapping out the legacy pump and valves with the current generation of hydraulics.



The Rexroth A4VSO 500 axial piston pump was the heart of the drop-in solution.

The result was a drop-in solution that would modernize the press without the significant downtime or cost associated with a complete upgrade or replacement. In fact, the installation took place over a long weekend, with tear-out happening Friday and full production by Tuesday.

Measurable results that go far beyond reducing downtime

The hydraulic pump retrofit produced measurable results almost immediately. The most significant improvement early on was the increase in press speed. Without any fine-tuning of the controls platform or the PLC code, the change was dramatic.

“Prior to the upgrade, the press ran around 2,000 pounds per hour,” Couture said. “Now it runs around 2,400 pounds per hour, about a 14% increase. The metal was just flying down the table. If the press ran 24 hours a day, five days a week, that would produce 1.8 million more pounds per year.”

The speed of the press increased so much that when one particular die ran at 2,800 pounds per hour, Superior’s oven could not keep up with the production run.

Superior found the new retrofit operated more efficiently. The Bosch Rexroth pump used less energy to the extent that a few months after the retrofit, they swapped out 200 horsepower motors for new, more energy-efficient, 150-horsepower motors with no loss of performance. The oil temperature also decreased. “Before the upgrade, it would run normally at around 110 to 120 degrees Fahrenheit. With the Bosch Rexroth pump, it operates between 105 and 110 degrees. So, the press runs more efficiently and at a cooler temperature,” Couture said.

Finally, it appears that oil-leak-related downtime is being significantly reduced, from 65 to 70 hours per year in the past to just three hours last year. Those savings added up, especially considering that press repair time could run up to \$800 per hour.

Couture noted that working with Bosch Rexroth was a smooth process. “Bosch Rexroth invested a lot of effort before we even hit the ground. Every aspect – from the expertise to the effort to the engineering – was very well planned out. On a scale of one to 10, I’d give this project a 10.”



An HADC digital electronic control was configured to take the existing analog signals that previously controlled the legacy pumps and use those outputs to control both the A4VSO piston pump and the LC and LFA valves.



Bosch Rexroth engineered a solution to directly match the way the older hydraulic components operated.



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- **Bradley Couture**, President and CEO, Superior Extrusion



Learn more about our hydraulics solution at

<https://www.boschrexroth.com/en/us/products/product-groups/industrial-hydraulics/index>

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