



"Our customers are telling us our presses are the best they have ever operated. They like the fact that the load-sensing hydraulic system makes the press more energy conscious, more consistent in operation, and quieter. And we all like the fact that our new hydraulic system is 15 percent lower in price than our previous system."

Tim Altomare, Fabriweld controls engineer

Fabriweld Senses Big Benefits with Load-Sensing Hydraulic System

Location:

Norwalk, Ohio

Segment:

Manufacturing: custom machine building

Challenge:

Issues with the press' command signal and acceleration and deceleration rates

Solution:

Applying load-sensing technology to existing Eaton components

Results:

Better control, lower energy consumption, quieter operation, and more economical

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Background

Sometimes a problem may not be evident until a better way is suggested. That's exactly what happened when Eaton and a distributor partner, Sentinel Fluid Controls of Toledo, Ohio, took a new approach to hydraulic circuitry on a press made by Fabriweld Corporation of Norwalk, Ohio.

Fabriweld has relied on Eaton products and the hydraulics savvy of Sentinel for some 25 years in its fabrication of presses sold to Tier 1 and Tier 2 automotive suppliers and other industries. Among its leading production items is a massive press used to produce headliners in cars and trucks. The forming/trim press is a showcase of Eaton products, including vane and piston pumps and industrial and proportional valves.

The folks at Fabriweld had no complaints about the overall performance of the hydraulic

system. Sure there were issues with the press' 10-volt command signal and acceleration and deceleration rates, but weren't these just "normal" quirks?

Challenge

Not to Dan Lindstrom, Sentinel's vice president of engineering; Rory White, sales engineer at Sentinel; and Fabriweld's Tim Altomare, controls engineer.

"Together we took a clean-slate approach to the project by analyzing how we would design the system if we could start from scratch," Lindstrom says.

"The press was equipped with a size 8 proportional valve for 100 gallons per minute of flow. On paper it was the right valve to use. However, depending on pressure drop, system flows varied all over the map, indicating the need for pressure compensation on the proportional valve.

"I was also concerned about the valve's resolution issues that caused the press' 10-volt command signal to have limited functionality. In fact,

any command above seven volts caused the press to operate at full speed, so the customer stuck to using only seven volts and under."

The press' relatively tight ramp rates for acceleration and deceleration also troubled the project team.

"The pump was set at 2,500 psi—a relatively high pressure—to open and close the press at a rate of one inch per second," Lindstrom says. "As the press closed and the load on the system started to go up, more and more of



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the pressure was required for the closing function, with less left over for pressure drop across the proportional valve. Consequently, press movement would gradually slow down."

Solution

Lindstrom sat down and reengineered the system by applying load-sensing technology to the Eaton components already utilized in the system, including Eaton® PVM open-circuit piston pumps, Vickers® 45V vane pumps, Vickers screw-in cartridge valves, and Vickers KBF industrial proportional valves.

"The load-sensing concept has been around for a long time, but it's not used much in the industrial sector. I've worked a lot in the mobile industry, where it's often used for minimizing horsepower consumption, and that's just what was needed on the press."

Lindstrom concluded that with the load-sensing hydraulic system, the press' closing speed would remain at one inch per second as the pressure force increased, resulting in consistent speed in the pressing cycle. Consequently, less heat would be required for pressure drop through a pressure-compensating proportional valve, resulting in less horsepower consumption and consistent ramps upon acceleration and deceleration. In addition, operator ramp control was replaced with Eaton signal generator modules that would, along

with the load-sense design, provide smooth performance.

Load sensing was also applied to the system's two vane pumps, allowing constant pressure drop through the valve no matter what the load pressures were.

"This would enable Fabriweld folks to utilize much more of the press' 10-volt command signal," Lindstrom says. "So if they had 50 gpm at five volts, they would be relatively assured they were going to have 100 gpm at 10 volts."

Results

The load-sensing hydraulic system offered enough appeal for Fabriweld to give it a try by entering into prototype development with Sentinel. All was well until the system start-up stage, Lindstrom notes.

"Unlike a standard hydraulic system, a load-sensing system doesn't generate any pressure during startup. The customer naturally wanted to adjust the pumps to increase pressure. I explained that the lack of pressure at startup was actually a benefit. With the hydraulic system operating and press functions idling, components are subjected to less wear and tear, and the overall system is much more energy conscious and quieter, too."

Fabriweld has been using the load-sensing hydraulic system on its presses and other projects for nearly two years, and end-users are calling in with praise, Altomare says.

"Our customers are telling us our presses are the best they



Adding load-sensing technology to Eaton piston and vane pumps and screw-in cartridge and industrial proportional valves has enabled Fabriweld presses to operate more quietly and on less electrical energy.

have ever operated. They like the fact that the load-sensing hydraulic system makes the press more energy conscious, more consistent in operation, and quieter. And we all like the fact that our new hydraulic system is 15 percent lower in price than our previous system."

Altomare adds that he uses a balancing act to grab customers' attention.

"After balancing a pen vertically on the platen, I show customers how the pen doesn't fall over during cycling. Now that's smooth operation."

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