CASE STUDY

Installing the latest digital servo valves and instituting a regularly planned maintenance ensures machine productivity and greater uptime at paper mills.

Paper Mills' Planned Maintenance Approach Pays Off

For industries such as the paper production sector, the quality of a product is dependent on the performance of the motion control. Paper thickness and quality can degrade if a servo valve is not performing according to specification.

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FREQUENT STOPPAGES to adjust the machine or change out a product wastes time and material. In spite of this, many mills continue to run to failure, repair their parts with third-party repairs and experience excessive downtime. However, when plant managers commit themselves to undertake planned maintenance, performance improves and costs drop. So why aren't maintenance managers more committed to upgrading parts and tackling maintenance before things fail?

As the global economy has slowed in certain parts of the world, managers don't always have the budget to keep experts on staff to help design and manage cutting-edge maintenance programmes, or tackle equipment performance issues. The dual pressure to rein in costs and squeeze out additional profits have led some companies to take a second look at their maintenance challenges and programmes.

Upgrading to Ensure Reliable Pressure Control

Paper Mills are undergoing production challenges like most plants as machines have become faster and the requirements more stringent for higher pro-

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ductivity, reliability and safety. These machines use hydraulic pistons placed inside a roll to exert forces at each load zone to maintain a controlled profile across the complete width of the roll. The force exerted by each piston is controlled by a pQ (pressure and flow) Servo Valve that controls the position and pressure on these rolls as paper runs almost continuously through the machine shift after shift, day after day. If even one spot on a roll causes a variation in pressure or position, the paper can slide or rip causing a stoppage that can shred the paper into confetti. For every hour the equipment is offline due to a stoppage, the mill can lose up to 30,000 US dollars.

Producing paper within customer specifications requires tight tolerances in which the pressure between rolls cannot vary more than 2 or 3 psi outside a pre-determined setting. The finished product is a 4,500-kilogram roll of paper used for newspapers and magazines.

Moog and its distribution partners recently helped several paper mills to institute a planned maintenance approach. Montreal, Quebec-based MCS-Servo is a designer, distributor and servicer of servo systems and industrial automation products. MCS-Servo recently helped one of its paper mill customers in Canada upgrade its servo valves from an early digital type to the latest, high-performance Moog digital system. Along with the upgrade, MCS-Servo trained its client on using the new valves. The Montreal firm also put in place a support and inventory control programme for its customer.

The paper mill runs a Metso calender roll, which consists of a number of 10-meter-long rolls arranged one above the other. As sheets of paper up to one kilometre long pass through these rolls, the machine imparts varying degrees of smoothness and gloss to the product.

When the Canadian paper mill mentioned here called on MCS-Servo, it was because the customized servo valves running its calender rolls weren't able to consistently control the pressure on its paper. The valves, which were ten years old at the time, were increasingly difficult to service and maintain. In spite of their age, the valves were actually quite durable. But the electronics boards for the valves, which were designed especially for this mill, could no longer be sourced. This servo valve model had been upgraded to a newer version with many advances over the first-generation design. Initially, the mill had called on Metso for help. But the manufacturer's knowledge of (and support for) the valves wasn't adequate to meet the mill's needs.

Testing, Training and Tuning

So MCS-Servo entered the picture. Because the valves were at the end of their model lifespan MCS-worked with Moog to implement an exact replacement for that valve and sent one of its engineers to Moog to become a technical expert on digital servo valve technology and software features.

With the latest digital valve in hand, the MCS-Servo team returned to the mill and worked with the maintenance team to install and test it in the calendar roll. MCS-Servo also provided instructions and training for the mill's staff, so they could take advantage of the digital valve's features such as real-time condition monitoring, easy-to-use adjustments to operating parameters and diagnostics. The high-performance valve's software allowed the paper plant to tune and set flow gains and null position, save these settings and download them to multiple valves at once, highly valuable on a machine with 30 valves vs a traditional manual tuning.

The new digital valve controlled both the paper position from an external source feedback and pressure feedback, which is internal to the valve. The upgrade of these valves for the Canadian mill helped the maintenance professionals achieve higher speed and better positioning of the paper. The upgrade worked flawlessly, and MCS-Servo focused on fixing the first of three machines with plans to upgrade more machines on a planned basis.

Replacing the valves took approximately two days for each machine. MCS-Servo prioritized the machines, working first on the one that had been giving the mill the most trouble. The team replaced the valves on the second machine as part of a regularly scheduled maintenance period. The third machine is due for its upgrade in the coming months.

A New Service Programme and Payoff

As MCS-Servo upgraded the machines, it also instituted a valve exchange programme. Each time the mill sends MCS-Servo one of the machine's original valves for repair, there is an incentive to purchase a new valve. With the new valves in place, the mill says pressure and position are much more stable and frequency of response is improved. This gives plant personnel more time to react if there is trouble with the calender roll. There are also fewer stoppages because there is better control of the roll, which also increases the quality of the finished product.

With the software and electronics controlling the new digital valves, the mill can now use fieldbus communications to make quick, real-time changes and smaller step changes that are nearly infinite. This translates into small changes that produce fine paper with an enhanced surface quality. Machines like the kind MCS-Servo worked on will run

Workers inspect a paper machine's calender rolls; Machines have become faster and the requirements more stringent for higher productivity, reliability and safety.

Servo Valves precisely control the position and pressure on a paper machine's calender roll and the pressure between rolls cannot vary more than 2 or 3 psi outside a pre-determined setting.

120 metres of paper per minute, so reducing the time it takes to make changes in pressure or position also eliminates huge swaths of wasted material.

Beware Third-Party Repair

Another example of the benefits of upgrades and planned maintenance comes from a Canada-based maker of pulp, wood products, tissue and newsprint. One of its South Carolina-based paper mills uses more than 40 analogue pQ-valves to control flow and regulate pressure on a Voith Janus™ calender roll machine. The mill was having reliability issues with its machine due to the age of the installed analogue valves. The company had sent the valves to a local repair house for a fix. But when the valves came back, they weren't restored to original condition. They soon failed again and caused lost productivity and in some cases an extended clean-up effort.

To rectify the situation, the mill hired a reliability engineer to audit its machines and make recommendations. As part of his audit, he reached out to the local Moog distributor, Hydraulic and Pneumatics Sales (H&PS) of Charlotte, N.C.

Working with the reliability engineer, H&PS also conducted an audit of all the valves in the plant, which Moog reviewed, and recommended an upgrade to digital valves. The mill owner concurred and purchased two, new digital valves to test and run in analogue mode with a 4 to 20-milliamp signal; these valves will control one of several calendar rolls on a machine in the plant. Once the digital valves have proven to duplicate the performance of the old analogue valves, the mill will look at converting the valves on the remaining calendar rolls. While planning to run the digital valve in analogue mode for the short term, the plant will be ready to take advantage of the full capabilities of digital controls when the machines are converted to fieldbus.

After Moog put in place a plan to get the paper mill's old analogue valves crossed over to digital ones, its team began working on a planned maintenance programme for the valves. Moog and H&PS developed a unique approach to planned maintenance. Moog would control the maintenance schedule by looking at each valve and building a custom schedule for the plant. If the team performed the regular valve maintenance and kept the oil clean, it could prevent accelerated wear and greatly reduce the actual maintenance over a lifecycle in contrast to running the valves to failure. As designed by Moog, the South Carolina paper mill's planned maintenance programme would last six years.

Helping Hydraulic Hand on Maintenance

H&PS also audited the hydraulic power units in the facility. To complement Moog's work, the distributor is providing a planned maintenance agreement on the hydraulic fluid systems that power Moog's valves. If the valve oil is kept clean and the plant staff follow the recommended schedule, the plant will pay a flat rate fee; if problems arise, then the repair cost is borne by Moog. However, if the oil goes out of specification, the mill owner must bring the oil back to within the standard or the planned maintenance schedule can be compressed to prevent unplanned failures and lost productivity.

The onus for success is on Moog, the distributor and the mill because cyclic use is just one wear component, friction is another.

Offering companies a unique, win-win approach for reducing maintenance costs should be attractive for anyone responsible for maintenance and production. Equally appealing for maintenance managers is working with a supplier that can offer planned service agreements and upgrades through a manufacturer's local distributor, especially when it involves upgrading to the latest digital motion control technology. It's a planned approach with a payoff for maintenance managers anywhere. ■