Rexroth technology leads to “less”—less waste, shorter changeovers—for new flexographic press

The PCMC Fusion Flexographic printing press uses a Rexroth drive and control system including servo drives, frameless motors and Rexroth Ball Screws and linear rails for a printing platform that offers faster changeover times and reduced energy consumption.

Newest generation system integrates frameless motors, regenerative drives, an advanced controller platform and linear motion components for a sophisticated press that provides more productivity and excellent print quality.

Paper Converting Machine Company—PCMC (www.pcmc.com) of Green Bay, WI, is a global leader in tissue converting, packaging, flexographic inline tag and label printing, and nonwovens and envelope technology.

As PCMC began developing a new generation of presses in 2008, the company sought to satisfy several customer requirements—most of which focused on reducing the factors that affect printers’ productivity and competitiveness.

“The industry wanted faster changeovers to help increase profitable printing time,” said Dave New

Challenge:
Create a next-generation printing and converting system featuring simplified system design, reduced changeover times and increased printing profitability

Rexroth Solution:
• IndraDrive intelligent servo drives with regenerative power
• IndraDyn T frameless torque motors
• IndraMotion MLC controller with pre-engineered algorithms specific to printing and converting applications
• Rexroth Ball Screws and Linear Rails
• Drive-based Safety on Board

Results:
• Advanced controls platform enables faster changeover times and reduced engineering costs
• PrintSense feature provides faster print impression setup through innovative use of motor data
• Nearly 60 percent parts reduction through use of frameless motors and other features
• Regenerative drives help printers reduce energy consumption without sacrificing print quality
Wall, Engineering Value Stream Leader for Printing, Coating and Laminating at PCMC. “Printers wanted to eliminate physical waste and wasted time.”

Customers also wanted to reduce the time it takes to set up registration and impressions to print good product. To achieve those goals, PCMC focused on using servo drive technology to make this step faster and easier.

Two additional factors PCMC wanted to address were reduced energy consumption and reduced system complexity, to keep costs down and make press maintenance easier.

To satisfy these requirements, PCMC integrated a range of electric drives, controls and linear motion products from Bosch Rexroth Corporation (Charlotte, NC www.boschrexroth-us.com) into the new Fusion Flexographic System.

**Fusion—wide web printing and converting**

The PCMC Fusion Flexographic printing press is an all servo-driven platform that includes up to 21 axes for a ten-color press, or 17 axes for an eight-color machine. There are also seven axes for web conveyance and tension control from the unwind axis to the rewind axis.

To develop the Fusion system, PCMC worked closely with longtime supplier Bosch Rexroth and local distributor and system integrator CMA/Flodyne/Hydradyne (Brookfield, WI www.cmafh.com).

The Rexroth drive and control systems powering the Fusion press include IndraDrive M servo drives with regenerative and DC bus sharing capabilities and IndraDyn T frameless torque motors, all controlled by the IndraMotion MLC motion logic controller. IndraMotion for Printing provides a full range of pre-engineered technology function blocks to solve the most complex printing and converting application. Implementation of these proven algorithms shortens engineering time and minimizes field support typical with implementation of new control algorithms.

**Reducing press setup time**

Changeovers were the first area the development team focused on.

Each Fusion system consists of a large central impression cylinder, eight to ten feet in diameter, radially surrounded by eight or ten printing “decks” with two cylinders, one containing the image and the other applying the ink. All of these cylinders are driven by Rexroth IndraDrive drives and motors.

During changeover, once the color cylinders are exchanged and the press web rethreaded, setting the image registration and impressions is the next step. In the past, this involved time-consuming manual adjustment.

Using Rexroth intelligent IndraDrive servo drives, PCMC developed a new setup feature called PrintSense. The image cylinder and anilox inking cylinder in each deck are brought together to reach “the kiss point” where the image impression will be correct.

IndraDrive motor feedback data is captured and used by pre-established algorithms to calculate when the proper feedback setpoint is reached, eliminating the need for initial setup.

**Control system benefits**

IndraDrive systems set new standards in drive engineering, with intelligent functionality, integrated
safety features and regenerative power capabilities.

According to Wall, the safety features and the regenerative drive capabilities provide the Fusion with a competitive edge. “During setup, we can use the IndraDrive Safe Halt feature while we change the plate; normally we would have to build a brake or lockout mechanism to safely hold the axis in position, adding more parts to the system.”

The regenerative drive feature lets the Fusion system capture energy typically wasted when machine axes slow or stop, feeding it back into the system power bus to reduce energy demand.

PCMC chose the Rexroth IndraMotion MLC motion logic controller to operate and control the tension and registration of the Fusion press.

The compact IndraMotion MLC system is suited for synchronizing multi-axis systems up to 64 axes. It features pre-engineered function blocks for winding, registration, tension, and other key settings, open system interfaces, and support for IEC 61131-3 function blocks and motion sequences.

According to Wall, the MLC helps to complete image registration faster, using an integrated end-of-line vision inspection system.

“The vision system shows the press operator the image registration; the operator can use the controller to advance/retard a color, or move left/right, to get the registration correct,” Wall said.

Frameless motors help reduce costs

For major systems like Fusion, cost control is the result of smart engineering that reduces component counts. To accomplish this goal, PCMC, working with CMA/Flodyne/Hydradyne, chose Rexroth IndraDyn T frameless motors to drive 11 of the Fusion’s axes.

IndraDyn T torque motors are liquid-cooled kit motors consisting of a separate stator and rotor designed for maximum torque applications up to 13,800 Nm. The rotor is mounted directly to the extended journal of the cylinder, rather than coupling a traditional servomotor shaft to the axis. The central impression cylinder can be >80” diameter. In order to hold 0.001” accuracy on a 40” radius, Bosch Rexroth utilizes a 32 million ppr sin/cos feedback device and is one of the few companies in the world with this level of control accuracy.
Doug Anderson, sales engineer from CMA/Flodyne/Hydradyne, worked with PCMC to select and size the motors.

“One of the strengths that Rexroth offers is its vast array of kit motors,” Anderson said. “We selected one torque motor size for the large impression drum, which needs to stop within 10 to 15 seconds, and then another size to handle the different widths of the image and color rolls.”

Using the IndraDyn torque motors enabled PCMC to reduce the Fusion’s part count by nearly 60 percent.

“I don’t know of any other company besides Rexroth that could have supplied us with the range of products that we needed—for example, the frameless motors let us accelerate the Fusion six times faster than in the past,” said Anderson.

**Linear components add rigidity**

A crucial design challenge on a printing press involves the decks mounting the image and inking rolls. These rolls range in width from 42” to 75”; each deck must move in and out for job changeovers when the press is re-webbed and the rolls exchanged. However, once printing commences, the decks must be extremely rigid and hold the rolls in position to keep perfect registration while they spin up to maximum speed.

To provide the flexibility and rigidity needed, each image cylinder and inking cylinder incorporate two Rexroth precision Ball Screws and four profiled Ball Rails. Rexroth Ball Screws and Ball Rails combine high rigidity and high load capacity in compact sizes, engineered to deliver precise tolerances and operate error-free for thousands of hours with minimal maintenance.

“We can’t have the mechanical elements of the press moving around, because that will show up in the print,” Wall said. “The Rexroth Ball Screws and Linear Rails give us the rigidity and resistance to backlash and tolerances the Fusion needs.”

**Prestige-Pak: pilot customer improves fusion**

PCMC enjoys a close working relationship with Prestige-Pak, Inc. (www.prestige-pak.com), a leading supplier of flexible packaging services to the bakery, cheese, confectionary and dry goods industry. During development, a working model was placed in their facility to help refine the Fusion’s design and control functionality.

“A lot of the improvements to the Fusion, including the development of the PrintSense capability, was the result of their contribution,” Wall said. He said that Prestige-Pak’s experienced operators helped fine-tune the tolerances in the feature and provided guidance on a number of issues to help improve performance.

Since the Fusion’s launch, it has been a success. According to Wall, PCMC has been continuously building machines, secured repeat orders, and is expecting more growth.

“The improved changeover times, the simpler system design for more profitable printing time, and the energy savings are all helping to contribute to the Fusion’s success,” Wall said.

PCMC credits both CMA/Flodyne/Hydradyne and Bosch Rexroth with contributing to that success—through technology and the support provided during development and production.

“Working with Rexroth and CMA/Flodyne/Hydradyne, we did a lot of complex engineering up front and chose the technology to help us make the system less complex,” Wall said.

“Since the Fusion was launched, we’ve had several customers tell us that the most compelling aspect of the design is its simplicity—and that’s helped to differentiate us from the competition.”

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**The Drive & Control Company**

Rexroth Bosch Group

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