

Absolute Positioning... on a budget

By David Gersovitz

When the Rock-Tenn paperboard mill in Aurora Ill. wanted to automate the positioning and tensioning of the belts on its conveyor system, it took over a year to find a vendor capable of meeting the project budget and specifications. Management wanted a robust, turn-



Conveyor with automatic adjusters in place.

key solution with high accuracy at a cost that precluded traditional approaches using servo or stepper technology (which, given the small degree of stroke, or adjustment, required would have been overkill anyway). In the end, it took an atypical combination of high-end, absolute encoders and basic, low-end control and drive technology to get the job done.

The Aurora mill, in operation since 1909, manufactures 100% recycled content binders board for, among other things, textbook covers. The continuous sheet is formed at a rate of 500 feet per minute, then cut into 21-foot lengths that are fed through a five-deck, natural gas-fired dryer about 30 feet high. Each of the 10, 170-inch-wide wire mesh carrier belts carrying board through the dryer has a tendency because of heat expansion to wander towards the side of the conveyor frame. If not re-centered, the belts rub up against the frame, incurring



Control panel.

damage. Employees had to clamber up scaffolding besides the conveyor structure and using a wrench, re-center the two carrier wires for each deck by cranking on a threaded rod and nut. That would happen at roughly 20-30 minute intervals and take 30-45 seconds per wire. The air is a humid 240°F exiting the dryer and working anywhere near it is unpleasant in any season, says John Goll, the mill's assistant general manager.

Several engineering houses and contractors declined to bid or quoted prices well in excess of Goll's budget for automating the adjustments. As the months slipped by, he began contemplating other uses for the funds. That's when Chicago Electric heard about the project and submitted a design employing FRABA POSITAL optical encoders.

Encoders with DeviceNet drove savings

The encoders, used in conjunction with a DeviceNet network, were the catalyst to deliver high-end performance on a small budget. "The belt is not moving far and it's not moving fast, but we still needed high resolution so it had to be absolute encoders," says Chicago Electric president Robert Kaska. "It's not something you could do with a linear potentiometer or other positioning sensor." The hardware package Chicago Electric proposed included one FRABA OPTOCODE (OCD) DeviceNet encoder and one half horsepower Marathon AC motor for each of the 30 axes, Control Technique half horsepower AC vector drives, an Allen Bradley Control/Logix PLC and Red Lion G3 touchscreen.

The choice of the FRABA OCD DeviceNet encoders, DeviceNet network (with a single DeviceNet card), and relatively inexpensive drives, motors and PLC kept Chicago Electric's quote at just under \$200,000. A more typical solution with servo or stepper technology and separate encoder cards for each of the 30 encoders would have cost 30-50% more, says Kaska. "The PLC cost is dramatically lower by going with networked encoders with multi-turn capability like the FRABA OCD DeviceNet."

Flexibility creates more options

Each OCD absolute encoder uses an integrated Opto-ASIC that provides up to 30-bit multi-turn resolution and can withstand the heat near the dryer. "The versatility of the OPTOCODE series is one of its strengths," says Christian Fell, vice-

president of FRABA Inc. "It comes with more than a dozen different interfaces, various flanges, shafts, mechanical options, electrical connectors, orientations and connection types. The encoder can be adapted to either large, complex factory systems or smaller, simpler applications – like Rock-Tenn Aurora – where a field-bus network is a cost-effective way to wire up multiple devices and still deliver high resolution."

The Aurora design is a variation of Chicago Electric's FAST (Flexo Automated Setup Technology) system, a retrofit package that exploits the high resolution capability of FRABA optical encoders in automating positioning on converting machines in the corrugated box industry.

One touch tensioning from touch screen

At Aurora, the system was installed first as a prototype on one conveyor deck and later on the other four. That replaced a completely manual process with a fully automated closed loop for positioning the belts as well as partial automation for tensioning, a smaller issue. If a belt slackens, a worker taps a button on the touch screen to take up the slack.

"The FRABA encoders have delivered the high accuracy and reliability promised, not losing their position whether the conveyor was in a startup, operating or shutdown state," says Goll.

"From the mechanical and operational side of things, the system is working extremely well. The guys who were having to make the adjustments think it's a great improvement. Their time spent in the dryer area has been reduced by about 50% and we're able to make better use of them in other areas."



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