



Plus Mark

Designed for Success

Results

- Complete automation retrofit for 10% the cost of new machines
- 30-year-old machines with new-machine capabilities
- Faster machines with 40% increase in uptime
- 70% increase in accuracy
- Better resource use
- Lower costs
- Less waste
- Reduced maintenance by 50%
- Remote monitoring through new LAN

"We were at a point where we had to retrofit or buy new machines. Now, we're running faster than we would be with new machines—and wrapping up our competition for 1/10th the cost."

Tom DuBois

Industrial Engineer

Plus Mark, a division of American Greetings

On a Roll

Servo retrofit speeds gift wrap production to new-machine levels

The holiday spirit abounds at Plus Mark (Greeneville, TN), the division of American Greetings that manufactures Christmas gift wrap. Filled with festive decorations year-round, the company has a particularly good reason to celebrate early. While most manufacturers would never expect 30-year-old machines to operate as well as new models, Plus Mark is enjoying high-speed, high-accuracy cut-and-roll production resulting from a low-cost motion control retrofit featuring a GE Fanuc servo system.

Rolling Over

On average, Plus Mark rolled 2.2 extra inches of gift wrap on each cardboard core due to accuracy limitations. With production topping 70 million rolls per year, the company was losing more than 150 million inches of wrap annually—enough paper to wrap from Los Angeles to New York City. Additionally, measuring the wrap once each hour required operators to spread a sample roll on the plant floor and compare against tape markers. Not only was this system inefficient and inaccurate, but it also resulted in more lost gift wrap.

For shorter rolls, operators selected lengths with a proportional infinite variable (PIV) gearbox. For longer lengths, a counter was used in conjunction with a clutch and brake. The system permitted selection of lengths only within one-inch increments, and accuracy varied with clutch and brake wear, as well as temperature changes. Because rolls could not be under specified lengths, the company ended up giving away inches of extra gift wrap with each unit sold.

The high cost of excess product—coupled with excessive downtime and maintenance expenses—pushed Plus Mark to explore



imagination at work

manufacturing alternatives, according to Tom Dubois, industrial engineer with Plus Mark.

"We were at a point where we had to retrofit or buy new machines," Dubois explains. "Our competitors had purchased new equipment, and we needed to upgrade to stay in an industry leadership position and reduce costs."

Chattanooga, Tennessee-based integrator Jim Jones, president of Automation Insights, designed and implemented the successful retrofit at Plus Mark at 10 percent of the cost of a new machine. The solution provides upgraded machine controls for smoother operation, faster production, and lower maintenance. The system measures each roll and supplies operators with a digital readout. Roll lengths can be selected within 0.1-inch increments for higher accuracy and less waste. Overall, cut-to-length accuracy has improved by 70 percent, according to Dubois.

Automatic Controls

Jones and his team retrofitted more than 50 machines at Plus Mark with compact GE Fanuc Series 90™-30 programmable logic controllers (PLCs). "We didn't have a lot of extra room on the machines, and we had to keep controls accessible and out of the operators way," Jones says. "Operators need to get in the machines and check the web for accuracy. With the Series 90-30 PLC, we have all the power that we need in a small module."

A Motion Mate DSM302 module controls the GE Fanuc β Series servo and gearbox. The servo system simplifies machine operation by replacing the clutch, brake, and PIV. The motion control module resides in the PLC host and affords easy plug-and-play integration. With this embedded solution, data is automatically and seamlessly exchanged between the PLC and motion controller. A web speed sensor allows the servo to follow the main drive.

"With the GE Fanuc system, I could concentrate on design and implementation without having to worry about product integration," Jones says. "The benefits ranged from having to use only one software package for machine control, motion control, and servo control to simply plugging in prefinished cables. This complete package bought me the extra time I needed to plan the best retrofit possible. Now that we're past the prototype stage, additional machines can be retrofitted within 24 hours."

For fast and accurate motion, the GE Fanuc control system closes all control loops—position, velocity, and torque—within the controller. All drive parameters are stored in the controller in a standard motor database. By reducing the number of mechanical drive-train components, the servo system increases machine reliability and provides greater accuracy. Controlled accelerations



and decelerations decrease jarring for less wear on other machine components—which results in longer life and lower maintenance.

"Rolls cut and drop 20 to 30 times per minute," Dubois says. "With the old system, the machines experienced a sharp jolt with every completed roll. Now, the motion is smoother and quieter, and our equipment will last several more years."

Automatic Spooler Verlin White operates a retrofitted machine and has seen an increase in product quality with the servo system. "The machine operates faster, and we're able to produce tighter rolls," he explains. "Additionally, the paper pulls out smoothly from the feed end."

Easy Operation

Operators access the control system from a terminal on the machine or from a central station. A local area network (LAN) connects the machines and permits remote monitoring and control through a graphical human-machine interface (HMI). The easy-to-use system requires minimal training, and a single person can operate a machine.

In addition to easier operation, the plant is enjoying less maintenance and greater uptime. The old system required twice weekly tightening of the chain and annual replacement or rebuild of the PIV, according to Danny Garber, Plus Mark master mechanic.

"The servo system eases maintenance with cleaner, simpler operation," Garber says. "Overall, we've cut maintenance costs in half and increased uptime by approximately 40 percent."

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