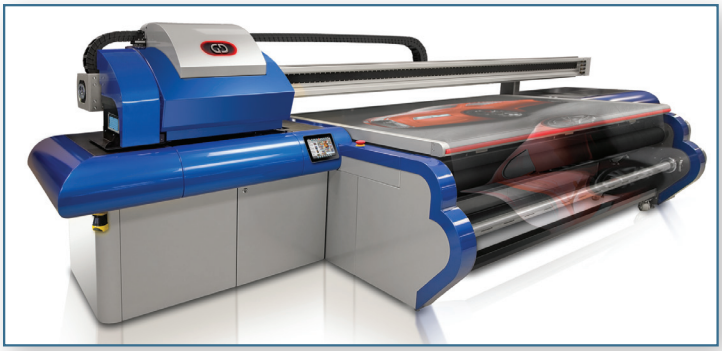
Bell Everman

Solutions For A World Of Motion

CASE STUDY

Linear Actuator Streamlines Large Format Printer Design



The evolution of large format digital printers is continuing to drive change in the printing and publishing markets. These large format machines are used to print everything from banners, posters, signs, and photographs to proofs, drawings, and textiles. As digital printers continue to improve in terms of cost, performance, quality, and speed, they are beginning to replace traditional analog sign and display technologies, such as screen printing.

One company specializing in the design and manufacture of large format digital printers is Gandy Digital, based in San Antonio, with manufacturing facilities in Oakville, Ontario. Electronics and software engineering are developed in the Texas office, while production and assembly take place at the 70,000 sq ft Oakville plant. Gandy Digital currently sells one product — a highly advanced large format digital printer named Pred8tor, with projected 2012 sales of four units per month to customers around the world.

The Pred8tor is a hybrid ultraviolet (UV) flatbed and roll-to-roll machine that prints high-resolution images on a 4 x 8 ft sheet of flat media at speeds not possible with earlier printers. The sophisticated machine achieves its high speeds and superior print quality using new print head technology, streamlined software algorithms, an iPad user interface, and advanced motion control components. An automated head cleaning system eliminates the messy task of cleaning print head nozzles before printing, while a vacuum surface on the UV flatbed keeps rigid or delicate substrates perfectly flat for precise printing. The Pred8tor can be used to replace conventional high-speed printing presses in a fraction of the space, which is especially beneficial to smaller print shops.

“Our new machine prints high-resolution 900 dpi photographic quality images with inline white or clear, and is the first commercially available high-speed UV true flatbed grayscale printer,” says senior software engineer Bryan Hackney. “Pred8tor will print a 4 x 8 ft sheet of rigid material up to 2 inches thick.

ServoNut

Precise motion control is a critical aspect of achieving the Pred8tor’s excellent print quality. The two main motion axes include the print table, which moves forward and backward, and the print head, which moves left and right. In earlier printer generations, linear motors were used on both axes. While using a linear motor on the high-speed print head axis works as expected, this approach caused several undesirable issues on the table axis. For one, the use of a linear motor on the table axis requires the use of a linear encoder as well — adding several

ServoNut Specs

Zero backlash. ServoNut directly drives the nut along the screw with exact position feedback for backlash-free operation.

Standalone or complete actuator. ServoNut Power Modules are available as a standalone drive element or as a complete precision linear actuator assembly with bearing carriage and linear or rotary encoder.

Inertia matching. A wide range of direct-drive servomotors and screw leads allows precise matching of payload and motion requirements. ServoNut inertia is equivalent to or less than that of a driven-screw stage.

High force. Load capacity exceeds 1,500 N continuous force. With options for pneumatic or electric failsafe brakes, ServoNut is suited for high-force vertical axis applications.

High speed, high precision. Speeds in excess of 1 m/s and accelerations over 4 *g* are possible. Bidirectional repeatability is ± 1 encoder count.

Robust components. Lubed-for-life rotary bearings and an anodized aluminum and stainless steel construction are standard.

hundred dollars of cost to the bill of materials. The linear encoder is also difficult to install and service on this axis, requiring additional downtime during maintenance intervals.

"In some of our earlier printer designs, the linear motor was not quite able to completely hold its position, which had the effect of introducing a small amount of vibration into the system," explains Hackney. "We knew there had to be a better solution for moving the table axis, and we wanted to build this design into the Pred8tor from the beginning."

Gandy's engineering team began exploring different options and decided to turn to Bell-Everman Inc., Goleta, Calif., a high-precision motion component supplier they had worked with in the past on a few custom machine projects. Bell-Everman's engineers worked with Hackney and his team to find a solution that would address the issues of cost, design simplicity, and minimizing the inertial mismatch apparent in earlier printer generations. Bell-Everman recommended its ServoNut Power Module, which mates a high-performance NEMA 23 motor directly onto a zero-backlash precision ball screw. In this design, the screw itself remains stationary while the nut is rotated to achieve linear motion, allowing higher speeds and longer strokes than are possible in traditional ball screw applications. A simple rotary encoder supplies position feedback. Compared to using a linear motor, the ServoNut's low-inertia, high-force driven nut design offers greater load capacity, acceleration and speed, as well as easier installation and lower cost.

"By specifying the ServoNut module into the Pred8tor, we were able to avoid using a linear encoder, which saves us a few hundred dollars per machine and simplifies installation," explains Hackney. "We also avoid the inertial mismatch we were finding in some of our previous large format printers. Later this year, Gandy Digital will introduce an even larger format machine than the Pred8tor, and we'll be using other Bell-Everman components in that printer as well."

For more information on Gandy Digital, call (210) 338-8303 or visit **www.gandydigital.com**. To contact Bell-Everman Inc., call (805) 685-1029 or visit **www.bell-everman.com**.

PRED8TOR PRECISION IN A NUTSHELL

Cost, precision, and simplicity are the prime selection criteria when it comes to specifying motion control components for use in Gandy Digital's printers, including the company's new Pred8tor flatbed UV inkjet printer.

The Pred8tor employs a 10-mm pitch Bell-Everman ServoNut high-precision ball screw for the table motion, while a linear motor drives the print head axis. Although the table axis is unusually long for an unsupported screw, the design works well and achieves extremely smooth motion. The ServoNut is commutated solely by the rotary encoder on the motor, simplifying maintenance.

Accuracy and repeatability of the ServoNut Power Module are excellent for this printing application. The Pred8tor prints using a 6 picoliter dot size at 900 dots per inch, and dot placement is critically important to print quality. The table weight is 200 lb unloaded, and the factory indexing accuracy specification is +/- 2 ìm. The ServoNut is driven with a proprietary jerk-limiting algorithm, which results in extremely smooth acceleration and deceleration while reducing forces. The algorithm is not required for operation, but results in less internal vibration in the machine, further boosting print quality.