

## Motion Control

# PC system improves transformer core making productivity

Today, the transformer manufacturing industry is focused more than ever before on development and production of energy efficient transformers. Customers expect nothing less.

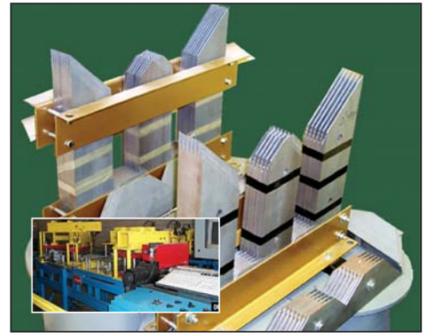
Rex Manufacturing of Toronto, a leading Canadian manufacturer of commercial and industrial dry type transformers (rexmanufacturing.com), anticipated this trend, and devoted considerable resources and effort to meet market demands. The process began with an assessment of its transformer core manufacturing capabilities since an important feature of the energy efficient transformer is the configuration of its core, and therefore the production of core laminations. Realizing that the core manufacturing equipment at its metal fabricating facility was not fast or flexible enough to match new requirements, Rex's management decided to install new machines to produce core lamination for energy efficient transformers.

"At first we scrutinized machines supplied by the established European manufacturers," said Rex vice-president Levon Hasserjian. "The Europeans offered an extensive selection of functional and reliable machines, but they were very complex and very expensive machines. We wanted a simple, flexible and reasonably priced system that addresses our current needs and can be expanded in the future." Unwilling to waste time on a prolonged selection and evaluation process Rex Manufacturing commissioned a Markham, ON-based machine builder, Karsh Precision Inc., to develop, design and construct a prototype core manufacturing machine to Rex's specifications.

"It was a considerable challenge," said Dikran Karsh, president of Karsh Precision Inc., "to meet all of Rex's design requirements, specifically in the areas of accuracy, flexibility and cost. Therefore, several concepts were considered and evaluated." Still, three months after receipt of the order,

Karsh delivered his first metal fabrication machine for production of transformer core laminations, with the initial process cycle of feed-to-length, notch, punch and cut-to-length steps. One of the most important tasks in the development process, according to Karsh, was the selection of a suitable control system. Following detailed evaluation of numerous motion control products Karsh Precision chose Dynaservo Inc., also of Markham, to supply a motion control system for his machine (dynaservo.com). It was a combination of product functionality, pricing and the level of technical support offered by Dynaservo, added Karsh, that led to his decision.

The advanced motion control products supplied by Dynaservo Inc. enabled Karsh to construct a metal fabrication machine featuring high speed, high accuracy and flexibility to produce different types of core laminations. Automatic process sequence generation, multiple process sta-



Above: Rex Manufacturing dry transformer core. Inset: A Karsh automated metal fabrication machine for the transformer core manufacturing process.

tions, automatic material status detection, and management of process information are additional features enhancing overall performance of this machine.

The use of Dynaservo servomotors for material feeding and positioning operations eliminated the need for a costly zero-backlash gearbox, and resulted in increased process accuracy of 0.001 to 0.002 of an inch. The introduction of the PC system equipped with Dynaservo PCI-bus type motion controller and advanced software was said to significantly improve process control and monitoring, and at the same time simplify machine operation. The operator graphically selects the type of core lamination to be produced, dimensions, specifies locations of process actions (punch, notch, cut), and the quantity of laminations to be produced. The operator can also select a standard core lamination design from a library of available design configurations, wherein all required information is recalled from memory and displayed for the machine operator to confirm.



Dynaservo servomotors eliminated the need for a costly zero-backlash gearbox in Karsh's machine.

Once the START command is entered, the system will automatically determine the optimum sequence of events for the minimum material travel required for core lamination production. The system continuously monitors and records every parameter of the production process, and generates production management reports.

The functionality of this metal fabrication machine is achieved through the utilization of Dynaservo PCI-bus type motion controller. The motion controller communicates with PC's main CPU via DPRAM, and can control a system incorporating up to 16 servo drives and 256 DI/DO in a serial communication network at speeds of up to 2.5 Mbps.

Dynaservo motion control software enables the system to perform multi-tasking, multi-axis linear and circular interpolation, matrix and palletizing functions, and  $\pm 1$  pulse Point-To-Point control. The software was specifically designed to allow the user of the machine to quickly change or modify the program, thus reducing user's dependence on the machine manufacturer for maintenance and modification services.

The amalgamation of Dynaservo motion control products with Karsh's mechanical systems is said to have created a very reliable and flexible metal fabrication machine with a price tag under \$150,000.

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