MECHATRONICS HELPS OEMS CUT COSTS

Virtual design tools can help machine builders to build fewer prototypes, save energy and get to market faster.

By John Pritchard, Global Product Marketing Manager, Kinetix Motion Control, Rockwell Automation

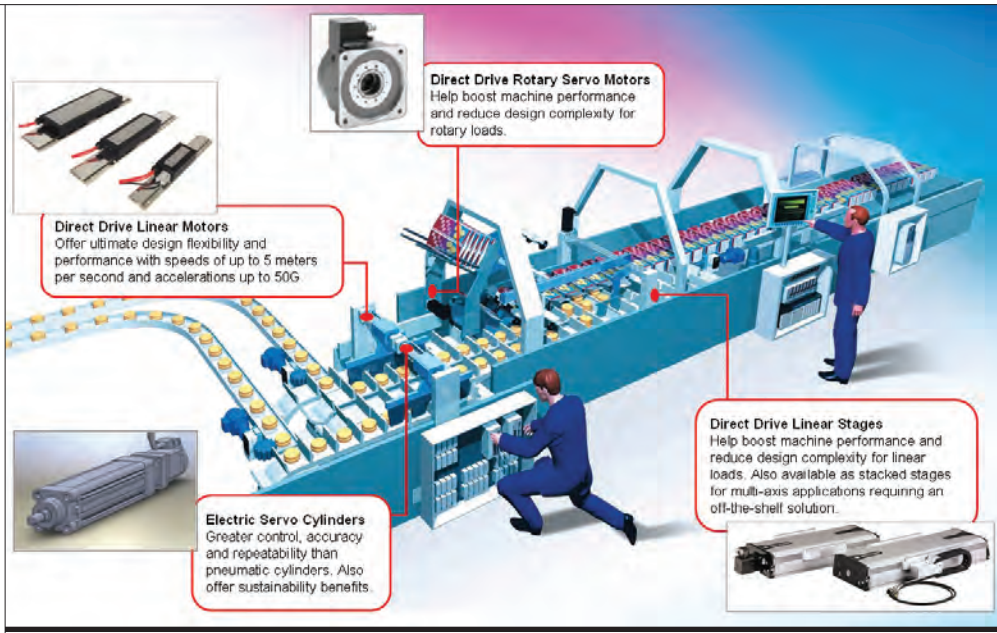
End users are requesting machines that generate less waste and make optimal use of utility resources such as water and energy to support their sustainability initiatives. At the same time, OEMs know that less time spent building a machine translates into lower engineering costs, faster time to market and a better bottom line.

A new design approach is gaining momentum and helping OEMs meet key business goals. Mechatronics — the combination of mechanical and electrical engineering — is a collaborative, interdisciplinary approach to machine design.

It helps OEMs bring engineering processes closer together to achieve faster time to market and to lower design and development costs.

The same approach results in improvements in sustainable production areas as well, resulting in a 'win-win' situation for both OEMs and their customers.

Motion Analyzer software from Rockwell Automation can help machine builders to select, size and optimize motion control systems faster and easier. Engineers simply enter information about the load and how it needs to be moved. From a pull-down menu, designers can then select an actuator, for instance, without having to figure out complex calculations or look up specifications in the manufacturer's data sheets.



Mechatronics is a collaborative, interdisciplinary approach to machine design that combines mechanical and electrical engineering.

The outcome of mechatronics is a machine design optimized for high performance controls. You can benefit by building a machine that costs less to make and uses less energy.

The virtual design tool means you need to build fewer prototypes, and that saves money too. For example, the virtual design tool lets you analyze whether the machine will operate reliably. It links mechanics with controls to analyze, optimize, simulate, and select in a virtual environment before committing to a final machine design.

Mechatronics Put to Work

One company that has benefited from mechatronics was using thermoforming for indexing a plastic product at 400 ppm. It wanted to double output, which required faster indexing, and to reduce waste caused by nuisance trips.

The old approach required a bigger motor and drive, with 600% more power than the lower-inertia design from mechatronics. The chain-driven transmission was responsible for the majority of losses and instability, resulting in the motor operating at 98% of thermal limit. This caused nuisance trips and material waste. The original design prevented speeding up the machine. The mechatronics approach was to:

1. Analyze the system.
2. Identify a chain-driven conveyor as a major opportunity area.
3. Optimize the new design around a servo-rated gearbox.
4. Simulate the design to verify stability and thermal performance.

The mechatronics approach helped the company to meet all its goals. Transmission losses were reduced. Drive size was trimmed from 13.5kW to 4kW. Waste resulting from nuisance trips was eliminated. And line speed increased with greater output per machine footprint.

Another company that knows the strengths of mechatronics is a glass manufacturer that moved 700-pound sheets of glass through various treatment stages. The company sought to increase output with faster line speed, improve quality with better stability and reduce waste using more accurate spacing.

Its old approach was a bigger motor, drive and equipment panel with higher energy consumption and marginal waste reduction. The transmission accounted for 82% of the mechatronic losses. Primary machine function, which was indexing glass, accounts for just 7%.

The power required…was reduced. In addition, accuracy was improved, resulting in less waste...

The mechatronics approach was to analyze the entire system, identify the transmission as a major area of opportunity, optimize the design around an integrated drive-motor unit and simulate the design to verify accuracy requirements.

This company also met all its goals. After implementing mechatronic design principles, transmission losses were reduced, resulting in the power required per motor falling from 905W to 131W — a reduction of 15.5kW overall for the complete machine. Line speed increased for greater output, and waste was reduced because of improved accuracy.

How Mechatronics Can Help

Benefits of mechatronics include:

Increased Machine Value. The value of a machine is closely tied to its ability to produce (ppm x overall equipment effectiveness). Design optimization often results in increased machine throughput at no additional cost.

Sustainability. Machine owners and operators are increasingly concerned about sustainability issues. Efficiency analysis can help decrease energy consumption and reduce waste.

Greater Innovation Agility. Offering shorter lead time often can help win the order, and even command a premium. Virtual prototyping reduces design, development and delivery time.

Risk Mitigation. Any design change carries an associated risk. Simulation helps reduce risk by predicting the likely outcome of design changes before they occur.

These simulation tools help reduce design time as well as help minimize errors that otherwise might come to light much later in the development process. More importantly, the improved reliability, optimized performance and energy usage, and faster time to market that Motion Analyzer can deliver means more satisfied customers and a more favorable bottom line. □

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