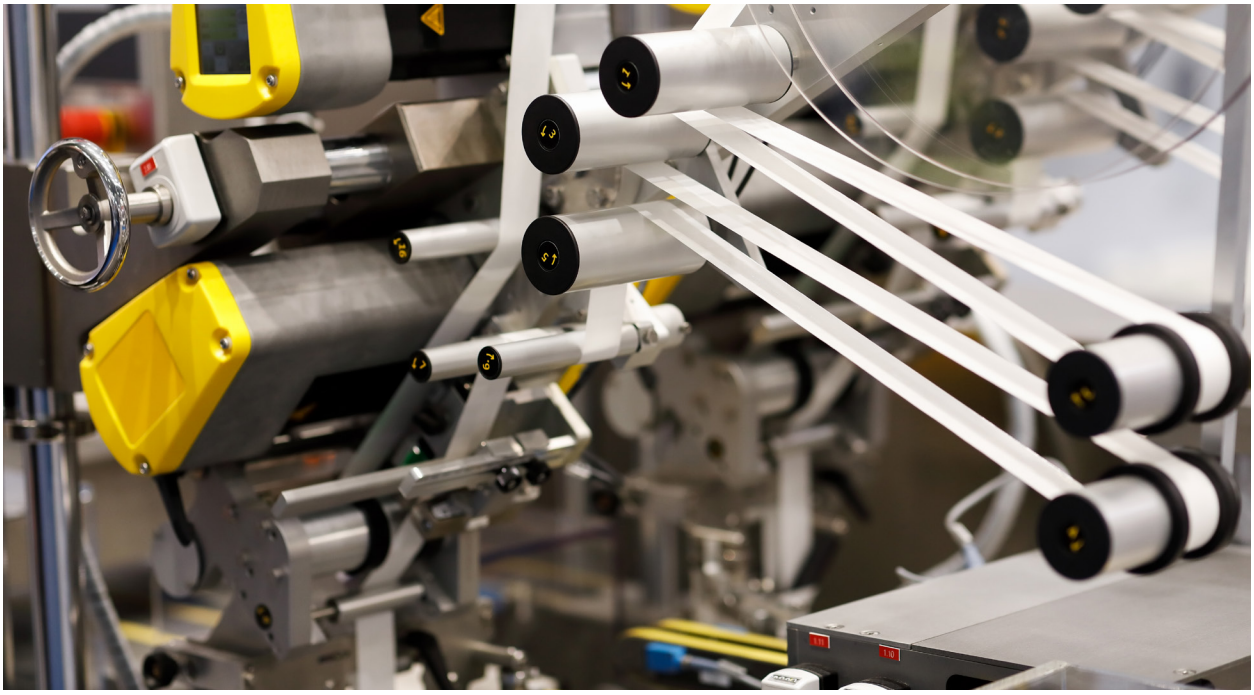
WHITE PAPER

INDUSTRIAL INDEXING SYSTEMS, INC.

Motion Solutions for OEM Machines

How motion control technology is helping OEM machinery builders strive for precise, repeatable performance and higher production speeds.

Electronic motion control has been a well-accepted technology in the machine tool industry for more than two decades. The need for precise, repeatable performance and higher production speeds quickly justified the cost of programmable motion controllers and servo systems.



Throughput increases and enhanced diagnostics reduce labor costs and translates into higher sales and satisfied customers.

Integration of Motion Control

These systems have now reached a technical sophistication, value, and marketing acceptance that allows the OEM designer to use them without the feeling of operating at a technology's outer edge. The integration of modern motion control into OEM products improves the quality of the items produced by these machines and increases market acceptance.

OEM machines using motion control create parts more precisely and repeatably while making the production process more flexible and user-friendly. Throughput increases and enhanced diagnostic abilities reduce skilled labor costs for maintenance translating into higher sales and satisfied customers.

Increased Reliability and Cost

The maturing of motion control technology has attracted many established OEM companies to invest in it and apply it to their products. This market expansion has raised the bar for all motion control suppliers and has increased industry-wide reliability and cost-effectiveness. And the explosion of software-driven products of all types has noticeably enhanced the acceptance of motion control integrated into OEM products.

By offering machines and systems whose abilities and functional configurations are changeable through software control, OEMs can meet their customers' needs without proposing custom designs. As a result, these standard products can be manufactured in larger quantities, thereby lowering prices while raising quality.

Line-oriented production machines, in particular, benefit from the application of servo technology.

Strengths of electronic motion control

Although anything that moves in an OEM machine is a candidate for conversion to electronic motion control, not every opportunity can be cost-justified. The OEM engineer must recognize where to apply this technology. This process begins by knowing the strengths of motion control when used to overcome a weakness, fixing a trouble spot in the OEM equipment, or offering an improved functionality to increase sales potential.

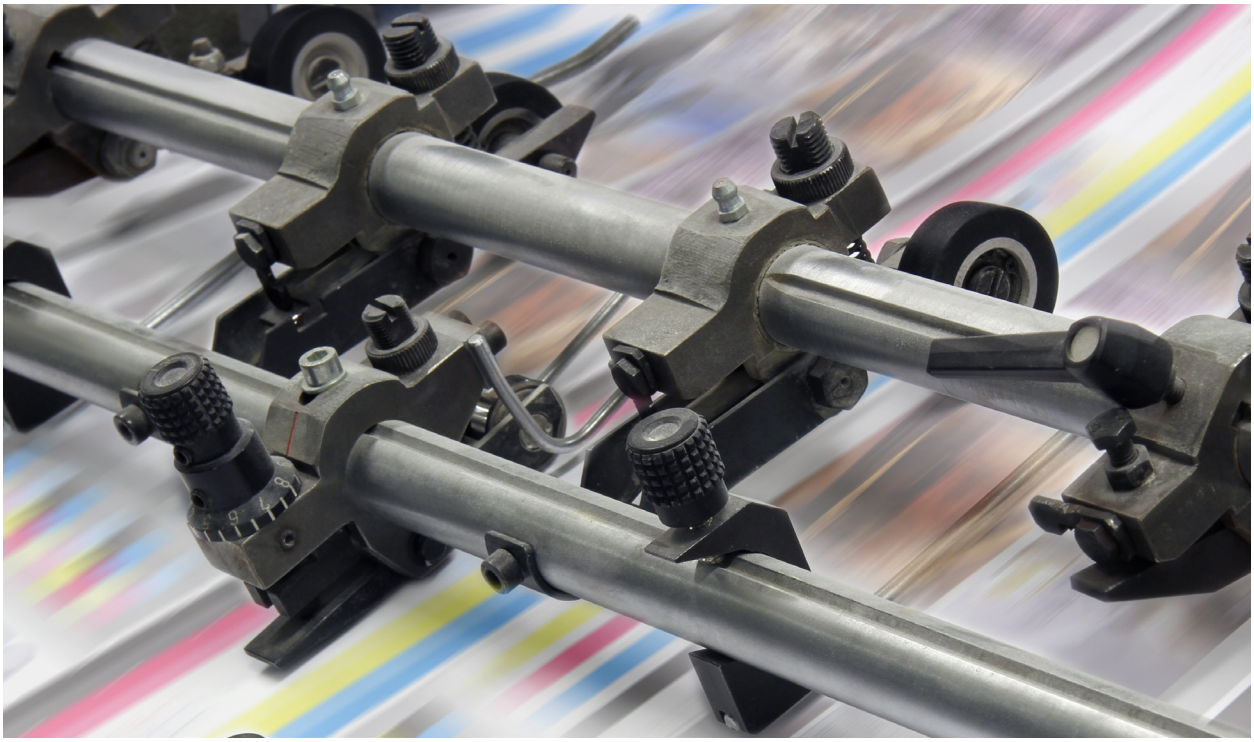
A motion control system can follow, or synchronize to, other equipment not driven by the motion control system.

~ The motion control trajectory shape is very flexible, ranging from traditional linear segments to minimum jerk profiles using complex S-curve profiles.

~ The trajectory of motion can change on-the-fly based on process inputs.

~ The motion control system can follow, or sychronize to, other equipment not driven by a motion control system.

~ A motion axes can be synchronized, one to another, or all to a single master. The phase relationship between synchronized axes can be easily changed, similar to a mechanical differential.



The motion system can precisely track each axis' location, using a high-speed registration to control product alignment.

~ Complex synchronized motion - electronic cams can be altered at setup time or on the fly, gaining flexibility over mechanical cams.

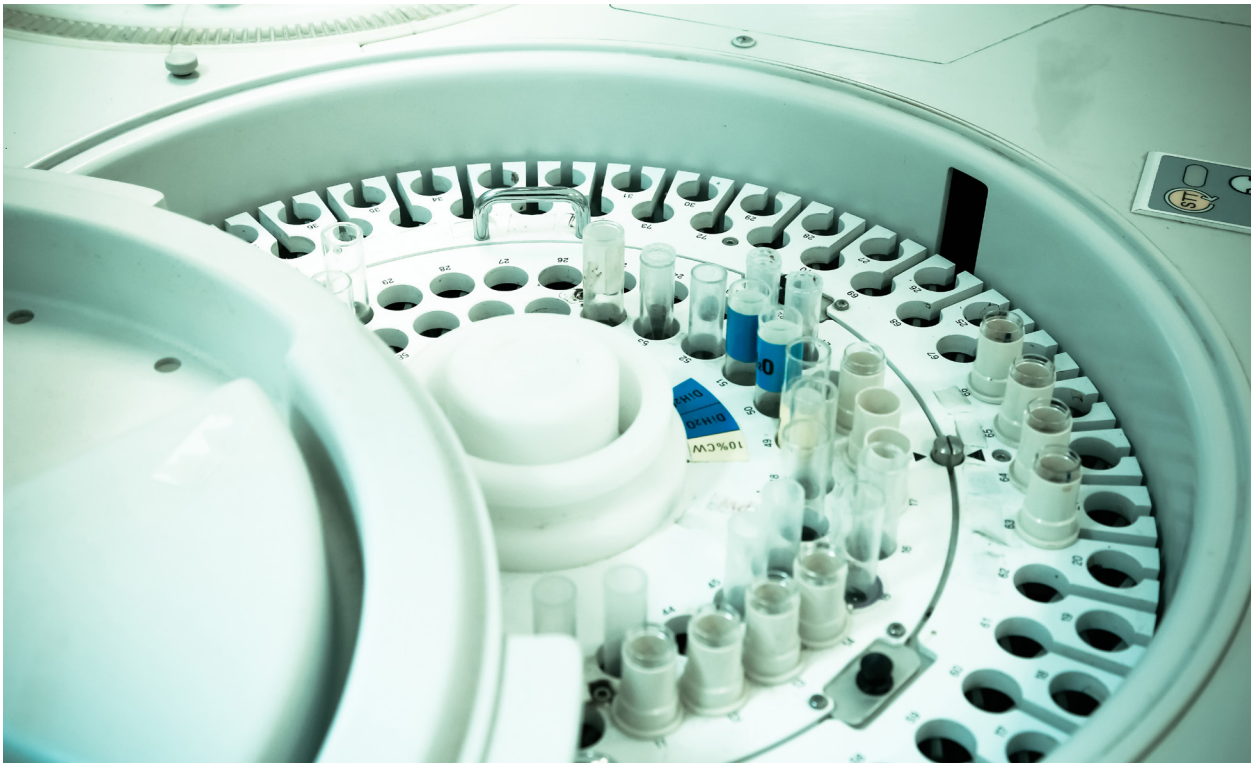
~ The choice of a master axis and the slave axis can be made at startup or on-the-fly.

~ The motion control system precisely tracks each axis's location, using a high-speed registration feature to control product's alignment in the production process. This feature traps the product location when a sensor, detecting the reference mark, trips. Using the trapped product location on the next cycle synchronizes the product back to its rightful place relative to the mark.

~ Monitoring the rotational force as torque during motion or at-rest can be recorded to provide process history for later analysis. Torque can be safely limited to allow the system to stall due to a product jam, to act as a holding clamp to run against a hard stop to reset a positional reference.

There’s more than motion going on in motion controllers

One of the strengths of electric motion control is the software’s ability to form master-to-slave relationships between different motor shafts and sensor shafts. The design of modern motion control systems makes use of microprocessors and other computer-based technology; they can handle many more tasks centered around just motion control.

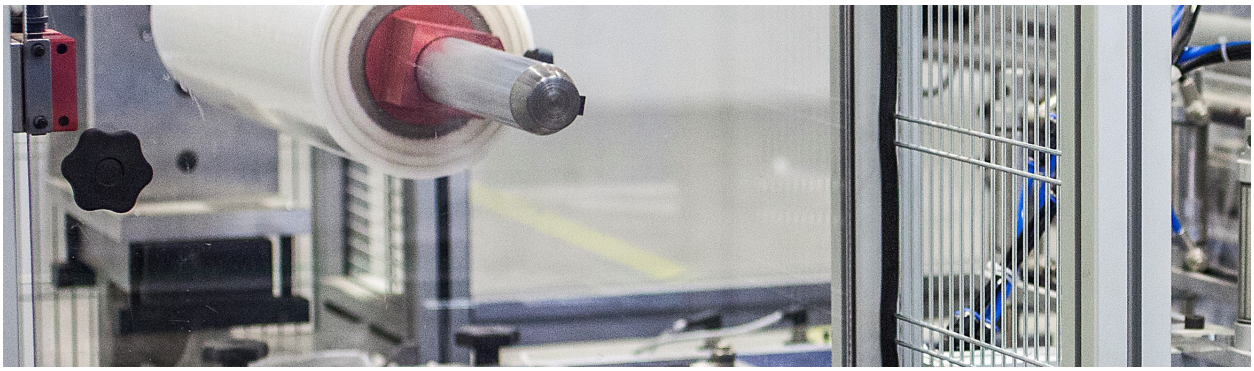


Precise speed control is crucial for reliable results in a variety of medical processes.

Additional functions typically include

- ~ I/O sequencing
- ~ Analog I/O
- ~ Programmable limit switch functions
- ~ Operator interface
- ~ Communications links to PLCs and host computers
- ~ Gathering process control data for ISO-9000 conformance or SPC
- ~ PID loops for process control
- ~ Local and remote diagnostics
- ~ Increased machine throughput

Electronic motion systems increase machine throughput



Motion control regulates acceleration and deceleration rates, which allows more precise control and top speeds to increase.

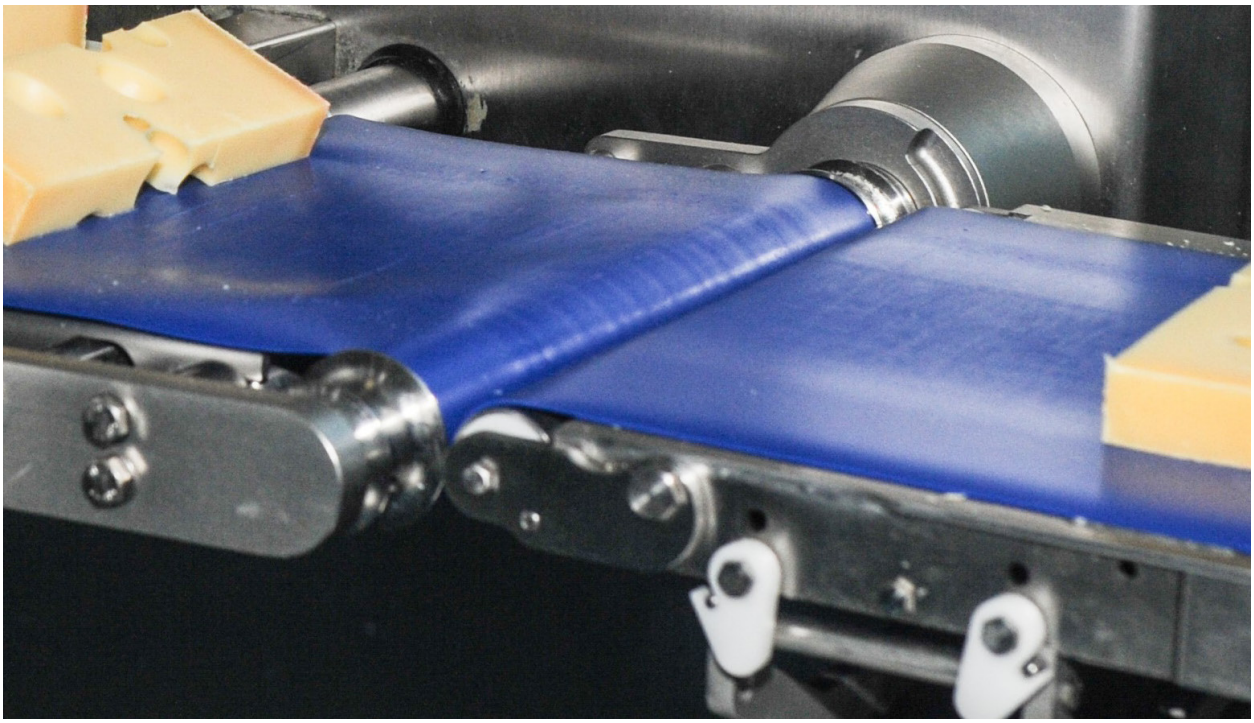
For example, using an air cylinder or clutch brake to provide movement results in uncontrolled acceleration and deceleration as the machine speed increases. At some point, these erratic motions cause unacceptable vibration and wear. Motion control regulates the acceleration and deceleration rates, which allows more precise control and top speeds to increase. The motion profile is proportional to machine speed and replaces the clutch to eliminate wear surfaces.

Another technique is to eliminate start-stop motions. Why bring a part to rest, to work on it, when a motion control system can synchronize the process while moving? A simple example is a machine that cuts a web material into sheets. In purely mechanical designs, the web is indexed, stopped, cut with a stationery knife, and re-indexed to start the process again. But it can be designed using motion control to cut the web to a precise length with a servo-driven rotary knife while the web is moving, often at high speed.

Many industrial processes involving die-cutting, embossing, and cut-off functions require that printed matter be lined up, or registered, with each operation in the process. Functions that act on printed material can become an expensive challenge with a purely mechanical system. The changing phase relationships among the various moving parts inhibits the process considerably. In an electronic motion control system, an electronic sensor detects the mark's position on the material and synchronizes the downstream processes to align with that mark. The speed of phase adjustments is exact and happens very fast. Digital filtering methods in the motion controller are incorporated to smooth the action of fast-reacting phase adjustments. And interestingly, it is often more limited to the sensor selected than the limits of a motion control system's ability.

Motion control offers flexibility

In general, if your OEM machine uses a mechanical cam, differential phase shifter, or gear trains to produce synchronized motion to a line-shaft, a machine design using motion control will be much more flexible. Applications that require putting glue on complex shapes, routing, or sewing can take advantage of motion control's ability to go directly from CAD to motion control.



Many industrial processes involving die-cutting, embossing, and cut-off functions that require precise synchronization.

The bedding industry is particularly good example. Motion control allows an artist to design a complex sewing pattern for a comforter produced electronically without the expense of cutting the pattens into mechanical cams. Winding and unwinding material is also a practical application for motion control and machines that notch, punch, index, rotate. Packaging and handling equipment are also strong candidates.

Is electronic motion control for you?

Electronic motion control has come of age in the last few years. Where once it was only

IIS' Applications and System Engineering staff provides expert guidance in system design and custom turnkey solutions.

considered for machine tools and other very high-end applications, it now needs to be taken seriously as a choice for nearly all OEM machines whenever designs undergo a revision, or new models are in a planning stage. Component costs are steadily decreasing due to standardization and growing volume.

Capabilities and quality, already very high, are increasing as well. Most motion control suppliers offer excellent application assistance, training, and software engineering to support their products. Many local distributors and systems integrators bring motion control products into their lines, so local help can often be arranged.

The electronic motion control marketplace is experiencing explosive growth in both sales volume and breadth of product offerings. There is no reason to wait to apply this easy-to-use technology in your OEM machines. Choose your motion control supplier that meets your needs, then go for it. Your customers - and your bottom line - will thank you for it.

INDUSTRIAL INDEXING SYSTEMS, INC

The IIS Team

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Our location houses all critical departments: Applications Engineering, R&D, Production, Warehouse, Panel Shop, Quality Control, Sales, Marketing, and Customer Support. Having everything under one roof speeds communications and provides better service to our customers.

Check out our IIS InMotion Blog for the Servo Motion Control Professional ~ https://www.iis-servo.com/blog/

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