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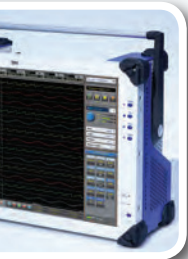
INSIDE:



● **MOTION CONTROL:**
Protecting against
mechanical overload
damage



● **LINEAR MOTION:**
Linear encoders
improve accuracy



● **TEST & MEASUREMENT:**
Space vectors aide drive
for optimal efficiency



Top 10 benefits of IoT Enabled Mechatronics

Integrating Internet Connected
Smart Robot Modules

Top 10 Benefit

of IoT enabled
mechatronics

Mark Huebner • PBC Linear



Manually adjusted slides can be upgraded with smart stepper or step-servo motors to take advantage of recipe-driven setup speed and flexibility.



Closed-loop integrated motors

A critical component of the smart robot module is the closed-loop integrated motor used to drive the axis. Integrated motors that combine motor, feedback, amplifier, controller and communications into a single device offer great flexibility to the machine designer, with the controller and communications elements being the biggest enablers of smart technology. Closed-loop performance means more torque, higher acceleration rates, increased efficiency, better machine throughput, cooler operation and less audible noise than traditional open-loop systems. Simple point-to-point motion of a single axis or complex coordinated motion of multiple axes, along with an expanding menu of industrial Ethernet options—including Ethernet/IP, EtherCAT and Modbus TCP—contribute heavily to the long term success of smart technology.

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The latest trend in machinery design is to take advantage of the Internet of Things benefits, which are seen throughout a machine's life cycle.

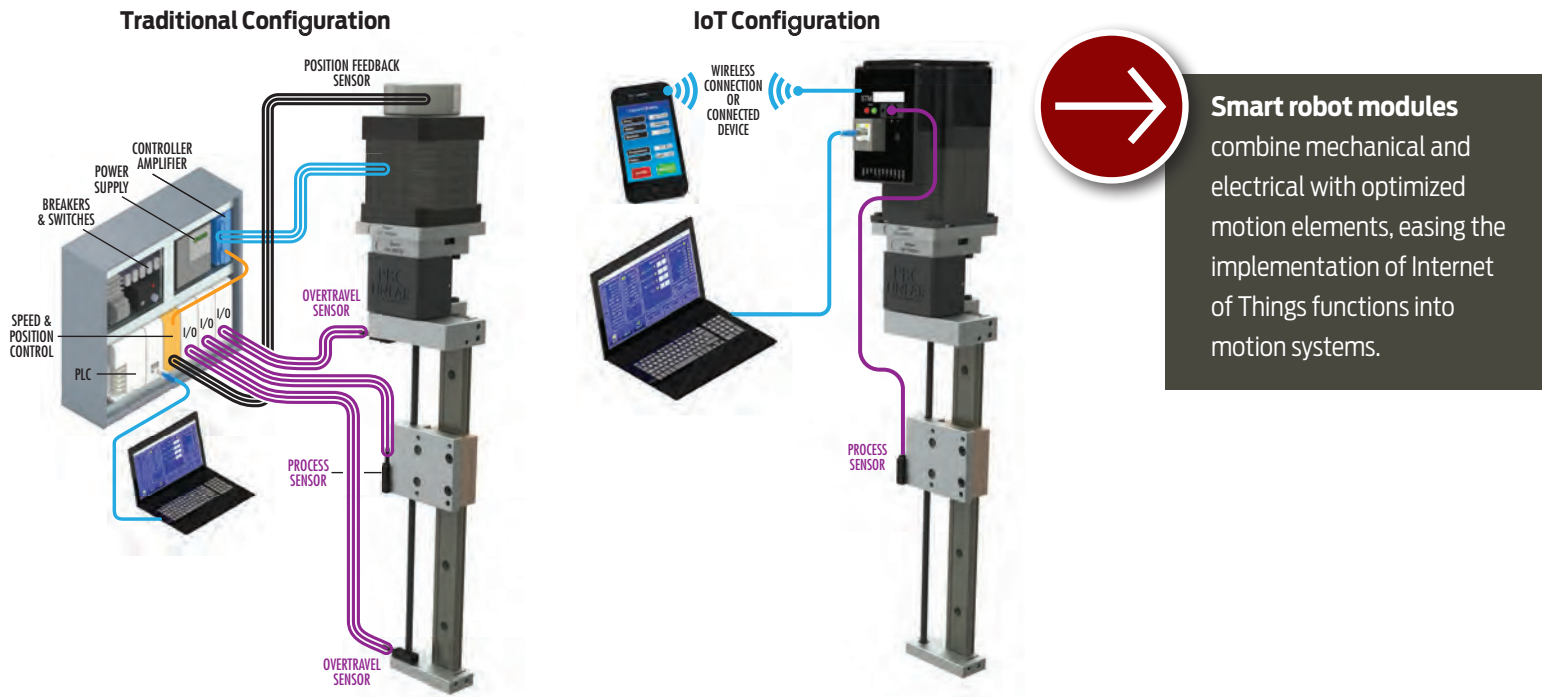
Internet connected “smart” technology

has become intertwined with almost every aspect of our daily life. The smartphone we all carry keeps us connected to people and lets us automate notifications or responses based on personal preferences. Automobiles are outfitted with increasing capabilities to automatically adjust, producing higher fuel efficiency and increased safety based on driving habits and surrounding conditions. The smart house can be programmed for tighter security, maximized electrical efficiency in lighting and HVAC, and greater comfort driven by an array of ergonomic sensors.

Similar technology in connectivity, control and automation are found throughout industrial applications, including motion. Internet enabled machines can deliver new levels of flexibility, performance and cost advantages.

The old way of addressing machine integration and motion control focused

on basic engineering disciplines—mechanical and electrical—and each dedicated engineering group worked independently. In the end, somehow the two had to be brought together and made to operate. The typical result would be a functional, but far from optimized, machine that was



cumbersome to build, wire and connect, and difficult to monitor, change or adjust.

In the old paradigm specifically, mechanical engineering would work on the physical motion created. Things like the bearings, rails, leadscrew, belt or other drive mechanism, and how to connect to a motor. Electrical engineering would select the sensors, attach the I/O, driver, PLC, controller, amplifier and power supply. The motor would fall somewhere in between, most often with the electricians because it had to be connected to power and controlled.

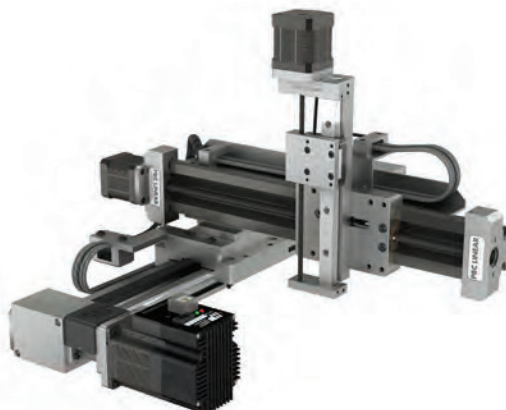
A new model has emerged that simplifies the machine design and build process while easily enabling Internet integration. This model involves the use of “smart robot modules.” These modules are the marriage of mechanical and electrical optimized motion elements components, including smart stepper or step-servo motor technology with integrated controls. They can easily be applied to single-axis, multiple-axis or XYZ Cartesian configurations.

Here are the top 10 advantages machine

builders and users gain when combining these enhanced mechanical components with smart motor technology and control strategies.

Top 10 benefits of Internet enabled mechatronics

- 1 Lower cost and better function** Each component must have a positive impact on the financial bottom line. Less wiring and connectors, fewer components



These smart robot modules can easily be applied to single-axis, multiple-axis or XYZ Cartesian configurations.

and sensors, less labor invested, reduced time spent in setup and maintenance and maximized operational uptime all substantially reduce the overall cost of ownership and operation.

2 Less space

By building the driver, controller and amplifier into a smart motor, less panel space is needed, which saves material, time, labor and overall cost.

3 Simplified wiring

Combining the driver, controller and amplifier means fewer sensors are needed, especially when an encoder is used, fewer I/O connections, and a less complicated wiring schemes.

4 Reduced troubleshooting

With fewer components and less wire connections, the job of tracing down problems that may arise is greatly reduced.

5 Streamlined commissioning

Machine installation and start up is made easier with pre-programmed homing routines and with the ability to make changes at an individual axis without working through the PLC. This distributed control model frees the installation team to work on multiple axes simultaneously, and report progress through Internet connectivity. It also allows an operator to make in-process adjustments at an individual axis without affecting the PLC or entire production line.

6 Modular integration

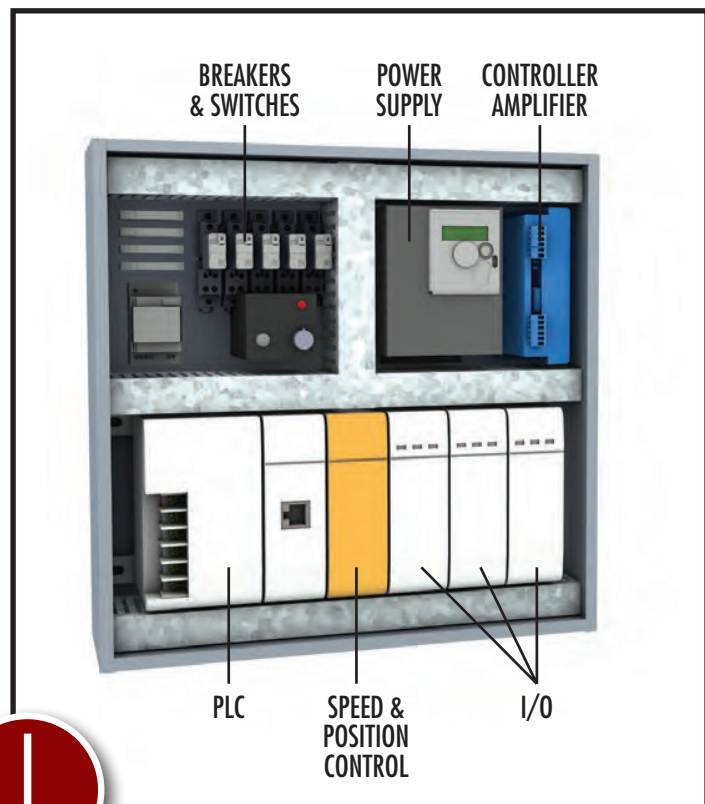
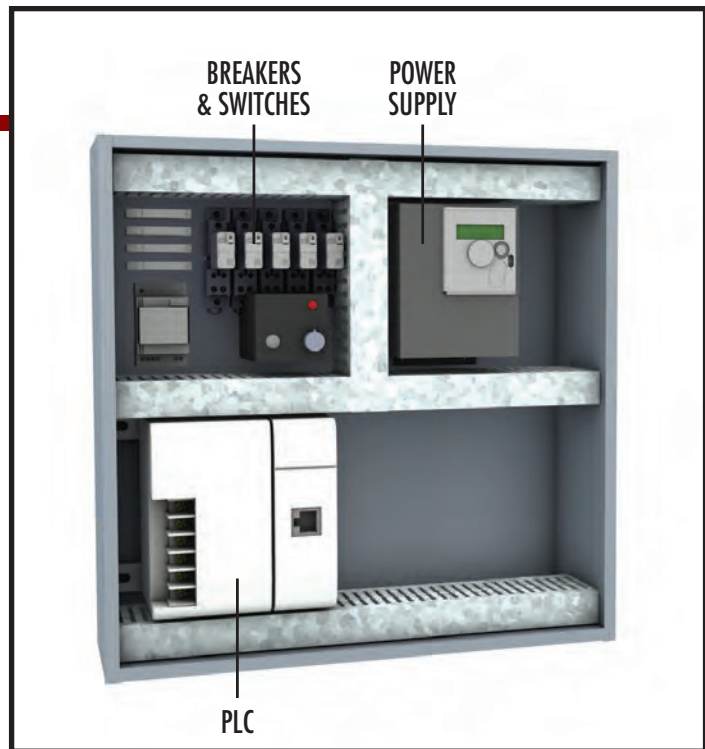
Standardized smart robot modules make integration into multiple axes or multiple machines a natural and easy process.

7 Automated adjustment

Switching a packaging or assembly line to a different size or part can become automated and “recipe driven,” increasing manufacturing flexibility and speed. Such adjustments eliminate time consuming manual changes.

8 Maximized uptime

Real-time monitoring of temperatures, friction, motor torque and other performance related data can be routed to a mobile device allowing operators, maintenance or engineers to proactively handle issues related to maximizing machine uptime.

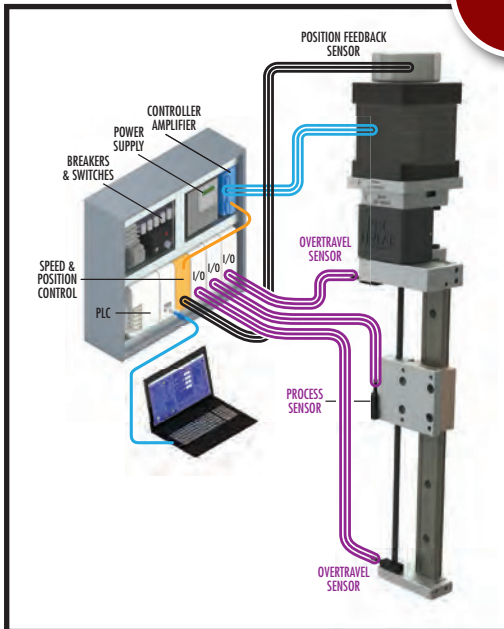


By moving the driver, controller and amplifier on o
the motor, cabinet space is opened up or the cabinet
can be downsized.

IoT Configuration



Traditional Configuration



A bottling company, setting up a new production line, switched from a traditional setup to using IoT enabled mechatronics. By eliminating components in the control panel, bulky complicated wire harnesses, and the setup labor, overall cost was cut by more than 50%. In addition, smart robot modules created new flexibility. Local monitoring and adjustment with hand-held devices reduced changeover time and down time by 60%. The end result is increased capacity and profitability.

9 Preventative maintenance

Established time frames for periodic maintenance based on cycles, number of pieces run or other dynamic conditions can easily be monitored and reported to any IoT connected device, such as a work station, tablet or mobile phone, allowing teams to proactively keep equipment running at peak efficiency.

10 Increased output

All of these things are working together in an IoT connected motion system, driving greater flexibility, less downtime, increased performance and greater bottom line output for manufacturers, assembly lines, packaging equipment and production equipment.

With today's integration of IoT processes and equipment, traditional disciplines are merging and the benefits are seen throughout the machine life cycle. The design phase is shortened with cross discipline communication, design development and project management tools. Procurement and build cycles are shortened due to the need for fewer components along with the use of online configuration and purchasing tools. With IoT connected programming and real-time analytics, ease of use, maintenance and overall life are increased for the user. All of these things combine adding to the bottom line, creating more opportunity and increasing financial returns. **OW**

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