Breaking the 4th Industrial Wall

Trends in Mechatronics and Motion Control in 2022

Matthew Jaster, Senior Editor

Manufacturing is facing constant challenges stemming from labor shortages and disrupted supply chains to productivity declines and the high replacement and maintenance costs of legacy equipment. Trends in mechatronics and motion control include equipment upgrades, e-commerce, a push for more robotics and automation and faster software and IIoT solutions.

What to do with legacy equipment?

The options when it comes to machine upgrades today are limitless, but the most cost-effective strategy greatly varies on a case-by-case basis. Many machine builders will tell you legacy equipment data remains untapped and should not be pushed aside for newer technology, but instead incorporated. Data migration in legacy equipment is the process required to move data that was stored in an old system into a new system. The motion controller is a perfect example of this.

"Siemens does a great job in migrating legacy equipment," said Kevin Wu, motion controller product manager at Siemens Industry, Inc. "The PLC controller can do so much more today than it could in the past. The biggest obstacle might be that you can add *too* many features to a new controller today, so it becomes a challenge to determine how much goes into it and where or when should you stop."

"In the past, you'd have multiple motion controllers for vision, safety, drives, etc.," added Craig Nelson, senior product marketing manager at Siemens Industry, Inc. "Now you can put all of these capabilities in a single motion controller. This represents our push lately for ease of use. We're trying to make it easier to adapt these technologies for our customers and partners."

Process Control and Engineering is a Siemens Solution Partner that provides machine builders and OEMs with integrated engineering services. Project manager Alejandra Cota discussed how mechatronics plays a role in robotic integration today:

"Many of the projects we're working on involve integrating old CNC machines with robotic technology. For example, we recently integrated a 7-axis robot for complex handling into a legacy machine," Cota said. "This is where the industry is going. How do we make these old systems more efficient through the integration of mechatronics?"

The Siemens Mechatronic Systems Certification Program (SMSCP) combines the German dual education system with Siemens' in-house know-how.

She added that in her three years with the organization she's seen a major growth shift in the use of industrial robots. "These robots are able to replace some high-cost machines and they represent a huge opportunity today for companies to save money."

Maximizing shop floor efficiency

Ask any manufacturer what's at the top of their wish list in 2022 and many will respond with the same answer: increase manufacturing output and maximize shop floor efficiency. New robotic and automation solutions are created daily to address these challenges.

"The pandemic accelerated far-reaching global mega trends — from labor shortages and supply chain uncertainty to the individualized consumer and growing pressure to operate sustainably and resiliently — leading new businesses to look to robotic automation," says Marc Segura, robotics division president at ABB. "As technology opens new opportunities for meeting customer demands, new trends will continue to emerge that will further drive demand in areas where robots have traditionally not been used."

One trend today is sharing knowledge in order to create new international standards, automation technologies and IIoT utilization.

"KUKA is gaining valuable insight that we can incorporate so that global companies like Danfoss, Universal Robots or the LEGO Group can successfully drive forward the automation and digitization of their productions on a scientific basis," said Kim Reeslev at KUKA. "To achieve this, it must be as easy as possible to connect the individual machines in the production halls with the cloud. And it is precisely for this purpose that the open architecture of the Open Industry 4.0 Alliance has now been successfully trialed."

The Open Industry 4.0 Alliance in Europe enables its members to actively advance the fourth industrial revolution. It offers an opportunity for participating companies to exploit new synergies and

The adoption of robots is driving demand for new skills that require education and training.

accelerate company growth. The objective is to bring like-minded industrial companies together to promote interoperability and digitization.

openindustry4.com/de/

An emphasis on e-commerce

The pandemic didn't create the thriving e-commerce market taking place across both the consumer and industrial markets, but it certainly heightened its importance.

In 2021, Regal and Rexnord combined to create an expanded range of products and services. The merger included four distinct business segments including motion control, climate solutions, commercial systems and industrial systems. The newly formed Regal Rexnord Corporation highlighted its desire to provide conveying solutions that "keep e-commerce flowing."

Edge tools from Regal Rexnord include product selection modules for belt drive, bearing and gearing products and mechanical power components, as well as bearing registration and a belt drive efficiency calculator. These tools are easier to use, mobile-friendly and fully integrated. Edge product selection modules assist users in selecting the right power transmission mechanical components based on their specific application requirements. Once they install new bearings products, the bearing registration allows users to not only register their bearings but also manage assets on the Regal PT mobile app. The belt drive efficiency calculator helps users calculate how much money they can save on energy consumption by using Browning belt drives.

ABB also sees an e-commerce push in packaging, warehouse and distribution industries.

"This trend will see the growth of lighter, smaller robotic applications, enabling the expansion of automation into new areas of warehousing and distribution operations. As artificial intelligence in robotics matures and learning robots become mainstream, expect to see these technologies deployed alongside AMR technologies, orchestrated and managed by intelligent software to provide enhanced flexibility, speed and efficiency," Segura added.

Automation, motion and drives at Hannover Messe

Electric vehicles, medical applications, consumer goods, warehousing and distribution are just a handful of areas where robotics and automation are gaining momentum. Hannover Messe 2022, taking place May 30–June 2 in Hannover, Germany, is your best bet to see some of these technologies in real world applications.

Schaeffler, for example, will offer an expanded range of precision strain wave gears and a sensor-based strain wave gear, both for use in articulated arm robots with a payload of up to around 20 kg.

"We are adopting a new, innovative approach with the integrated torque sensors, both in design and technological terms, which has aroused considerable interest among our pilot customers," said Ralph Moseberg, head of the industrial automation business unit at Schaeffler.

Schaeffler will also present its portfolio of PSC-series high-precision planetary gearboxes for industrial robots in Hanover. These are characterized by a torsional backlash that is ten times lower and a service life that is three times longer than the market standard.

Mechatronic system products from Festo process a lot of data and compress it so that it can be used as diagnostics for maintenance. In the future, predictive maintenance on the basis of artificial intelligence will offer additional possibilities in comparison with traditional condition monitoring approaches. Data from the devices will be merged and evaluated using analytics models and cloud-based solutions. Festo will discuss some of these technologies during Hannover Messe.

"We have decades of application knowledge in sensors and actuators that we can now combine with domain and data science knowledge. This will open the door for artificial intelligence," said Jan Bredau, head of application software for system solutions at Festo.

Faster software and IIoT solutions

Mechatronics Concept Designer (MCD) from Siemens Digital has easy-to-use modeling and simulation which allows users to quickly create alternative design concepts early in the development cycle. Unlike a model-based tool, *MCD* allows you not only to see what it looks like but validate that it works. This validation is enabled by the re-use library, from which you can quickly add data to the functional model. This data includes joints, motion, sensors, actuators, collision behavior, and other kinematic and dynamic properties for each component. This allows a physics-based, interactive simulation to verify machine operation. This verification helps you detect and correct errors in the digital model.

Schaeffler will offer an expanded range of precision strain wave gears and a sensor-based strain wave gear during Hannover Messe 2022.

The fact that all the heavy lifting can

happen digitally is a sign of things to come.

"We react faster to everything today," Siemen's Nelson said. "We can get projects going in the simulated world in the cloud without any hardware. We're really making strides in how quickly some of these new technologies can come to market."

Wu said that Siemens can take any project with robotics and get it up and running as quickly as possible in 2022. "Instead of spending weeks and weeks on programming, we're looking at adaptability and user-friendly solutions that we can provide in days."

These solutions are incorporating AR and VR tools as well.

"Data collected from intelligently automated processes will be analyzed by producers to make more informed decisions. At the same time, more advanced and responsive simulation and programming software tools, such as those in ABB's *RobotStudio*, will cover the entire life cycle of robotic applications — from commissioning to onstream productivity — using AR and VR tools to simplify automation for customers," added Segura at ABB.

Nelson also mentioned the industries push for new power devices to make drives smaller and more efficient in the future, but he believes it will be a few years before this becomes a disruptive technology. "The priority today seems to be industrial communication," he said.

"Cloud computing, cybersecurity, all of these technologies that have been impacting consumer products are becoming more relevant in the industrial market," added Wu at Siemens. "This will impact motion control. Our end goal is to make these products and technologies less complicated."

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regalrexnord.com
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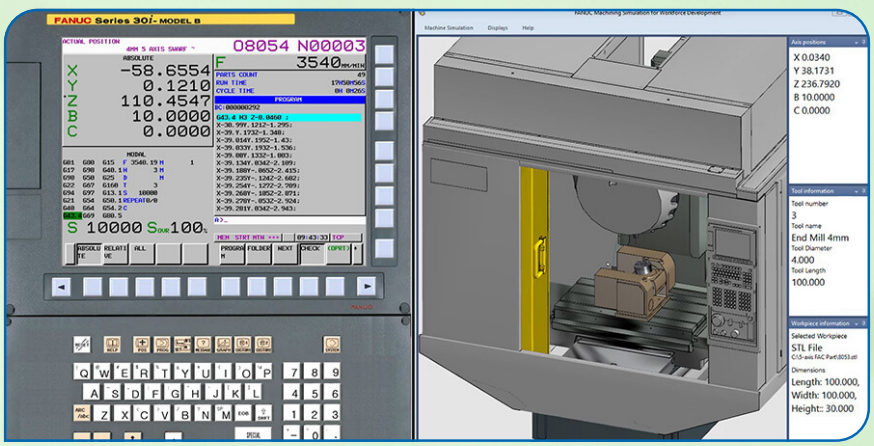
FANUC focuses on workforce development

As manufacturing adopts more robotics and automation, the industry will require its workforce to do different types of duties. FANUC America recognized years ago that while companies wanted to add more technology, there was not enough supply of skilled workers in the field to support the demand.

"We're deploying such advanced technology, such as with the emergence ofcobotsand data analytics, trying to get a workforce to keep up with that is very challenging," said Paul Aiello, executive director of education for FANUC America.

There are two pathways to workforce solutions, as Aiello explains: Upskilling incumbent workers and developing talent in the pipeline. "We work on both fronts," said Aiello. "For employers that want to upskill their workers in a very rapid, intense training course, we have FANUC Academy."

FANUC Academy offers coordinated workforce training, some funded through schools. Classes can also take place at FANUC locations. Additionally, in-house training solutions for businesses are available as well.



Machining Simulation for Workforce Development.

As for the acquisition side, FANUC America started the Certified Education Program, or CERT, to help build a talent pool filled with people that have current and relevant skills in manufacturing. Since the effort began in 2010, the CERT network has grown to over 1,300 partner schools. Through the partnership with FANUC America, these high schools, post-secondary colleges and universities, now offer education and certification programs using cutting-edge automation technologies that meet businesses' labor demands. "We make sure schools have access to real industrial equipment and real-world technical curriculum," said Aiello. "This is to ensure they are building a workforce that aligns with the industry's needs."

Whether future workers need to gain a basic understanding ofrobotic operations and programmingor need to understandintegration of advanced automation systems, FANUC America has a solution.

Automation and digital manufacturing will unlock opportunities for many businesses in the United States. Innovative manufacturers are looking at ways to seize on this opportunity now and make big investments in new processes and tools.

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