



Smart and flexible **automotive & tire production**

How automakers and their suppliers can stay productive
and agile with digital manufacturing solutions

A new day in automotive production

A once-in-a-lifetime transformation of the automotive industry is underway. Vehicles on the road are increasingly electric. Consumers, regulators and industry are preparing for a move to self-driving vehicles. And personalized cars that are just as unique as we are will soon take to the roads.

Being in the midst of all this change is as thrilling as it is daunting. Now is the time to reshape the industry as we know it. Before you dive in, you must also confront the challenges that come with such great transformation.

For automakers

- **Ramping up electric-vehicle production** will require a constant focus on production efficiencies, safety, and cost containment.
- **Creating a lot-of-one production approach** will only happen with a level of flexibility that, to date, has not been seen in automotive production.

For suppliers

- **Delivering the battery power** that electric vehicles need will require an ability to adjust operations as battery technologies evolve quickly
- **Meeting the growing demand for tires** even as SKU counts rise and recipes evolve will require a greater focus on flexibility and agility.
- **Keeping up with a fast-changing automotive market** will require that suppliers optimize the productivity of their machines, lines, and people.

Smart manufacturing makes this reinvention of automotive production possible. Data that freely but securely flows from product design to production to on-road use – and then back to design – unleashes a better understanding of your products and processes. Highly automated and flexible operations accelerate production. And IoT tools unlock valuable insights and better ways to work.

A lot-of-one production approach can make car buying and ownership immensely more personal, but it will also require greater flexibility within manufacturing.

Get smart, get connected

Smart manufacturing requires integrating three key elements – your design systems, production systems, and IoT platform – so you can operate more flexibly and understand your performance in new ways.

First, by connecting CAD and product-lifecycle-management (PLM) systems to production systems, you can automatically integrate bills of process of design with dynamic routing capabilities on the plant floor. This integration allows you to automatically reconfigure lines and deliver the right work instructions to operators so you can dynamically change what you are building on the fly and build to demand.

Then, with connectivity to an IoT platform, you can continually monitor things like processes and product quality. You can then send data back to the design process to create a loop of continuous improvement.

Digital solutions are essential to making this vision of smart production a reality. And while a range of digital solutions exists on the market, a select few will have the most significant, most immediate impact on your business. **These solutions include:**

A MODERN MES • ANALYTICS SOFTWARE • DIGITAL TWIN SOFTWARE

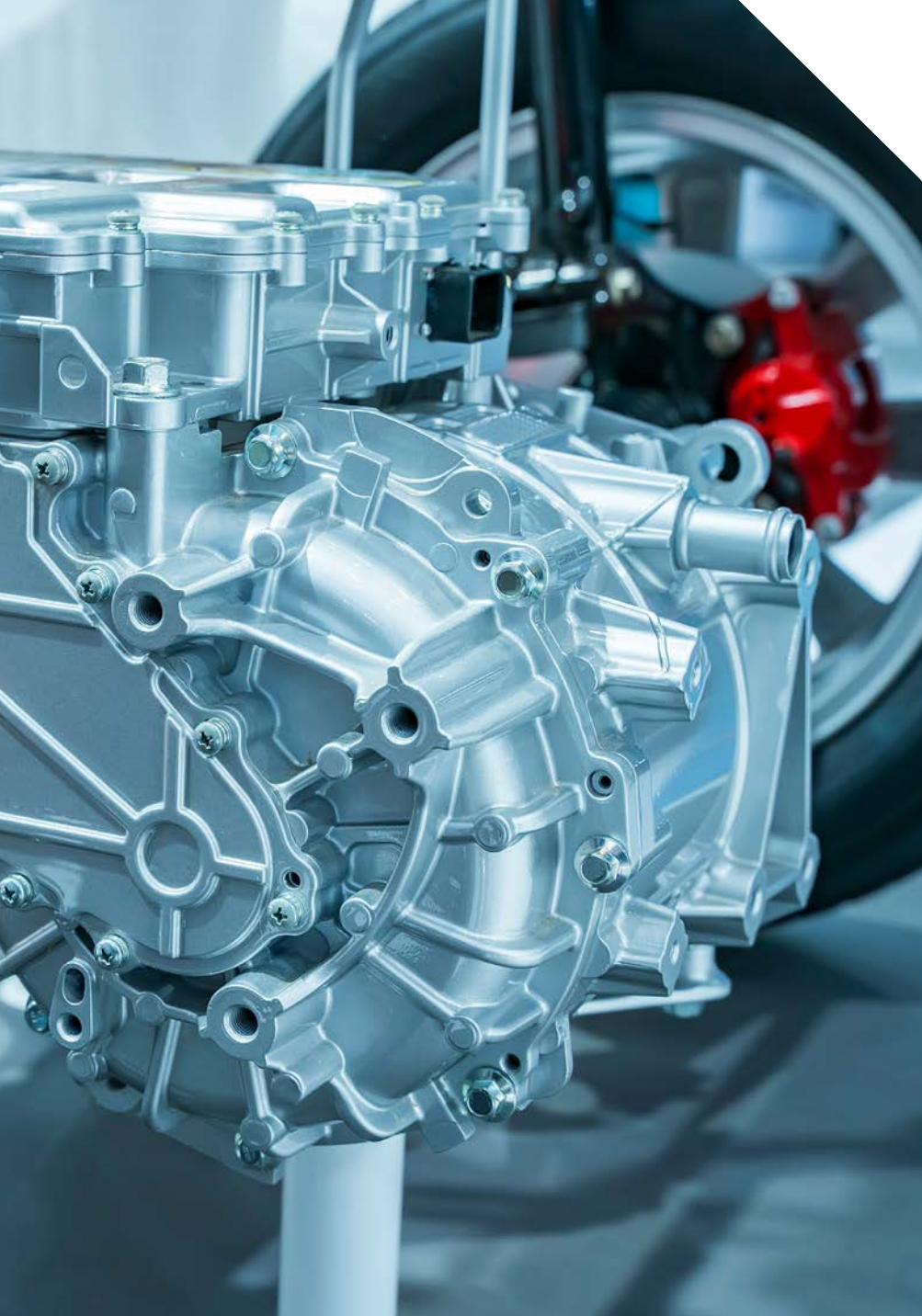
How you use these solutions will depend on the unique needs of your business:



Keys to Success

For your digital solutions and your smart manufacturing strategy to succeed, you need some key things in place:

- **A robust network** that can meet your data and traffic needs both today and in the future as those needs grow.
- **An IoT platform** that can integrate with multiple plant-level applications.
- **A unified data model** that allows data to move freely across different layers of your organization.
- **Comprehensive cybersecurity** that helps protect your people, processes, and intellectual property.



Established automakers: Reimagining production

Faster model refreshes, more variations, and a shift toward the lot size of one demand a new production strategy. One where information flows seamlessly from product and process design to final assembly, and where products don't come to equipment, but rather equipment comes to products.

A modern, integrated MES is essential to implementing this new strategy. It can seamlessly integrate with your PLM system to create a manufacturing bill of process for each order, while also making sure that data can flow across your operations. The MES can also identify the most efficient route for building each vehicle and guide operators through the assembly process.

Analytics can help you optimize production in this new, multi-dimensional production environment. The analytics can help you address issues that you already know exist, like bottlenecks. But they can also help you uncover and resolve problems that weren't previously known. Examples could include high energy usage in certain process points or quality issues associated with specific suppliers' components.

Finally, automakers have been using simulation capabilities for years to optimize plant layouts and machine designs virtually. But with **digital twin** technology, you can do even more to improve efficiencies and quality in your processes.



FOR EXAMPLE, if a technician needs to service a machine, a digital twin can overlay digital repair instructions on top of a physical machine in an augmented reality (AR) environment. This can improve the mean time to repair (MTTR) in your plants. You can also use a digital twin to virtually train operators, allowing them to learn from a broader range of production scenarios than is feasibly possible with physical training.

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Established automakers: Reimagining production

Flexible assets for flexible production

As you digitalize your plants, consider how your critical production assets can support your goal of more integrated and flexible production. A prime example is the servo press.

“Black box” servo presses that have proprietary programming and are challenging to modify can limit your agility. That’s because the producers of these assets lock their application code, meaning you can’t access or change it. Your only option is to program your code on top of the locked code to alter or adjust press performance.

Add-on code takes time and resources, first to develop and then test, validate, and verify. It creates the potential for problems like errors and latencies, which can impact production and lead to longer start-ups.

A servo press that has an open design is flexible and configurable. You can easily tailor it to your specific application, and it allows you to make modifications over time. This open design can give you the production flexibility you want while keeping key press safety functions secure.

OTHER BENEFITS

In addition to helping keep your operations at the forefront of change, a servo press with an open design can:



Enhance safety

Improve productivity while helping protect workers by using integrated safety functions.



Reduce energy usage

Reduce servo press energy costs by 10% to 20% with regenerative active front-end technology.



Improve motor flexibility

Choose motors from any manufacturer to get the speed, torque load, or other characteristics you need.



Electric vehicle makers: Keep up with markets, technology

Whether you're an electric-vehicle startup or an established automaker transitioning to hybrid and electric vehicles, you need the same thing: flexible and scalable operations. They can help you scale production to adjust to consumer demand. And they can help you quickly transform lines and processes to take advantage of technology changes. Digital solutions can help you create flexible, scalable operations in crucial ways.

Scalable analytics software can help you improve your efficiency – like by performing throughput analysis and identifying the cause of micro-stoppages – as you deal with the constant changes in powertrain technologies. Analytics can also help you protect quality by tracking critical points in the product lifecycle – all the way from raw material usage to battery assembly to finished-good performance.

A scalable MES can automate data collection and drive decision-making to manage complexity, especially as your operations grow or evolve.

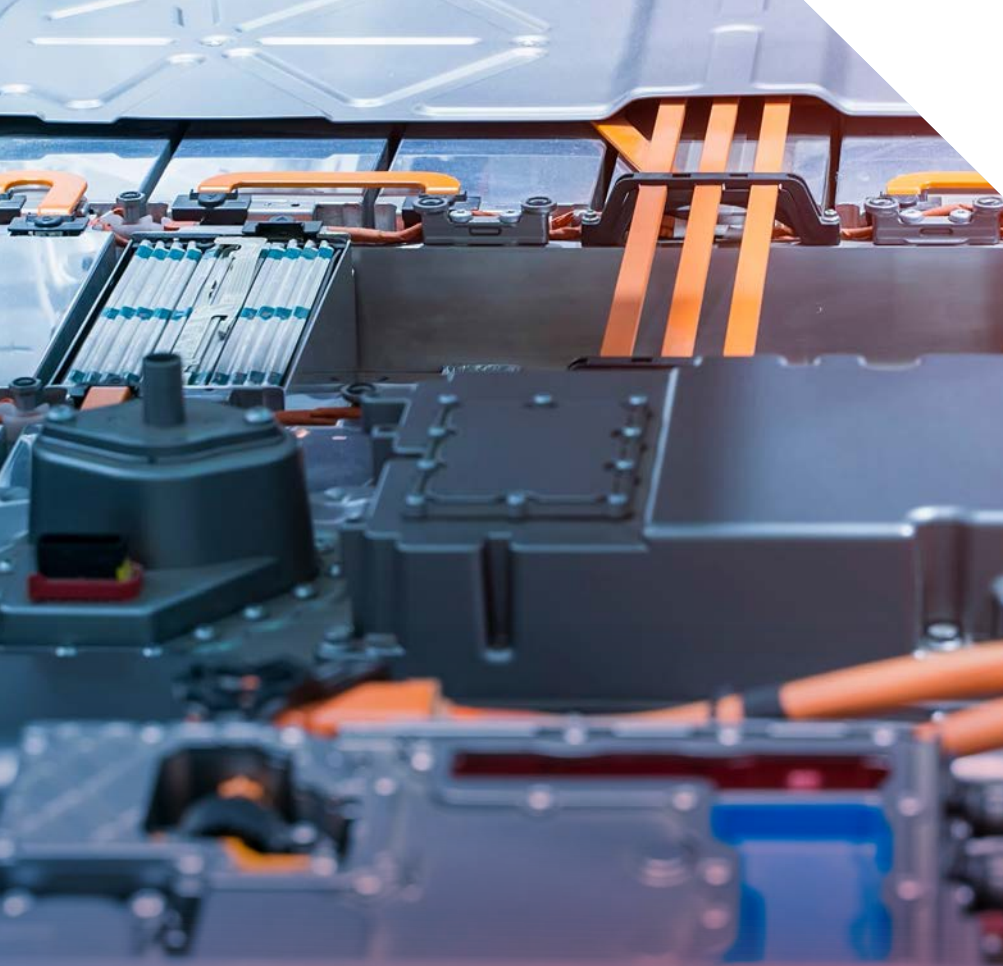
An MES can manage production from order initiation to final assembly to help reduce work in process and make sure that materials are available to keep lines moving. It also allows you to create a digital

genealogy for every vehicle that can be tracked and traced through your plant and the supply chain. This insight can help you identify, investigate, and resolve potential quality and safety issues.

Powertrain technology and production processes will continue to evolve. And with a **digital twin**, you can prototype the design of a powertrain line virtually – and test, debug and verify performance before you build or commission it. Then, you can continually emulate the line to model performance and test new products and configurations.

Want to make a line or machine change during production? In order to reduce risk and validate your decision, simulate the change first using a digital twin.





Speeding up rework

A digital twin can also improve efficiency in battery production. If a bad battery cell is detected, for example, a digital twin can quickly guide an operator through the required rework – from stopping the machine to reviewing safety information and even seeing which cell needs replacing.

Battery producers: Optimize visibility and quality

Delivering the billions of watts of energy that the world's electric vehicles will need in the coming years will require more than production capacity. It will also require a deep understanding of the battery lifecycle – from raw material sources to production processes to battery performance.

Today, many battery producers don't have this complete visibility. Often, they don't even have a full view across their plants because their processes aren't connected, resulting in information silos.

A modern MES and plant-wide network architecture can create a foundation for better process management and end-to-end traceability in your plant. Then, you can use analytics to turn raw production data into valuable information. This visibility can help you address top needs in battery production – like understanding and validating battery chemistry, and identifying opportunities to reduce constraints in processes like battery formation and aging.

In addition to MES, other technologies can also help you achieve flexibility in battery production.



Digital twins of your machines or lines can assist in validating product or process changes to help ensure that implementation goes smoothly.



Motion-control systems with independent cart technology can operate faster and more flexibly than traditional mechanical solutions. For example, they use simple software profiles to change products with the push of a button.

Tire producers: Staying agile

Challenges like global cost pressures, higher SKU counts, and new tire mixes have added new pressures to the tire industry. You need smart, flexible, and low-cost tire operations to stay competitive.

Digital technologies can transform your processes with new insights and better ways to work.

Optimized tire production

Find answers to your top production challenges and learn how you can improve your performance in areas like productivity and quality with analytics software. The software can even predict failures in assets like extruders, mixers, and tire-building machines to help you stay ahead of downtime.

Smarter, faster operations

Keep tire production efficient and focused on quality, even as you manage more complex tire mixes, using modern MES software.

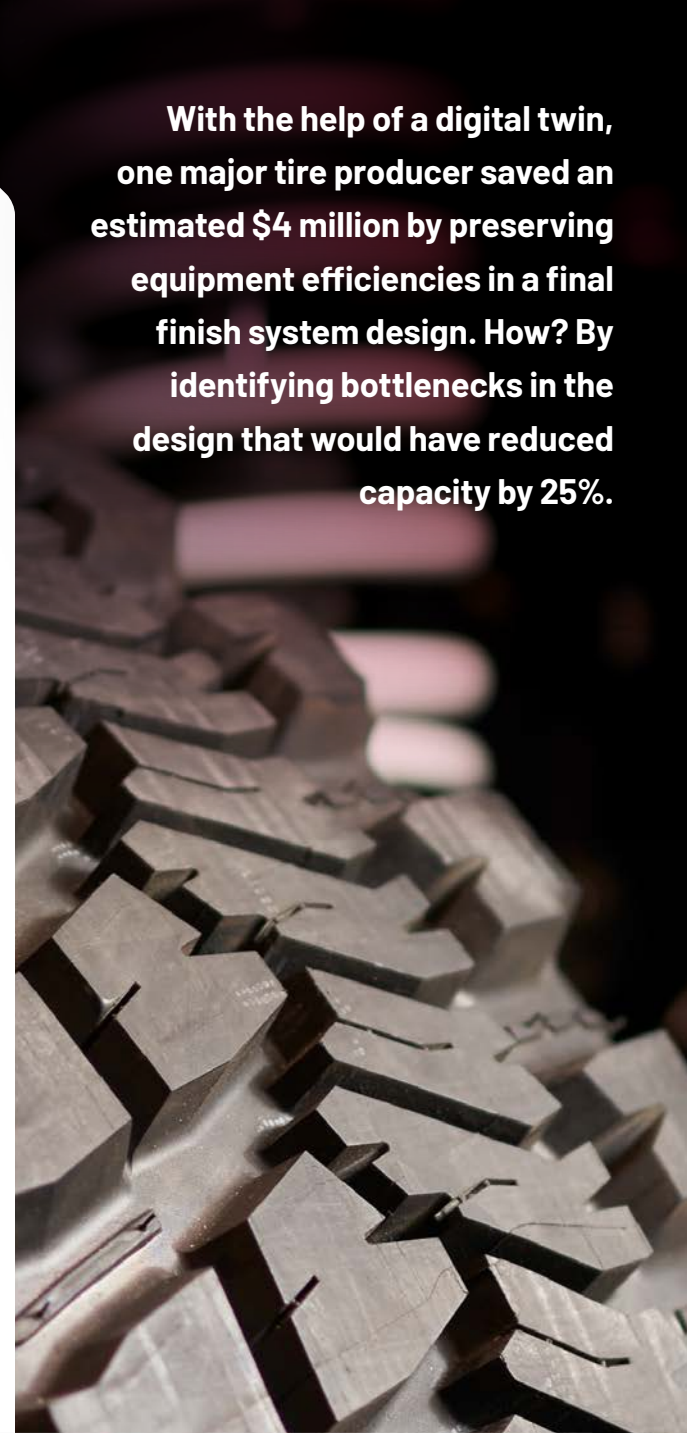
The software can help you control, sequence, monitor, and document tire production faster and more effectively. The software also allows personnel to use real-time insights to make better and faster decisions. And it can guide operators through processes, so even less experienced workers can build tires to spec.

Better way to work

A digital twin is a virtual replica of a physical asset – like a tire, a machine, or an entire plant. And with digital twin software, you can digitalize processes and see your operations in entirely new ways.

- Digitally design machines to prove their performance before they're built.
- Digitally commission machines to reduce unexpected integration issues.
- Use virtual training to improve how workers learn to do their jobs.
- Use guided maintenance to speed up repairs and improve accuracy.

With the help of a digital twin, one major tire producer saved an estimated \$4 million by preserving equipment efficiencies in a final finish system design. How? By identifying bottlenecks in the design that would have reduced capacity by 25%.



Fast time to value

Scalable MES applications are designed for ease of deployment and use.

- Guided and graphical configuration to simplify implementation.
- Drag-and-drop tools allow new workflows to be built, with no coding needed.
- Out-of-the-box integration provides access to production data across systems.

Tire suppliers: Maximize the value of machines and lines

Keeping up with automakers' needs while helping protect tight profit margins is a daily challenge for suppliers of all sizes. With the right digital point solutions, you can solve the production problems that threaten your ability to meet customer needs and your bottom line.

Modular, scalable MES applications allow you to address your top needs in areas like machine performance, quality and track and trace and genealogy – all without investing in a complete integrated MES solution.

With a performance-management MES application, you can more efficiently use plant assets, materials, and labor to boost productivity and reduce costs. And with a quality-management application, you have the ability to minimize plant-floor paperwork and gain better control over process and product quality.

Scalable analytics software can tap into your data to solve specific production challenges in your plants, including at the machine and line level.

The software embeds analytics close to the source of the information and decision-makers. It can also use disruptive technologies to improve how you monitor operations. By using machine learning, for instance, the software can help predict outcomes like quality issues and machine failures.



You can deploy scalable analytics software from the edge to the enterprise. With device-level analytics software, you can answer common production questions like:

- How is my line running?
- Why did a machine failure happen?
- When and where will our next failure occur?

But first...

Automakers and their suppliers are racing toward a future of smart automotive production – where operations are efficient, data-driven, and highly responsive to technology and demand changes.

The right digital solutions can help make this future possible in your plants right now. But first, you need the right strategy. Because digital solutions can deliver the most significant value if they're aligned to your operational needs, can be scaled or replicated across your operations and can be sustained long term.

Learn how Rockwell Automation can help you at every step of your strategy, from design and deployment to continuous improvement, by visiting the technology challenges [web page](#).

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AMERICAS: Rockwell Automation, 1201 South Second Street, Milwaukee, WI 53204-2496 USA, Tel: (1) 414.382.2000, Fax: (1) 414.382.4444

EUROPE/MIDDLE EAST/AFRICA: Rockwell Automation NV, Pegasus Park, De Kleetlaan 12a, 1831 Diegem, Belgium, Tel: (32) 2 663 0600, Fax: (32) 2 663 0640

ASIA PACIFIC: Rockwell Automation, Level 14, Core F, Cyberport 3, 100 Cyberport Road, Hong Kong, Tel: (852) 2887 4788, Fax: (852) 2508 1846

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