

A photograph of a car body on a Siemens Flexlift conveyor system in a factory. The car is white and blue, with its rear end facing the camera. It is mounted on a black, multi-layered conveyor system. The background shows a factory floor with other car bodies and equipment. The Siemens logo is visible in the top left corner.

SIEMENS

DIGITAL INDUSTRIES SOFTWARE

Digital manufacturing for the automotive industry

Using a comprehensive portfolio of integrated solutions
to accelerate innovation and drive quality

Highly disruptive trends in the automobile industry are magnifying the existing challenges across the competitive landscape.

With the emergence of electric vehicles (EVs) and other innovative technologies, more companies have entered the market. We see a dichotomy between incumbent, traditional, large automotive manufacturers and newer, more nimble manufacturers that focus on bringing innovative designs and services to market.

The entire market shares some common challenges, while each of the segments faces their own unique set. The consumer is pushing innovation to a new level across the board. A higher expectation for personalized configurations requires manufacturers to handle greater variability in their manufacturing designs, processes and operations. At the extreme, every car going down the line may have a different set of products on it.

Supply chain disruption is also pushing all manufacturers to rethink their supplier strategies and even their global manufacturing footprint. As manufacturers prepare their build schedules, adapting to material shortages and human resource risk has been challenging.

At the same time, sustainability and quality performance are transparent to the market and amplified by the consumer using social media. As regulations change, particularly with carbon emission restrictions, manufacturers must stay in sync with the requirements. Quality remains king, with exceptional products delighting customers and product defects risking recalls that can make or break companies.

Digital manufacturing implication

Automotive manufacturers in all segments need a digital manufacturing infrastructure that supports product variants at scale. They need to adapt rapidly to raw materials, parts and labor disruptions. Compliance processes must keep pace with regulatory change. Additionally, everything must work together to ensure companies deliver high quality products to the consumer.

Traditional automotive OEMs

Original equipment manufacturers (OEMs) that have been in the industry for decades are facing the challenge of change more than their new entrant rivals. They are retooling to accommodate different technologies – primarily shifting from internal combustion engines to electric engines. These changes are in the midst of an existing plethora of variants from personalized vehicle options.

These manufacturers are carrying a significant overhead burden that smaller, more nimble competitors do not have. While they are trying to accelerate the delivery of innovation, they are doing so on aging systems, sometimes with many siloed applications, that are becoming more brittle as internal support teams turn over and maintenance becomes too expensive and complex.

They need to upgrade or update this infrastructure while lowering costs in a more competitive market, putting pressure on margins.

As new plants are built, these manufacturers need an infrastructure to support production operations that do not necessarily match the existing profiles of current plants. The switch to EVs has been a catalyst for them to relook at their plant infrastructure. They need to get new plants and production lines up and running quickly, anticipating the connection of operational systems with design and simulation systems.

Ultimately, for a large OEM, changing a manufacturing execution system (MES) is a strategic decision, one that will have an impact for many years. They must mitigate risk while operating with the speed the market requires. They cannot support year-long, high-cost implementations anymore, and are looking for a stepwise approach that can deliver rapid value.

New automotive entrants

Electrification spawned many new automotive OEM companies. Startup manufacturers bringing new innovations to market are all about speed and cost. They have the advantage of being small and agile, with the ability to push the reset button when they get something wrong. But they do not have the wealth of experience that established OEMs do.

These companies tend to gain investment based on the innovation of their designs. When it comes to building plants and orchestrating production, they do not have a full view of the digital factory. Some industry leaders have said that manufacturing is thousands of times more complex than design. These companies need established systems and support for automotive processes in operation to take design into production.

Getting manufacturing operations correct is critical. If quality suffers and vehicles are defective or recalled, new companies may not have the backing to survive. While new entrants typically have few variants, with some focused on a single product, their designs may have higher complexity, which adds risk to the production process.

Digital manufacturing implication

Digital manufacturing platforms need to have prescriptive out-of-the-box (OOTB) solutions with wide configuration options that adapt to the manufacturer's process and product complexity. It should incorporate best practices in automotive manufacturing as well as experienced partners that can time, an integrated solution must adapt to new and evolved business processes.

Ultimately, changing MES systems for a large OEM is a strategic decision, one that will have an impact for many years.



Siemens is leading the way in digital manufacturing

Siemens Digital Industries Software has been a long-time leader in manufacturing for all segments of the automotive industry, anticipating the implications of market challenges and innovating a comprehensive digital manufacturing portfolio that creates closed-loop manufacturing. Closed-loop manufacturing is the desired state – a seamless process that takes product and process design, simulates product and process performance in the digital realm and transmits the optimal plan into real manufacturing production.

Quality is enforced throughout manufacturing execution, with performance feedback closing the loop back into design for continuous improvement.

The Siemens Xcelerator platform is an open digital business platform featuring a curated portfolio of internet of things (IoT)-enabled hardware and software, a powerful ecosystem of partners and a marketplace for learning and access.

The platform is built to be modular, which supports rapid deployments that can expand functionality over time. The investment in product lifecycle management (PLM) and manufacturing operations management (MOM) is scalable, leveraging the expertise of decades of best practices and experienced practitioners without requiring an internal information technology (IT) team that does not represent the core competency of the manufacturer. The result is a lower total cost of ownership for the long term.

Multiple disparate legacy systems, typically present in large, established OEMs, can be replaced with a stepwise approach that minimizes disruption. Companies can apply retooling to new plants in a lift and shift approach, expediting expansion at scale. They can manage all plants centrally with a digital manufacturing platform that supports a global production footprint. Siemens PLM/MOM composition allows the development process to run smoothly and to be standardized and repeatable across plants.

Quality management is seamlessly and natively integrated in the Siemens PLM system and can be connected to the Siemens MES system to leverage advanced quality planning and continuous improvement best practices.

Companies can perform quality inspections, rapidly identify eventual problems at the shop floor level and analyze them using proper quality methodologies. With quality, design and production connected, root causes can be identified, corrective and preventive actions (CAPAs) triggered and change requests fed back into engineering by maximizing the value of closed-loop change management.

Using the digital twin of a product and process, Siemens offers simulation capabilities that allow engineers to identify and correct potential problems before consuming physical resources during production. Having fewer surprises on the shop floor means faster, higher-quality production cycles. With the growing complexity of hybrid technologies and increasing product variants, manufacturers can simulate everything from engineering to execution in advance so they can anticipate and solve for various material and logistics flows.

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The Siemens Xcelerator portfolio is built to be modular, which supports rapid deployments that can expand functionality over time.

Siemens also integrates digital planning and scheduling, which creates visibility across inventory and production schedules to optimize resources and time. Using Siemens Xcelerator supply chain and scheduling modules, the “golden sequence” can be achieved, recalculating suboptimal sequences for assembly lines based on defined constraints. With inventory issues plaguing manufacturing in the past few years, this capability is becoming critical.

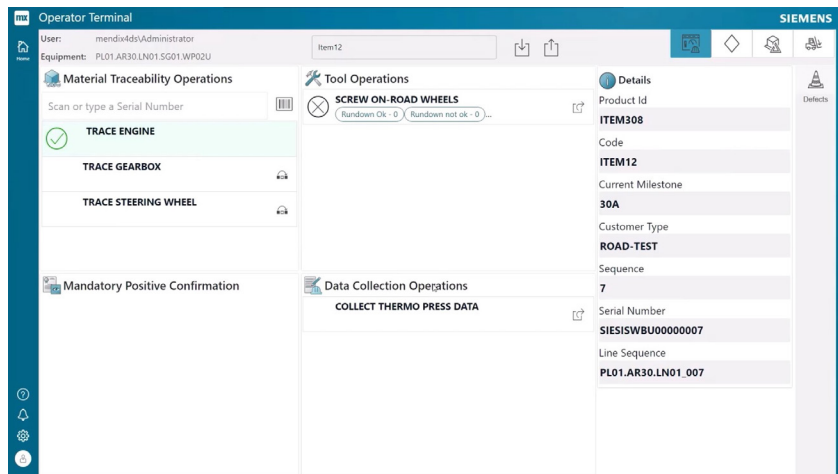
Siemens can help identify, predict and simulate the implications of supply chain disruptions.

Furthermore, OEMs can personalize the Siemens MES to meet specific manufacturing needs. It offers templates for the front-end layer that can be easily adapted in a low-code environment by employees with lower IT skills and greater domain expertise. This way, manufacturers can take ownership of the user interface (UI) personalization and cocreation. These templates can be used OOTB or to further personalize the experience. They are persona-based, industry-specific and process-centric.

Conclusion

Siemens has been a trusted partner for automotive OEMs for decades. Siemens understands the needs of traditional OEMs as they expand their digital manufacturing infrastructure, preparing them for new innovation and complexity in a more stringent regulatory environment. For new entrants, Siemens is the needed partner to extend operational expertise rapidly to translate innovative design into quality production.

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