POINT OF VIEW

5 ways to help automotive manufacturers maximize MES investments

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Key insights

COVID-19 is exacerbating the already tremendous pressure on automotive manufacturers to make operations as lean as possible. Manufacturing Execution Systems (MES) investments can be a source for crucial operational savings and efficiencies.

- In tandem with Industry 4.0 principles, MES implementations enable lean manufacturing grounded in deep intelligence and visibility across global production operations.
- Five key ways to extract greater value include line balancing, sequencing and scheduling, optimizing inventory, improving quality and simulating new product and change management models.
- MES can be a powerful driver toward agile, data-driven manufacturing supported by Internet of Things (IoT), machine learning and other transformational technologies.

Automotive manufacturing facilities are highly unique, and their wide-ranging responses to COVID-19 have been predictably varied. Some facilities needed to abruptly reduce or increase output, while others like Ford Motor Company pivoted to health care equipment. Despite the differences, manufacturers uniformly agree on one thing: they urgently need to make their operations as lean as possible.

While COVID-19 is responsible for a large part of the urgency, reducing the overall cost of manufacturing is not a new ambition. To support this goal, many manufacturers had already implemented some form of Manufacturing Execution Systems (MES), either legacy or commercial-off-the-shelf (COTS) solutions. MES solutions act as a control system to execute, monitor and report operations – from generating station tasks lists to validating parts and capturing product build, defects and operational quality parameters, such as torque on fasteners. In tandem with Industry 4.0 principles,

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But because MES solutions have traditionally focused on the execution of tasks and operations, only a few manufacturers are fully leveraging their MES investments. With renewed pressure to produce more with less, MES data has the potential to deliver crucial operational savings and efficiencies.

Extracting greater value from your MES

Here are the top 5 ways automotive manufacturers can extract greater value from MES implementations:

- **Line balancing:** MES commonly provide step times and operation times for each part or assembly variant produced. When analyzed, this historical data can provide vital information regarding line balancing and bottlenecks. Historical data – including machine availability and operation times – can create a digital twin of the factory setup and enable simulations to determine the optimal product variety mix. This capability is critical for manufacturing organizations as they move toward mass-personalization and by extension, increase the variety of their products. For example, line balancing analysis for an auto OEM demonstrated a potential reduction in takt time by 15%.[1]
- **Sequencing and scheduling:** While most organizations use some form of tacit knowledge for scheduling and sequencing, this may not be the ideal approach. In addition, high product proliferation and mass personalization can make scheduling and sequencing very complex. The typical build chain is a mix of different manufacturing models, such as batch, single piece flow and so on. For example, in auto OEM, trim and final assembly is single piece flow, while paint shop and body-in-white (BIW) are considered batch operations. MES data analysis can optimize scheduling and sequencing through simulation models that balance the conflicting objectives between batch and single piece flow with demand. The final assembly is tuned to the real demand, while paint and other batch processes are optimized to the final assembly schedule and sequence, which enables true demand-based planning.
- **Optimizing inventory:** As personalization and product variation increase, there is typically higher inventory for raw material parts and bought-out materials. Based on the

[1] Based on TCS internal model estimates; actual results may vary.

historical consumption data of parts and sub-assemblies, MES can implement pull-based, demand-driven inventory management by providing inputs for actual daily average consumption, and the availability of parts and sub-assemblies at the point of fit. Fed into upstream planning and simulation tools, this information can help fine-tune lead times, calculate lead-time, demand variations to maintain optimal inventories and ensure the smooth flow of parts and sub-assemblies.

- **Improving quality** MES can capture defects in parts and packaging, as parts directly come to the point of fit from certified suppliers. In addition, MES can capture process defects, such as improper torque, wrong part fitment and test pass/fail during manufacturing assembly processes. Understanding the underlying patterns and fixing these core issues can significantly improve First Time Through (FTT). MES can also provide the means to drive No Fault Forward (NFF) further. When integrated with camera systems, MES can provide information and images to manufacturing cloud technologies for suppliers to access in near real-time. This information can help eliminate disputes that happen as a result of incomplete or late information exchanges and help reduce the dependency on human judgment. For example, manufacturers can implement a native mobile app that can take pictures, read bar codes and provide the information packet with images, part and lot numbers, defect type, date and time of production in near real time.
- **Simulating new product and change management models:** Introducing new products on existing production setups can be a tedious, time-consuming process. In addition, multiple engineering change scenarios frequently occur, including model year, single and coordinated multi-part changes, and changes to software. A model year change alone can consist of 200 to 400 parts changes for an automotive OEM. And after years of implementations, many IT environments can be disjointed, which can lead to a more manual process of establishing MES to process new parts and operations. As a result, the bill of process (BOP) designed for it has the potential to disrupt existing line balancing and inventory levels may need to be re-tuned to accommodate new changes. Simulation models that predict the time taken for vehicle build at a detailed task level can optimize line balancing and determine material inventory forecasts to help ease engineering change implementations.

MES and the Journey to the Future

In a time when manufacturers are incurring significant disruptions, MES holds valuable insights that can drive efficiencies as organizations restore operations. The ability to connect MES across global plants with standardized key performance indicators (KPIs) can help scale operational improvements. Historical data from MES can provide insights into plant performance for future production build, the optimal product mix, inventories and the smoothest path to launch new products. And as Industry 4.0 principles become ever more entrenched, MES can be a powerful driver toward agile, data-driven manufacturing supported by Internet of Things (IoT), machine learning and other transformational technologies. The ability to extract greater value from existing MES investments offers a vital competitive advantage, both now and in a reimagined future.

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