

Manufacturing Velocity

Positioning Your Auto Manufacturing Operations
to Keep Pace With Market Demands



Infrastructure • Information Visibility • Workforce Productivity

LISTEN.
THINK.
SOLVE.

Manufacturing Velocity

Positioning Your Auto Manufacturing Operations
to Keep Pace With Market Demands



Infrastructure • Information Visibility • Workforce Productivity

This paper addresses the changing automotive landscape and why automakers need to gain speed in their operations to remain competitive.

Executive Summary

There's no slowing down in the automotive industry. A customer base with a range of differing priorities for new-vehicle purchases – including safety, fuel efficiency, performance, design and options – means you're producing more vehicles in more variations than ever while also undergoing more frequent design refreshes. This is in addition to meeting the latest fuel-efficiency regulations, serving emerging global markets and tightening profit margins.

Correspondingly, most manufacturers have transitioned from traditional one-vehicle, one-plant production models to now producing multiple vehicles – in multiple variations – at a single location. Delivering this flexible manufacturing capability while reducing downtime and maximizing output is a critical challenge. But manufacturers can meet this challenge and increase production by improving their manufacturing velocity.

Manufacturing velocity strategies incorporate three key components: infrastructure, information visibility and workforce productivity. By addressing manufacturing velocity, you can respond to customer demands around the world more quickly and get to market faster without hurting the bottom line. This white paper will articulate how you can speed manufacturing velocity to better respond to current and future global challenges.

Introduction

Automotive manufacturing has come a long way in the 90 years since Henry Ford launched his moving assembly line to cut the production time of the Model T from 12 hours to six. Your goal, however, essentially remains the same today: operate more efficiently and get products to market faster. Only today, vehicle variety is infinitely greater and constantly evolving, and your "market" not only reaches across several states, but several continents.

In talking to WardsAuto, Chrysler Chairman and CEO Sergio Marchionne summed up his company's flexible-manufacturing ambitions: "Where we'd like to be is to have groups of plants that can produce multiple vehicles that are designed with the same architecture, but can serve multiple platforms."

LISTEN.
THINK.
SOLVE.™

 Allen-Bradley • Rockwell Software

Rockwell
Automation

Challenges

Having emerged from a global recession that saw some of the world's largest automakers nearly collapse due to withering sales, the auto industry is by and large back in the black. According to IHS Automotive, more than 80 million light vehicles were produced across the globe in 2012. That marked the first time production ever exceeded 80 million.

While the fortunes of automakers have greatly improved, the road forward will still have its bumps. Some of the greatest challenges include:

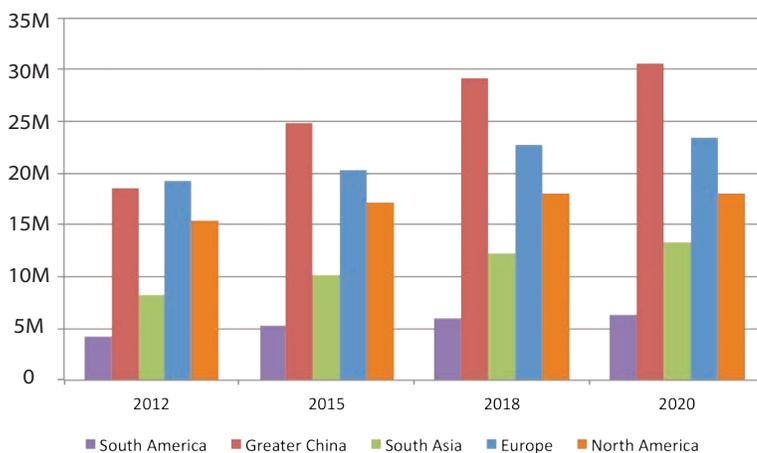
- Continued pressure to remain profitable
- Meeting increasingly stringent fuel-efficiency requirements
- Expanding operations into new markets
- Delivering products that satisfy a consumer base with an ever-increasing range of demands

Profitability: The world's largest auto manufacturers annually produce anywhere from about 3 million to more than 10 million cars across their global operations. Such a high level of output means hundreds of vehicles are driving off production lines around the globe every minute. Combine this with the fixed profits attached to every vehicle and that puts a tremendous amount of pressure on plant managers to ensure downtime is kept to a minimum and productivity remains high.

Improved Fuel Economy: High fuel prices and ever-increasing fuel-efficiency standards are forcing automakers to deliver better-performing vehicles, hybrid and electric alternatives, and diesel-based vehicles. Additionally, as gas prices fluctuate, so does consumer demand. Your operations must be flexible enough to quickly react to these fluid changes in demand.

Consumer Demand: Demand goes deeper than the price of fuel. As cars become more advanced, better connected and in general "smarter," consumers want the latest features and styles. Vehicle models that once endured years with minimal changes now undergo regular refreshes. The term "early adopter" doesn't only apply to those who want the latest smart phones or high-definition TVs – it's just as applicable to the consumers who also want the most-current vehicle models with the latest technologies.

Global Production Summary*
Light Vehicles (2012-2020)



*IHS Automotive – August 2013 (www.ihs.com/automotive)

New Markets: The significance of the global market can be seen in the industry's shifting production numbers, particularly in emerging markets. According to projections from IHS Automotive for 2012 to 2020, light-vehicle production will:

- Increase about 50 percent in South America
- Significantly increase in China, from about 18 million vehicles in 2012 to more than 30 million in 2020, and jump from about 8 million to more than 13 million in South Asia
- Increase 10 to 20 percent in North America and Europe, with most growth coming from Eastern Europe

The upward shifts in new markets are thanks in large part to emerging middle classes that want the same safe, technologically advanced and fuel-efficient cars that consumers in first-world countries are driving.

Life in the Fast Lane

Feeling the pressure to launch faster, refresh more often and change options on a much more regular basis, you're tasked with being able to get the speed you need to ensure all those changes can happen regularly and with ease. However, vehicle design changes can't simply be "thrown over the wall," from the design center to the manufacturing floor.

Vehicle refreshes, whether midyear or every other year, have impacts on the people, processes and machinery in your operations. Vehicle design changes – whether an added small crease in the back of a car, new taillights or a new phone dock – can be relatively small with minimal impacts on your overall equipment. But they can require tooling changes, supplier revisions, station changes and more.

You must find ways to sequence all of these things into your plants while negating or minimizing the complexity that's driven into your operations.

That means initiating manufacturing velocity strategies and solutions that enable you to deliver the right products, at the right time and with the right quality.

Manufacturing velocity encompasses three main components:

- Having the right infrastructure in place
- Producing information in the right form factor, for the right people and at the right time
- Employing a highly skilled, multi-talented workforce

“As the automotive industry’s reawakening continues, less-expensive high-payload robots are gaining traction over more conventional fixed tooling among automakers focused on cutting costs while improving manufacturing productivity and processes.”

– Manufacturing Engineering, September 2012

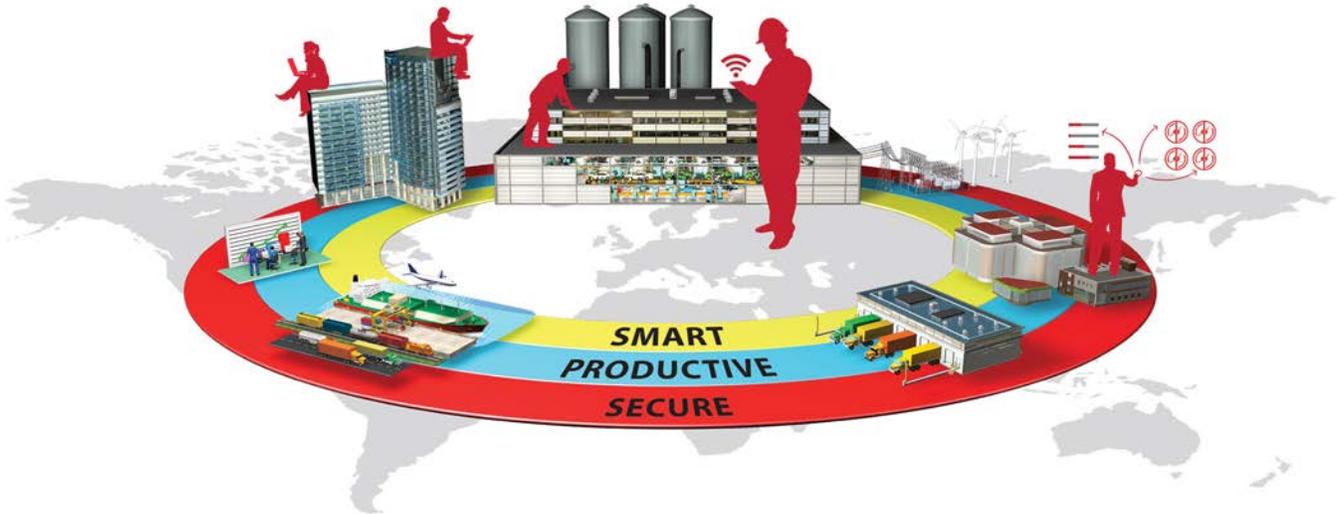
Infrastructure

Plants dedicated to manufacturing single vehicles are a thing of the past. Today's auto-manufacturing plants must be flexible, capable of producing multiple vehicles in multiple variations, all on a single line.

With the increase in flexible manufacturing comes more parts, more variation and programs, and more interfaces to robots and other devices. Additionally, you must be able to maintain continual operations without reprogramming all of your equipment or reconfiguring your entire control architecture to ensure output and productivity remain high.

An enterprise-wide infrastructure is needed to support these flexible manufacturing needs. That includes integrating flexible equipment and tooling that can quickly and easily adjust for different vehicle variations and sizes on the same production line. Equally as important are the business systems that provide a real-time window into your manufacturing operations and supply chain to keep all parties informed with visibility into the constantly changing production stream.

To support the flow of all of this critical information, achieving a truly connected enterprise that can get data securely to and from machines and people – at every level, in any location and in the right context – is vital. Using a unified control and networking infrastructure that is IP-centric can help ensure all devices within an automotive plant can talk with one another, increasing the amount of available information and thus creating more room for agility and innovation.



To support the flow of critical information, achieving a truly connected enterprise that can get data securely to and from machines and people – at every level, in any location and in the right context – is vital.

An information-enabled control and information system that utilizes EtherNet/IP can help you more easily move toward the use of a single network, streamline multiple disciplines and applications into a single package, and help enable secure and easy flow of production data. EtherNet/IP allows you to leverage the availability of hundreds of IP-based devices – including those that weren't originally designed for an industrial setting – to help increase productivity, quality, efficiency and safety on the plant floor.

On top of this, a manufacturing execution system (MES) should be integrated into your enterprise and plant-floor operations to help you synchronize your manufacturing tasks, quality procedures and inventory movements throughout production. An MES also enables you to capture vehicle-production information for regulatory compliance, warranties and continuous-improvement analysis.

Incorporating more information into the manufacturing process also enables customer feedback to reach the production line faster. Whereas it once took months for enough feedback to make its way back to manufacturers, it can now be done in days. Today's vehicles are smart enough that they can be plugged in for a diagnostic check, and any issues can be immediately reported back to the plant. That puts the onus on the plant to have a connected enterprise in place that's robust enough to route the information to the necessary workers so they can quickly address quality issues on the line.

Information Visibility

A survey conducted by TechValidate and Rockwell Automation® of auto manufacturing executives from around the world found that nearly two-thirds of respondents said they were "very confident" that their organization was accurately interpreting the production data generated by their current systems. That's an encouraging statistic, because to operate efficiently, you need to understand what's happening in your manufacturing operations and across your supply chain.

It is critical that the information is in the right form and for the right people, and shared across plants and global business systems for better decision making and competitive advantage.

Having real-time information visibility can help you:

- Understand what's happening across your enterprise (production work flows, OEE, supplier deliveries, production times, parts inventories, etc.)
- Predict downtime events before they happen and intervene as needed
- Distribute event data or other information to the appropriate personnel so they can make any necessary adjustments

It is critical that the information is in the right form and for the right people, and shared across plants and global business systems for better decision making and competitive advantage.

Anything from a quality issue on the production line to a supply shipment being stalled hundreds of miles away can have wide-ranging, chain-reaction effects on your operations.

Understanding the impact disruptions can have and then relaying the relevant information across the enterprise to the right people can mean the difference between stalled and on-time production. This could include notifying a maintenance technician with relevant tooling information or informing scheduling personnel about supply-rerouting options. It could even include notifying outside parties such as suppliers so they can then make adjustments in their operations to ensure your inventories don't deplete.

Production information can also be compiled and compared, whether it's within a single plant or across an enterprise. The use of comparative data has the potential to identify efficiencies, trends and best practices across your operations. For example, why does it take 10 percent longer to produce the same platform in one plant vs. another? Or why is quality varying between production runs? The answer exists – it simply needs to be mined from your operations.

“The nature of production work is becoming more and more complex as the product – and the technology used to build it – become more and more advanced.”

– Center for Automotive Research

Workforce Productivity

“The nature of production work is becoming more and more complex as the product — and the technology used to build it — become more and more advanced,” according to the Center for Automotive Research report “The Big Leave: The Future of U.S. Automotive Human Resources.” “This production complexity necessitates employing workers who may not have higher levels of formal academic preparation beyond high school or a GED, but nevertheless can demonstrate higher literacy and numeracy levels and more advanced communication and team skills than were previously required of automotive manufacturing workers.”

Because their responsibilities are greater and their expertise more diverse, auto workers today more than ever need to receive cross training to build their understanding and expertise across multiple areas. For example, maintenance technicians need to receive comprehensive training for the increasingly complicated machines found on the plant floor and the plethora of devices that are being connected to them. These connected technologies continue to become more advanced, and the roles are beginning to blur between what the IT department and the maintenance technicians will each be responsible for managing.

As technologies allow plant managers to view comparative data across plants, that data needs to be incorporated into training programs. Operational improvements, after all, are only as good as the people who implement them.

Additionally, as automakers launch operations in emerging markets, they're striving to replicate the successful operations they've built in their established markets. That means employing highly skilled employees in countries that may lack the experienced workforce that they're accustomed to drawing from. Delivering comprehensive training to these employees is critical.

Beyond training, productivity can be optimized in a number of other ways. One key area is asset management, where a four-step approach can help get more out of facility assets while also minimizing downtime:

- Evaluate – assessing existing processes for inventory management and maintenance needs
- Design – identifying process efficiencies, as well as areas where inventory and production issues can be improved
- Implement – putting into place processes that will improve productivity, reduce costs and enable financial predictability
- Measure & Optimize – using analytics and reporting tools to drive continuous improvement

Obsolescence is another issue that can result in downtime and lost productivity. Automakers should ensure they are proactive in their life-cycle management. This includes pinpointing any obsolescence risks and planning ahead to ensure they have access to parts, particularly for those that may be hard to find.

The Auto Manufacturer of Tomorrow

Increased globalization and better-connected operations will likely push vehicle refreshes to occur at an even faster speed than what's taking place today. At the same time, production volumes are only going to increase.

These factors will put continued pressure on the auto industry to be ever more versatile in its operations. They could also push the need for flexibility from the manufacturing level down to the supplier level.

Additionally, continued pressure to improve fuel economy in vehicles is likely to lead to significant design changes. The use of composite materials, for example, could be used more in place of aluminum. That will have a major change on production operations – such as replacing welding with fasteners, rivets and screws – and will also drive plant operators to rethink their facility layouts and production processes.

For the auto manufacturers that aren't putting in place strategies and solutions that can speed their manufacturing velocity today, these future challenges will prove all the more difficult to overcome tomorrow.

Resources

Call a Rockwell Automation sales office or an authorized distributor today to discuss solutions for your auto manufacturing operations. Or visit:

<http://www.rockwellautomation.com/industries/automotive/>

Allen-Bradley, LISTEN. THINK. SOLVE. and Rockwell Software are trademarks of Rockwell Automation, Inc. Trademarks not belonging to Rockwell Automation are property of their respective companies.

www.rockwellautomation.com

Power, Control and Information Solutions Headquarters

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