

Manufacturing Optimization

Unlocking Greater Productivity and New Efficiencies in Today's Rapid-Pace Automotive Plants



Workforce • Processes • Equipment • Safety

LISTEN.
THINK.
SOLVE.

This paper addresses the everyday pressures and challenges facing modern auto manufacturing plants, and outlines four key areas where manufacturers can improve productivity and reduce downtime.

Introduction

Global auto sales are expected to exceed 85 million in 2014, according to IHS Automotive. If so, this will be the fifth straight year of record sales – a clearer sign than ever that the global recession is now behind the auto industry.

“Since [2010], emerging growth markets have extended their lead in the global sales race for light-vehicles (cars, SUVs, vans, and light trucks under six tons gross vehicle weight), with 52% of the worldwide market in 2011, 54% in 2012, and 55% (estimated) in 2013. And we expect this trend to continue, given these markets’ economic momentum and their sheer numbers of potential buyers.”

Credit Week: The Global Auto Industry Shifts Its Focus To Overseas and Emerging Markets

Helping bolster sales in the mature markets have been the availability of more vehicle models and options than ever before. Meanwhile, emerging markets are driving unprecedented growth in the industry. According to the Credit Week report “The Global Auto Industry Shifts Its Focus To Overseas and Emerging Markets,” emerging markets accounted for just more than half of the global light-vehicle sales in 2010, which was a first in the industry’s history.

The auto industry’s turnaround has improved the business of auto manufacturers around the world. At the same time, this sales boom is putting renewed pressure on auto manufacturing plants to produce more vehicles in more variations, with downtime and disruptions kept to an absolute minimum.

Challenges

In the high velocity world of auto manufacturing, seconds matter. Finding efficiencies that help you take even seconds off a manufacturing process can ultimately lead to an additional one or two more vehicles being produced each day. With high production quotas and critical profits attached to each vehicle, this seemingly small improvement in daily numbers can add up in the long run to generate significant additional annual revenue.

But managers seeking to optimize their operations and equipment are feeling the pressure, with more challenges than ever on the plant floor. Production has been consolidated to the point where most auto plants now produce several vehicle makes and models. In addition, vehicle refreshes are happening much more frequently to meet continually changing customer demands.

This is all driving greater complexity into the plant and is requiring more frequent changeovers. Production must be unyielding, and plant managers are tasked with getting more out of their plants than ever before.

By focusing on four key areas for optimization on the plant floor, you can address these challenges and drive continual improvements in productivity and uptime.



1. Workforce

Whether you're launching a new plant or adding a new vehicle on an existing line, don't overlook worker preparedness. Auto makers too often focus on the mechanical, electrical and control issues involved in a vehicle launch, which means that worker-induced downtime issues are frequently left unchecked.



With this in mind, worker preparedness should be addressed well before your launch. Ensure workers are empowered with all the knowledge sets they'll need regarding the machines, tools, procedures and processes that they'll be using. For a new facility launch, set baseline skills goals for workers. For a new vehicle launch on an existing line, conduct an assessment to see where skills stand today and then implement a training program that works toward your goal.



Your workforce also should be equipped with the latest technologies that can help maximize their productivity. When downtime events occur, for example, plants notify workers through some form of alarm system. In most cases, lights flash and bells ring. Maintenance workers are sometimes paged, or screens may display messages.

But what's the quality of the information that you're relaying to workers? Do they immediately know what they need to do? Or are they being left to figure it out on their own?



Delivering detailed diagnostic information that is role- and location-based to the right people can significantly help reduce your mean time to repair. Instead of taking the time to drive to the machine, diagnose the problem and determine if the right spare parts are in stock, all of this information can be immediately delivered to workers when an event occurs so they can take faster corrective action.

Such information is becoming easier to communicate as display boards in the plant become more advanced, with high-definition graphics and touch-screen capabilities. The information can also be directly sent to workers' tablets or smart phones using mobile technology. An electrician, for example, may receive the following information in a downtime event:

- The machine location
- The specific error(s)
- What tools/parts are needed
- Where those tools/parts are located

Ready to Launch

Rockwell Automation helped a major Chinese auto supplier launch its greenfield facility with advanced new control architectures.

The goal was to ensure 100 percent of the plant's maintenance workers and engineers had a baseline competency in the new technology while 30 percent had mastery of the technology, prior to the facility's production launch.

Using embedded instructors, a proprietary learning management system and training workstations, among other solutions, plant workers experienced an improvement in measurable skills three times greater than expected.

You should also have tools in place that allow you to manage for part and software obsolescence. For instance, if a line goes down and you need a spare part, do you know that the spare part in your crib is still the right one for the machine? Or if you plug in an I/O module, do you know it will work because the software has been revised and is therefore compatible with the system? Proactively managing for this upfront will help prevent it from becoming an issue during a downtime event.

On-site support services can help with start-ups, line commissioning, preventative maintenance and more. In many cases, support technicians and service providers no longer even need to be on-site 24/7. Just as an organization's IT staff can monitor systems across multiple sites from a central location, support service providers can remotely monitor your plants' systems and machines around the clock from an off-site location safely and securely. Remote support personnel can:

- Notify you when parts or components are reaching the end of their life cycle to stay ahead of downtime events
- Direct your local resources to an alarmed event
- Remotely connect to a machine to take corrective action themselves



2. Processes

The very nature of modern auto manufacturing is driving a tremendous amount of complexity into your processes. It begins on the plant floor, where a flexible, demand-driven manufacturing model means your production schedule varies not only day by day but minute by minute. On the business side, you're striving to gather data from dozens – if not hundreds – of systems, while also interpreting, sharing and reporting it across multiple levels.

You have the daunting challenge of trying to unify these disparate processes and data to build a more cohesive and efficient operation.

On the plant floor, one solution is to incorporate model predictive control (MPC)

technology. This technology can compare current and predicted operational data against desired results to provide new control targets, which helps reduce process variability and inefficiencies while also improving consistency and part quality.

A paint shop serves as a good example. Some plants keep paint shops continuously running – even between shifts and over the weekend – to ensure the ovens are always the right temperature. MPC technology can link your paint schedule to your machines' operations, giving you greater energy savings. The technology can also control the paint process to ensure a consistently high-quality finish on your vehicles.

Similarly, workers can spend inordinate amounts of time gathering, assessing and presenting data from their business systems. There are also problems of inconsistent data between teams and an over reliance on a manual handling of the data, which can lead to human errors, such as the wrong parts being ordered.

Automating these systems as part of a manufacturing intelligence strategy can help you automate reporting and provide you with production data, KPIs and other critical analytics in easy-to-understand dashboards.

A scalable and flexible manufacturing execution system (MES) that integrates plant-floor production and ERP systems, allows you to share production data to optimize manufacturing processes across multiple plants.

This data can also be shared through a scalable and flexible manufacturing execution system (MES), so you can integrate your plant-floor production systems with your enterprise resource planning system to optimize manufacturing across multiple facilities. 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.

This greater enterprise-wide visibility can deliver information-based decision making to help:

- Manage the scheduling and workload balance on flexible manufacturing lines
- More quickly respond to supplier disruptions or changes in customer demands
- Seamlessly incorporate changes in your manufacturing operations based on quality feedback

3. Equipment

Equipment is one of your largest capital investments and opportunities for continuous improvements throughout the manufacturing operations lifecycle. During the design phase, consider how your equipment will support flexible manufacturing. And when in full production, identify opportunities for improvements.

There are several low risk improvements you can make over the lifecycle of your equipment to be more efficient and help speed overall operations. Equipment improvements can be as simple as component migration to take advantage of features and functions at the right level of the architecture to deliver better performance. You can also apply a systematic, staged migration approach, allowing you to upgrade equipment over time thereby reducing your upfront investment and ultimately achieving a better ROI.

It is also important that you are proactive in managing product obsolescence that could result in downtime and lost productivity. This includes pinpointing any obsolescence risks and planning ahead to ensure you have access to parts, particularly for those that may be hard to find.

Embedded diagnostics can help reduce unexpected machine downtime and lower your mean time to repair. Today's machines often provide little detail as to what's wrong or what specifically needs to be repaired. Advanced diagnostics technology is changing that, so workers can diagnose problems more quickly and know exactly what to repair. Ideally, this technology is used for predictive diagnostics to help identify a potential problem before it becomes a downtime event. This would allow maintenance personnel to rectify issues during planned maintenance downtime.

Increased machine data and advanced diagnostics empowers your personnel with greater visibility into plant-floor equipment, helping to ensure they have accurate and timely data on current machine performance. This allows them to make more informed decisions on asset utilization and can help identify production barriers to improve OEE.



4. Safety

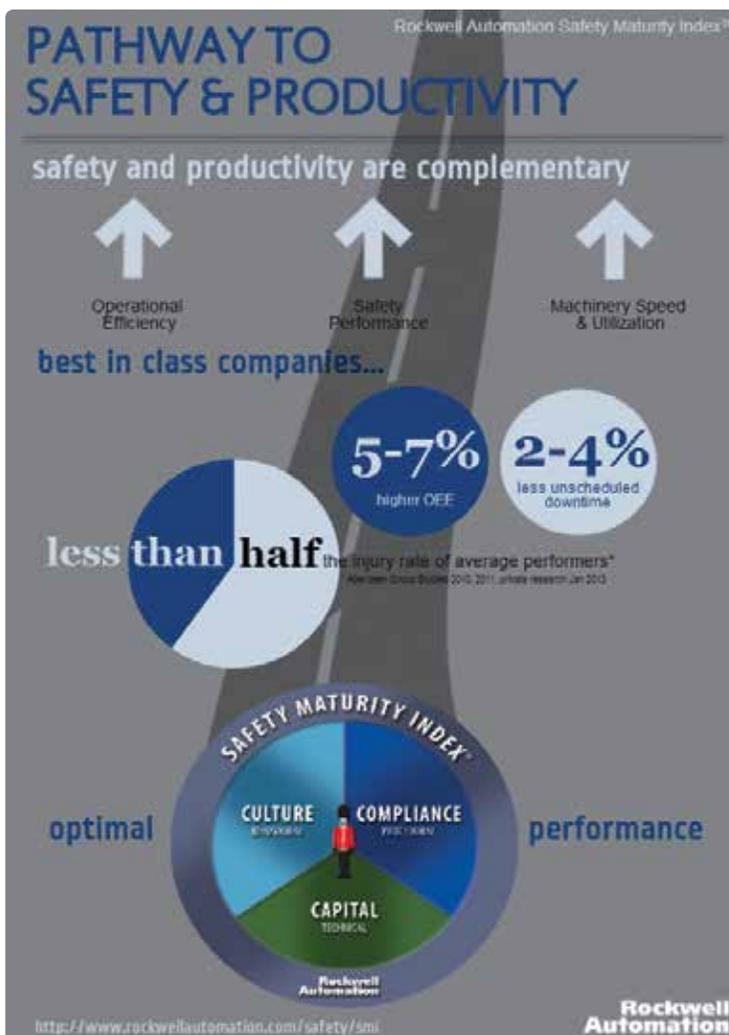
Safety is intrinsic to your workforce, processes and equipment. It shouldn't, however, be viewed as a single, separate element within each of these different components. Instead, safety should be viewed holistically, across your operations.

Most plant operators associate safety with downtime. But recent research says otherwise. Best-in-class manufacturers (defined as the top 20 percent of aggregate performance scorers) have been able to achieve higher OEE, less unscheduled downtime and significantly lower injury rates than average performers using a common set of best practices that fall into three categories:

- Culture (behavioral)
- Compliance (procedural)
- Capital (technical)

From a capital standpoint, too many auto plants today are forced to shut down their machines for safety reasons when they have a problem on the line. But new technologies allow you to keep a machine running at a designated safe speed even when the safety door is open. Similarly, manufacturers increasingly are using integrated safety controllers, which allow safety and control systems to work in concert with each other, to improve machine diagnostics and help reduce downtime.

To help manufacturers understand their current safety programs and how they can be optimized, Rockwell Automation created the Safety Maturity Index (SMI) assessment tool. For more information or to take the self-guided online SMI assessment, visit: <http://www.rockwellautomation.com/go/smiwp>



The Unyielding Journey Ahead

Automotive plants will continue to face greater pressures from both external and internal sources. Increased government regulations and changing consumer demands will drive greater complexity into vehicles and the manufacturing process. Yet even amid these pressures, you will continue to be expected to minimize production costs and maintain profitability with a more efficient operation.

The key to managing these challenges is a devotion to continuous improvement – in your people, processes and equipment – while ensuring safety is addressed across the entirety of your operations to protect your people, your equipment and your uptime.

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/>

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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