Driving Productivity With Machine Vision

How single-software industrial scanning and machine vision technologies are poised to change the game for automotive manufacturing and assembly.
When it comes to automotive manufacturing, it’s all about quality — from tracing parts and assemblies as they move through the supply chain, to verifying part quality until the vehicle reaches the consumer. However, in an industry where manufacturers face mounting pressures to reduce their costs, comply with safety regulations and deliver more custom vehicles, managing process quality is easier said than done.

Fortunately, fixed industrial scanners and machine vision cameras can help automotive manufacturers address these various challenges. Without affecting throughput, these tools streamline manufacturing workflows, save valuable time and costs, and help manufacturers better meet consumer and legislative demands. In addition, these tools:

- Are scalable in a way that supports quality processes.
- Document the quality control process by archiving images for later use.
- Meet the demand for more barcode scanning throughout the industry.
- Support complex, highly detailed visual inspections — e.g., looking at the gasket materials that are automatically being laid into a component.
- Track and trace components and assemblies throughout the supply chain, enabling manufacturers to add value wherever possible.

These scanners and cameras, coupled with simple, user-friendly single-software technologies, are changing the game for automotive manufacturers, capturing key manufacturing data and improving analytics with minimal time, cost and effort.

**Under Pressure**

Automotive manufacturing processes are among the most complex to design and execute — let alone optimize. Not only are there many moving parts to track, but you must apply a great deal of effort to maintain an accurate line of sight into your supply chain, including the raw materials, manufacturing equipment, finished products, workers and suppliers. With all these balls in the air, manufacturing oversights are unfortunately common — and not without consequence.

In addition to these challenges, your channel partners, consumers and government regulators are always keeping a watchful eye on your manufacturing performance, making it important to do everything you can to improve the speed and quality of your operation. Due to contractual obligations to supply chain partners, along with the rising expectations of your customers, missing a delivery deadline is not an option. And if something does slip through the cracks, you can’t just start over at the drawing board.

Fortunately, with the right industrial scanning and machine vision hardware and software technologies, you can significantly improve your ability to:

- Trace parts.
- Improve quality control.
- Reduce production waste and scrap.
- Ramp up your overall production and fulfillment rates.
Overcoming Four Common Automotive Challenges With Zebra Machine Vision

From an operational or technological perspective, most automotive manufacturers are typically concerned with four things: complexity, precision, accountability and speed.

**Challenge 1: Complexity**
Automotive manufacturing involves many different processes and systems to manage, with several of them relying on fixed industrial scanners, machine vision cameras or a combination of the two. To gain a competitive edge, it’s important to streamline these various systems and simplify your parts intake, quality control and outbound logistics processes.

Having a single-software platform like Aurora™ makes it easy to transform and optimize all the barcode reading and machine processes happening in your automotive plant. These platforms use standard communications protocols, support 1D, 2D and DPM barcode reading and offer a comprehensive machine vision toolset.

In addition to streamlining processes, Aurora automatically creates a digital record — whether of images or inventory movements — to help you populate shipping manifests, inventory management systems and even invoices. The result: less manual steps in your production, storage and shipping workflows.

**Challenge 2: Precision**
When it comes to automotive manufacturing:

- Parts are either compliant or they’re not.
- The assembly process has a low tolerance for errors, necessitating fast, accurate inspections of individual parts.
- It’s critical to check the date and lot code of each part, package and pallet entering or leaving your facility, driving up the need for industrial scanning processes in increasingly lean manufacturing environments.

Zebra machine vision technologies can meet all of these challenges while keeping your throughput high. For example, with best-in-class algorithms like pattern recognition, edge detection and blob analysis, these systems ensure each component meets design compliance. Considering each part is one of roughly 30,000 total parts that must be inspected in a mass-produced vehicle, these technologies are also a faster, more efficient scanning solution than human workers.

And, scanning technologies can quickly and efficiently read a part’s direct part markings (DPM) and other barcode information, even as the part is moving along a conveyor. Equipped with optical character recognition (OCR) capabilities, these devices can even check date and lot codes to ensure compliance or reconcile warehouse management systems.

**Challenge 3: Accountability**
There are serious repercussions when non-compliant parts are received or shipped. The goal is to get ahead of these issues to avoid costly product recalls, financial losses — or worse, putting human lives at risk behind the wheel.

By capturing and evaluating critical barcode data and images, Zebra machine vision technologies can help you detect patterns or process inconsistencies. And, if the system flags a component as noncompliant, then you can easily trace the part back to its supplier or production line system using the DPM or other identifier. By empowering you to investigate and resolve issues quickly, these technologies improve your accountability, keep uptime high and reduce scrap.

**Challenge 4: Speed**
Processing automotive parts fast enough for production runs is no simple task — especially given the growing sales volumes and demand for greater vehicle customization. Zebra industrial scanners and machine vision cameras can operate in continuous mode, enabling you to capture multiple decodes per second with accuracy and precision — no matter how many different vehicle models you have on your line.
The Issue With Legacy Vision Systems
The average vehicle has over 30,000 parts that must be designed and assembled perfectly — not just to keep drivers happy, but to keep them safe. If an assembly is missing a gasket, or a gear is missing its teeth, for example, any number of things could go wrong when the vehicle trades the production line for the road.

Unfortunately, it’s not so easy for factory workers to take a step back from their production line to verify that everything, from the powertrains to the pistons, are present — much less properly seated. And without the aid of high-resolution cameras, the human eye is simply incapable of inspecting the nitty-gritty design details of an automotive assembly — whether confirming components have the right adhesives or that a chipset was designed correctly, for example.

Making matters more challenging, most legacy machine vision systems don’t operate with the simplicity, speed and efficiency required by modern automotive production lines. Poor camera resolution can cause manufacturers to question the system’s accuracy, while many older systems process images too slowly to keep pace with today’s fast-moving automotive production environments.

In general, the sentiment is that machine vision demands more work on a manufacturer’s behalf, necessitating machine vision systems that are simple to set up, learn, maintain and upgrade. Unlike many legacy systems, these hardware and software technologies can analyze parts quickly and accurately, automating inspection and parts traceability processes with minimal time, cost and engineering effort.

Automotive Product Labeling Solutions
Properly labeling automotive components is a critical step in the manufacturing process, as manufacturers must be able to identify components should an issue arise during the vehicle’s lifecycle. In these cases, proper barcode labeling makes it possible to notify vehicle owners of a recall, for example.

Automotive labels must comply with strict requirements to ensure they’re scannable, readable and secured properly to the component. There are many different testing and certification standards, and automotive manufacturers can differ widely in their requirements. That’s why at Zebra, we provide component labeling solutions that are certified to many automotive manufacturer requirements, ensuring you meet compliance.
What to Look For in Your Machine Vision System

You Can Control All Hardware With One Software Platform
Most automation management technologies for controlling industrial scanning and machine vision systems are built on complicated, outdated or inflexible software platforms that are difficult to set up, deploy, operate and upgrade. The solution is to look for unified software platforms that provide one common development environment for barcode scanning and machine vision applications. These platforms deploy quickly and let you upgrade your hardware with forward-looking features via a simple software license, reducing valuable engineering time and effort.

Scaling Up is Quick and Easy — and Avoids Downtime
Because they’re easy to upgrade, single-software platforms make it easy to start small — using barcode scanners to trace incoming automotive parts to your warehouse, for example — and then scale up as your needs change. For example, by upgrading the software license, you can easily unlock machine vision inspection capabilities in your fixed scanner, avoiding the time and costs associated with ripping and replacing hardware.

Your Machine Vision System is a Lighting Expert
Single-software platforms overcome common lighting challenges, eliminating the need to purchase external lights, worry about frequent job changes or make complex coding changes to programmable logic controllers (PLC). In addition, many scanners and cameras integrate their own lights and come with accessories to help you optimize the image-capture process. Options include external lights in various colors, blue color filters for imaging stainless steel objects, light polarizers to reduce glare from reflective surfaces and bandpass filters to reduce the effects of ambient light.

Thanks to this wide range of hardware and software features, you don’t have to be a lighting expert — because your machine vision system already is.
Zebra Machine Vision Solutions

Zebra fixed industrial scanners and machine vision products deliver the power, intelligence and speed you need to optimize your automotive operation in terms of its simplicity, precision, accountability and speed. Our easy-to-use hardware and software solutions improve parts traceability, barcode scanning and inspection processes, enabling you to improve your throughput, better comply with industry regulations and exceed customer expectations.

A Rugged Design
To withstand the rigors of automotive manufacturing, Zebra scanners and machine vision cameras are built with many rugged features:
• IP65/IP67-rated aluminum housing
• Chemical and oil resistance
• Sealed optics and lighting
• Units are dust-tight

### Zebra Fixed Industrial Scanners

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>FS10</td>
<td>Compact, plug-and-play scanner for offline track-and-trace and barcode validation applications.</td>
</tr>
<tr>
<td>FS20</td>
<td>Compact, networkable scanner for track-and-trace and barcode validation applications.</td>
</tr>
<tr>
<td>FS40</td>
<td>Industrial scanner featuring a comprehensive toolset for sophisticated track-and-trace applications.</td>
</tr>
<tr>
<td>FS70</td>
<td>Customizable scanner for the most challenging track-and-trace applications.</td>
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### Zebra Machine Vision Systems

<table>
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<tr>
<th>Model</th>
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</thead>
<tbody>
<tr>
<td>VS20 Smart Sensor</td>
<td>Compact, networkable camera for basic inspection applications.</td>
</tr>
<tr>
<td>VS40 Smart Camera</td>
<td>Smart camera featuring a comprehensive toolset for sophisticated inspection applications.</td>
</tr>
<tr>
<td>VS70 Smart Camera</td>
<td>Customizable camera for the most challenging inspection applications.</td>
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Zebra Aurora™ Software

Set up, deploy, run and upgrade all Zebra fixed industrial scanners and machine vision cameras with Aurora, a single software platform that brings all barcode scanning and machine vision applications into a common development environment. This platform reduces the time, cost and complexities associated with using different automation management tools for different devices. And, you can easily upgrade your devices with new features and capabilities with a simple software license, enabling you to scale up your machine vision capabilities as needs change.

What You Can Do

Easily connect Aurora to your plant’s infrastructure. Aurora connects to your plant’s existing infrastructure and to PLCs using Ethernet/IP, PROFINET, Modbus TCP and many other common industrial protocols. All Zebra devices also includehardwired general-purpose input/output (GPIO) configurable ports that make it easy to add peripherals.

Make changes quickly with Aurora’s intuitive interface. Aurora has a sleek, user-friendly design that presents complex vision settings as simple sliders and buttons. Thanks to these features, you don’t have to waste any time hunting for the functions you need. And, if you need additional guidance, Aurora’s well-designed management platform will walk you through all the necessary steps in the correct sequence. You can also take advantage of various tutorials and videos to learn more about the software’s comprehensive toolset.

Minimize training time. Aurora simplifies the automation architecture across your entire enterprise, and your workers only need to learn one tool to manage all barcode scanning and machine vision hardware, minimizing training time without affecting your uptime.

Optimize image-capture settings with ease. Aurora includes cutting-edge image-capture features that improve the speed, efficiency and functionality of industrial scanning and machine vision applications. Some examples include:

- **Object Locate**, a setting that locates objects right out of the box with optimized settings regardless of variables like the object’s orientation or lighting conditions.
- **ImagePerfect**, a function that captures up to 16 images with a single trigger event, each with its own unique settings. And, Aurora automatically compensates for lighting and part variation, eliminating the need for multiple cameras, external lights or custom coding.
- An ability to quickly identify and resolve issues if a barcode or image capture fails, minimizing production downtime.
- **Statistical triggering** for identifying process issues before productivity is impacted.
- **Job Compare**, a feature that determines if settings have been changed and offers the option to revert back to original settings.

Make your data actionable with accessible dashboards. Aurora includes human-machine interface (HMI) dashboards that are accessible by connecting a monitor directly to the scanner or camera via USB-C ports. This tool lets operators see and interact with data in real time without having to install a PC at every workstation.

For more information about Zebra’s industrial machine vision and fixed scanners, visit [www.zebra.com](http://www.zebra.com)