With time at a premium but quality crucial, a global vehicle manufacturing group has used white light scanning to improve productivity.

Aviel First

Since the introduction of the progressive assembly line in the early twentieth-century the motor industry has remained at the forefront of industrial development, speeding up processes and increasing output. Now, over a hundred years later, every minute still counts in the highly-competitive automotive world.

The difference today is that safety and quality control are no longer nice to have – they are essential. However, the time invested in the inspection process has cost implications for manufacturers and consumers alike. As a result, the automotive industry is increasingly turning to metrology suppliers to help them improve productivity.
For one leading automotive OEM, moving to automated white light scanning systems has cut inspection times by 75% while also improving the quality of the data gathered. Implementation of the Hexagon Metrology WLS400A solution has also brought inspection closer to the production line, enabling quicker reporting of quality issues and shortening the feedback loop. As a result, the impact of inspections on production output is minimised and the effectiveness of control measures maximised to ensure the best possible quality when the vehicles hit the road.

Moving on from traditional inspection methods
In the past, the manufacturer used stationary coordinate measuring machines to inspect stamping parts and closures. With each part typically taking around two hours to measure, this was a huge burden for a group which produces nearly 10 million vehicles each year. The point-based data generated could also be difficult to read and analyse, while response times were not always good enough to cope effectively during ramp up. In effect, the company had three key needs to modernise its quality control departments and achieve the agility required for such a large business to react to customer demand without compromising its output:

- Improve the level and usability of quality data gathered
- Shorten the quality assurance time of the manufacturing process
- Reduce the costs of quality control within the line while enabling quicker responses

While speed was clearly important there was also no question of reducing accuracy, so the project team was looking for a technology solution which delivered at least comparable measurement quality to the existing CMM setup. In addition, gaining more interpretable and ultimately actionable insights that could be easily shared by production and quality department staff was a priority.

Identifying and implementing process changes
With the support of consultants from Hexagon Metrology, the company took these three desired outcomes and identified the process improvements which would be required to achieve them.

To improve the quality levels across the board, it was established that factories needed equipment that would enable them to measure more components and package the data meaningfully for users to easily interpret and base decisions on. Faster planning, measurement and analysis were the central means of shortening the quality assurance times, while quicker indication and feedback would ultimately bring cost savings.

From the process review, the project team moved on to sourcing equipment capable of facilitating such changes. Their conclusion was to transition from CMM measurement to a scanning system to gain the data advantages required, introduce automation to provide time savings at all levels from planning through to analysis, and to take the equipment closer to the production line to minimise the cost implications of both production errors and the quality control process itself.
The result was the installation of a series of near-the-line automated inspection cells using the Hexagon Metrology WLS400A white light scanning solution.

The advantages of white light scanning
There are many technologies and methods that can be used to measure and inspect components in an industrial setting, each with their own advantages. White light systems are among the quickest and most flexible solutions available, making them a compelling option for in-line and near-line inspection of objects of almost any size and complexity.

The Hexagon Metrology WLS400A solution uses rapid exposure digital stereo vision technology to gather highly-accurate dimensional data from 2D and 3D images. With three 4.0 megapixel cameras, the white light scanner has a 500 mm x 500 mm field of view, offering area coverage of 250,000 mm² in a single shot. High-power blue LED illumination minimises the impact of changes in ambient light. For automotive applications, the scanner’s ability to measure full surfaces, geometric features and edges is very important due to the varied nature of vehicle bodywork, while the typical tolerances of ± 0.5 mm for panels present no problems for a white light system.

Application and configuration across the group
The technology and process solution defined, the automotive manufacturer wanted to install inspection cells at several production plants around the world. With each location set up differently and the various makes and models all having diverse requirements, Hexagon Metrology used the flexibility of the white light technology to recommend a range of cell configurations for the WLS400A system.

For three European plants, there was a defined set of performance management targets to meet. The focus was on the quality of closures, ensuring assembly would be smooth, and that gap and flush inspections could be passed successfully. These facilities also needed a high-throughput design that could efficiently measure all the closures produced in every shift. As a result, they deployed cells using two robots. The first holds the white light scanner, while the second has a fixture to hold the part to be measured.

In contrast, a plant in China decided to deploy two automated cells – one for closures and one for body side stamping parts. The closures cell uses a robot-mounted scanner on a slider rail with four turntables around it to maximise the utilisation of the measuring system. Two turntables are used to inspect doors, one for bonnets and
Body side inner and outer left and right stampings mounted on two adjacent turntables are measured by a robot on a slider rail.

one for boot hatches. While one part is being measured the other turntables can be loaded, with safety bars ensuring that operators cannot enter the area where the robot is working. The stamping parts cell uses just two turntables, but each is equipped with a fixture to clamp the body side for inspection.

The cells were designed and simulated in 3D to find the best possible configurations and locations of robotic equipment and supply mechanisms. After construction, all the layouts successfully passed a CMM correlation test and the plants were ready to measure with white light.

Turning data into useful information
The WLS400A solution runs on CoreView, a specialist dimensional metrology software for white light scanning. Although Hexagon Metrology programmed the initial routines, the manufacturer’s own employees are now trained to program new parts by themselves. The information output potential of CoreView is huge, so the reporting structure was again tailored to meet the manufacturer’s standards and needs.

Once the measurement process is complete, the system automatically generates visual reports such as colour maps, as well as the dimensional data. This provides the ease of reference and interpretation that operators need to quickly react to issues. Deviations from the model are highlighted by warm colours on the image, so red or orange areas draw attention to potential issues. In the event of a problem, these areas can be analysed using more detailed techniques such as cross-sectioning from the same dimensional data set.

For this customer, Hexagon Metrology designed a range of custom reports, including the ‘picture of the day’ overview, which is generated and distributed to production and quality management teams on a daily basis and informs decisions in the closure process. Once several pieces of the same item have been measured, they are compared to identify process stability and the results output as colour maps to show the standard deviation and average positioning at certain points on the object. Statistical information is also available, meeting the company’s demanding performance management requirements.

Productivity gains across the board
For such a large-scale implementation spanning factories on several continents, provable results and return on investment were of the highest importance. The WLS400A system showed an immediate impact on the measurement times. For example, a door unit with 42 closed features, 427 surface points and 186 edge points defined (door digitising) can now be measured in less than 20 minutes, compared to two hours using the previous CMM system. A typical door measurement will take 10 minutes.

On average, the time the automotive manufacturer spends on quality inspection has dropped to just a quarter of what it was using traditional methods. Because measurement is closer to the production line, the feedback loop is shorter and corrections can be made in less time. But perhaps the most startling impact is on the user side, with several plants reporting that the actionable information provided by CoreView makes identifying the root cause of problems significantly faster for staff. The result is an impressively fast return on investment since the implementation of their white light systems, and greater productivity throughout this essential quality control process.

Roll-out of the WLS400A solution off-line and near the production line is continuing in additional plants, while in-line inspection is beginning to be implemented as well.
Hexagon Metrology offers a comprehensive range of products and services for all industrial metrology applications in sectors such as automotive, aerospace, energy and medical. We support our customers with actionable measurement information along the complete life cycle of a product – from development and design to production, assembly and final inspection.

With more than 20 production facilities and 70 Precision Centres for service and demonstrations, and a network of over 100 distribution partners on five continents, we empower our customers to fully control their manufacturing processes, enhancing the quality of products and increasing efficiency in manufacturing plants around the world.

For more information, visit [www.hexagonmetrology.com](http://www.hexagonmetrology.com)

Hexagon Metrology is part of Hexagon (Nordic exchange: HEXA B). Hexagon is a leading global provider of design, measurement and visualisation technologies that enable customers to design, measure and position objects, and process and present data.

Learn more at [www.hexagon.com](http://www.hexagon.com)