



MAKING ZERO DEFECTS A REALITY

Relimetrics transforms how companies manufacture products by enabling video analytics and artificial intelligence at the edge, on the shop floor, to improve quality assurance

Businesses rise and fall based on the quality of their products. Recalls and rework can cost a company dearly and leave lasting reputational damage. This puts pressure on companies to make sure no products leave the assembly line with quality issues, particularly as demand for customization grows. But with the rise of computer vision and machine learning, companies can now transform their quality management. Relimetrics is using this technology to help businesses analyze video data right at the edge, in real time, bringing them closer to achieving zero defects.

Relimetrics knows very well what thought keeps manufacturers awake at night—defects. The pressure to get quality management right has intensified in today's rapid production environment, compounded by a growing demand for product customization. As the complexity and precision involved in making and assembling products increases, so does the potential for anomalies.

“For example, the vehicle you're driving consists of more than 35,000 parts. If there's a problem with a single component, it can potentially result in a vehicle recall,” says Kemal Levi, Relimetrics' founder and chief executive officer. “The overall ensuing costs of facilitating a recall and the damage to the manufacturer's brand value can be billions of dollars.”

In the electronics industry, demand from enterprise customers for lower prices is squeezing suppliers' already thin margins. It's now even more important for these companies to ensure their items meet the required quality standards when they reach the end of the assembly line.

RELIMETRICS

INDUSTRY: TECHNOLOGY

REGION: GERMANY

VISION

Enable manufacturers to achieve zero defects during production

STRATEGY

Automate quality audits using video analytics and machine learning at the edge

OUTCOMES

- Reduces the number of defective products that reach customers by 25%
- Expands test coverage by 20% and saves 96 seconds of inspection time per server
- Improves overall production performance from sigma 2.1 to sigma 4.2

Yet, many companies continue to rely on their workers and manual processes to carry out inspections—despite the inability of the human eye to match the speed of today's production lines and stringent quality requirements.

Enter Relimetrics, an HPE OEM and NVIDIA Metropolis platform partner based in Germany. The firm is helping companies transform how they design and create products using software that fully digitizes their quality audit (QA) cycles. The solution uses real-time GPU-accelerated video analytics and machine learning to inspect the configurations and properties of product components, improving the accuracy of detecting defects.

But capturing and processing video data to match manufacturers' need for speed and accuracy is not always easy. Often, sending massive amounts of data to the cloud creates latency and slows the QA process. To help businesses reduce defects and accelerate inspection, Relimetrics must deploy its solution where the manufacturing action is—the shop floor.

Reducing defects and inspection time with analytics at the edge

By enabling companies to run video analytics at the edge, Relimetrics is helping them detect quality issues more accurately and address problems quickly. This brings them closer to achieving zero defects, improving their profitability through reduced scrap and rework, and increasing customer satisfaction and retention.

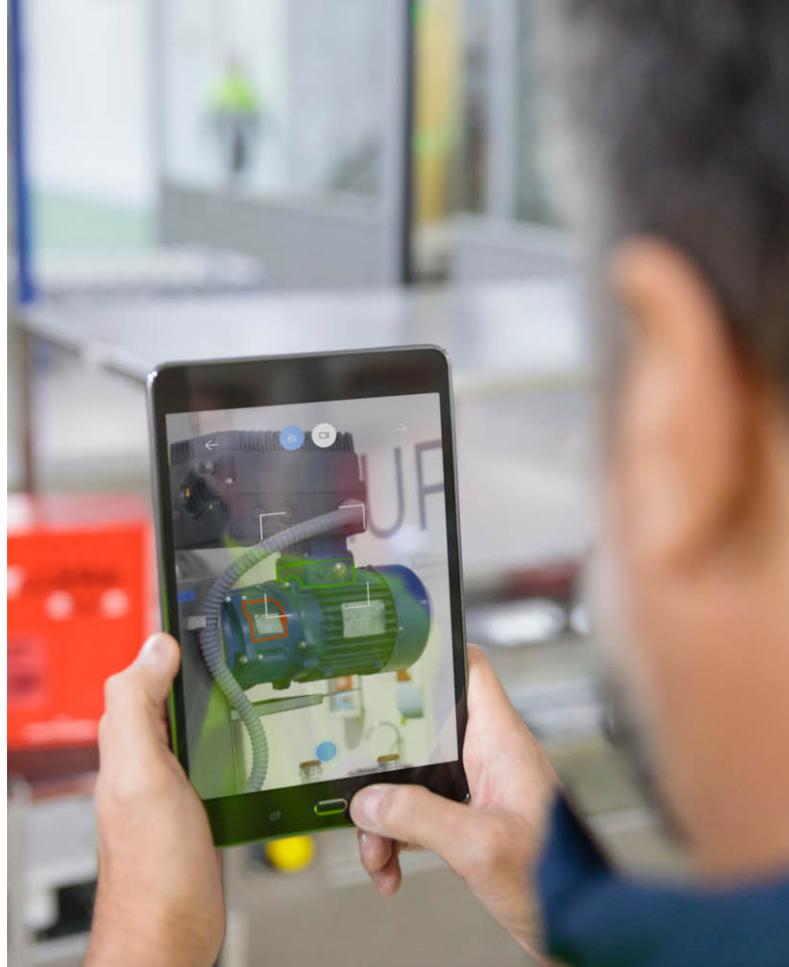
"We are taking QA automation to a new level," says Levi. "Reducing scrap and rework is no longer a dream but a proven reality."

Levi and his team showed how automation using edge intelligence can transform manufacturing when they digitized the QA of a Foxconn production line.

Located in the Czech Republic city of Kutná Hora, the facility manufactures servers for Hewlett Packard Enterprise (HPE). These products are highly complex, varied, and customizable. For example, a server model can come with two to 16 memory modules, and each can be 16, 32, 64, or 128 gigabytes.

Memory configuration is but one of more than 20 different product manufacturing variables involved. Besides this complexity, the pace of production is also high. So, having humans inspect these servers on a fast-moving conveyor belt would inevitably lead to some defects being missed.

"Manual inspections took two to five minutes per unit," says Levi. "For a production line like Foxconn's, this could mean added cost and reduced productivity."



Increasing detection accuracy

HPE and Foxconn decided to automate the production line's QA using machine vision at the edge. By having better traceability of quality, they hoped to increase the accuracy of detecting defects and reduce the number of faulty servers that reach customers.

"The key target was to be able to reduce warranty claims and improve the overall quality of service. A good chunk of these claims were a result of poor-quality products being shipped to the customer," notes Levi.

"So, having a technology that can adapt to production variability and be more accurate than humans in quality checking is a big deal in manufacturing electronics products like HPE's," he adds.



We now have the ability to automatically check the configuration and assembly quality of our products and eliminate human error in areas where the solution is able to verify."

- FOXCONN SPOKESPERSON

Enabling analytics on the manufacturing floor

Together with HPE Pointnext Services, Relimetrics implemented its video analytics and machine learning technology at the Foxconn production line.

The solution involved setting up five cameras to capture high-resolution images of products entering the conveyor belts and streaming the images to an embedded system for processing using machine learning algorithms on-site. Relimetrics' machine vision system then compares the pictures from the cameras with reference images that show the correct and faulty implementations of the server components. If issues are detected, the system will immediately flag them, enabling Foxconn operators and line managers to remediate the problem right away. Or if a server is in good order, it can move on to final packaging to be sent to the customer.

The system analyzes images at the edge instead of the cloud using HPE OEM solution HPE Edgeline Converged Edge Systems equipped with NVIDIA® GPUs. This setup saves time and prevents latency problems, which is particularly important because each camera installed at the conveyor belts streams large volumes of data—about 3 GB an hour.

“The size of the high-resolution pictures needed to verify the tight tolerances and providing immediate feedback to the operations team drive the need to process data very fast and at the edge,” says Volker Heinle, senior director of EMEA supply chain operation at Hewlett Packard Enterprise GmbH.

Levi agrees and notes that HPE Edgeline Converged Edge Systems with NVIDIA GPUs have given Relimetrics' solution the performance it needs to support inspections in real time, right on the factory floor. HPE Edgeline servers are built for harsh environments like shop floors and can integrate operational technology such as data acquisition systems and industrial networks.

“By introducing an NVIDIA GPU to the HPE Edgeline EL4000 chassis and optimizing network performance with NVIDIA TensorRT, inference latency decreased from 4165 to three milliseconds,” says Levi. “This translates to almost 1400 times better performance.”

This kind of throughput is difficult if not impossible to achieve by sending data to the cloud for analysis, he adds.



We are taking QA automation to a new level. Reducing scrap and rework is no longer a dream but a proven reality.”

– KEMAL LEVI, FOUNDER AND CHIEF EXECUTIVE OFFICER, RELIMETRICS

Accelerating algorithm training

Harnessing the combined power of central processing units and GPUs allows the Relimetrics solution to train artificial intelligence models inline.

“This way, manufacturers can digitize their QA without constantly worrying about retraining their models offline each time they have a new configuration in their production,” says Levi.

Training machine learning algorithms to detect issues or anomalies becomes challenging and time-consuming when the products involved are highly varied and customizable, like HPE servers.

To save time, Relimetrics and HPE Pointnext Services built the machine vision system at the Foxconn facility in a way that it requires the storage of reference images of server components instead of whole units. Under this design, the manufacturing execution system provides a bill of materials for each product on the conveyor belt so that the system can make a full reference image based on reference image components.



This has accelerated algorithm training and saved a lot of time. HPE Pointnext Services, for example, managed to train the machine learning model for a new server QA with about 1,000 configuration variants in just two days.

Increasing production performance

Thanks to its ability to process data at the edge, in real time, the Foxconn production line has sped up its quality inspection process.

According to Heinle, the facility has saved 96 seconds of inspection time per server and increased its test coverage by 20%, while trimming associated costs.

“The additional audit checks and the fact that the machine learning solution has no fatigue-induced errors and is able to adapt to high production variability, drove a two-percentage point increase in the initial pass rate,” he says. “While this may sound low, it is significant as it moved the overall production performance from sigma 2.1 to sigma 4.2.”

Doing away with human errors

With its QA process revamped, the Foxconn facility has improved the accuracy of its visual inspection, enabling it to reduce the number of defective HPE servers that reach customers by 25%.

“We now have the ability to automatically check the configuration and assembly quality of our products and eliminate human error in areas where the solution is able to verify,” says a Foxconn spokesperson.

Levi estimates that the automated QA has a detection accuracy of more than 99.9%. “We are truly enabling zero defect manufacturing here,” he says.

Digitizing QA has also taken some load off workers.

“Automation and machine vision systems enable us to enhance our workforce to deliver a competitive product and service to our customers,” says the Foxconn spokesperson. “Machine vision systems provide

support to our audit operators and take some of the workload away from our inspectors, which allows them to concentrate more on the key aspects of their job.”

Digitizing QA across all manufacturing lines

With the success of the QA automation at Foxconn’s Kutná Hora facility, Relimetrics is now gearing up to help digitize the QA process at HPE’s other contract manufacturers.

HPE has decided to expand its QA automation project to cover all production lines and is working on a global rollout plan for all its manufacturing partners.

“We’re looking forward to going beyond a single production line and being able to put our solution across factories and enable them to share data and centrally manage the flow of information,” says Levi.



Automation and machine vision systems enable us to enhance our workforce to deliver a competitive product and service to our customers.”

– FOXCONN SPOKESPERSON





By introducing an NVIDIA GPU to the HPE Edgeline EL4000 chassis and optimizing network performance with NVIDIA TensorRT, inference latency decreased from 4165 to three milliseconds. This translates to almost 1400 times better performance.”

– **KEMAL LEVI**, FOUNDER AND CHIEF EXECUTIVE OFFICER, RELIMETRICS



EXPLORE MORE

→ **FIND** more Digital Game Changer stories

hpe.com/us/en/servers/edgeline-systems

SOLUTION

HARDWARE

- HPE OEM
- HPE Edgeline Converged Edge Systems
- NVIDIA GPUs

SOFTWARE

- NVIDIA TensorRT

HPE POINTNEXT SERVICES

- HPE Advisory and Professional Services

KEY PARTNERS

- NVIDIA



SHARE WITH YOUR NETWORK



CHAT



EMAIL



CALL



UPDATES