

## How to create data-driven manufacturing using automated vision metrology systems

Applying automated vision metrology technologies for process control before, during and after assembly and machining/moulding is now a prerequisite in any production environment, especially in the orthopaedic and additive manufacturing industries. This month, we're drilling down on the data and knowledge you can create for your manufacturing process when deploying vision metrology systems for production quality control. Let's face it – we all want to know where we are versus the production schedule!

### **What are “vision metrology” systems and machines?**

It's the use of non-contact vision systems and machines using metrology grade optics, lighting and software algorithms to allow increased throughput of quality control inspection and data collection in real-time for the production process.



### **What are the benefits of vision metrology systems?**

Before we look at the data available on such systems and how they can be utilised to create data-driven production decisions, we should look at the benefits of automated vision metrology systems. This, combined with the data output, clearly focuses on why such systems should be deployed in today's production environments.

*Increased throughput.* One of the main drivers and benefits of using automated vision metrology systems is the higher throughput compared to older contact and probing CMM approaches. Coupled with integration into autoload and autotending options, the higher production rates of deploying automated vision metrology allow for faster production and increased output from the factory door.

*Better yields.* As the systems are non-contact, there is no chance of damage or marking of the product, which is the risk with probing and contact inspection solutions. Checking quality through automated vision allows yields to improve across the production process.

*Faster reaction to manufacturing issues.* Data is king in the fast-moving production environment. Real-time defect detection, seeing spikes in quality and identifying quality issues quicker, allows production managers to react faster to changes or faults in manufacturing faults. Vision metrology allows immediate review and analysis of statistical process control on a batch, shift and ongoing basis. Monitor live progress of work orders as they happen.

*Less downtime.* With no contact points and fewer moving parts, maintenance downtime is minimal when applying automated vision metrology machines. Maintenance can be used for other tasks and increases productivity across the manufacturing floor.

*Guarantees your quality level.* Ultimately, the automated vision metrology machine is a goal-keeper. This allows the quality and production team to sleep easy, knowing that parts are not only being inspected, but also providing warranty protection via a photo save of every product through production.

### *How do we get data from an automated vision metrology quality control system?*

This is where the use of such vision technology gets interesting. The central aspect is the quality control and automated checking of crucial measurements (usually critical to quality CTQ characteristics). Still, the data driving the quality decision is paramount for the manager. The overall data covers a range of data objects that could potentially be needed when running a modern manufacturing plant. These include OEE data, SPC information, shift records, KPI metrics, continuous improvement information, root cause analysis, and data visualisation.



*OEE Data (Overall Equipment Effectiveness)*. The simplest way to calculate OEE is the ratio of fully productive time to planned production time. Fully productive time is just another way of saying manufacturing only good parts as quickly as possible (at the ideal cycle time) with no stop time. A complete OEE analysis includes availability (run time/planned production time), performance ((ideal cycle time x total count)/run time) and quality (good count/total count). The vision metrology data set allows this data to be easily calculated. The data is stored within the automated vision metrology device or sent directly to the factory information



*Statistical Process Control (SPC)* is used in industrial manufacturing quality control to manage, monitor, and maintain production processes. The formal term is “the use of statistical techniques to control a process or production method”. The idea is to make a process as efficient as possible while producing products within conformance specifications with as little scrap as possible. Vision metrology allows vital characteristics to be analysed at speed on 100% of product, compared to the slow, manual load CMM route. SPC data can be displayed on the vision system HMI, and immediate decisions can be made on the process performance and data presentation.

*Shift records* are part of the validation and access control system for the vision system used in vision metrology. This stops operators from accessing certain features and logging all information against a specific shift operator or team. Data analytics allow trends in operator handling and contribute to the data provided by the system. You may see a spike in quality concerns from a specific shift or operator; these trends can easily be tracked and traced.



*KPI metrics* are Key Performance Indicators normally specific to the manufacturing site. However, these invariably include monitoring the quality statistics, OEE, process parameters, environmental factors (e.g. temperature and humidity), shift data, downtime and metrology measurements. This is all part of understanding how certain situations impact the output from processes and how levels can be maintained.

*Continuous Improvement* is the process to improve a manufacturing facility’s product and service quality. Therefore, the data and images from any automated vision metrology machine play an important role in providing live data related to Six Sigma and real-time monitoring of the ppm (parts per million) failure rate within the facility.



*Root cause analysis* of manufacturing issues is challenging without tangible data from a quality inspection source. The ability to review product images at the point of inspection (with the date and time stamped information), coupled with the specific measurement data, allows easier and quicker root cause analysis when problems crop up.

*Data visualisation* is now built into modern automated vision metrology systems. The production manager and operators can see quality concerns, spikes in rejects, counts of good and bad, shift data, and live SPC all in a single screen. This can be displayed locally or sent immediately to the factory information system.

## Conclusion

By utilising the latest-generation automated vision metrology systems manufacturers can now build a fully-integrated data driven production environment. They are allowing easier control based on accurate, immediate information and photos of products running through production.