

CMM OR PORTABLE METROLOGY

HOW TO CHOOSE THE MOST
EFFECTIVE MEASURING TOOL



THIS WHITE PAPER EXPLAINS:

1. The problems and impacts of limiting quality control to the CMM.
2. Explores complementary portable solutions.
3. Provides QC managers with guidelines to facilitate the migration of quality control to the production floor.

Quality control managers have the delicate task of verifying and guaranteeing that manufactured parts meet customers' requirements, specifications, and tolerances. To do so, QC managers mainly rely on coordinate measuring machines (CMMs), which are the most precise and accurate metrology equipment available for quality inspection.

Systematically choosing the CMM to perform all quality controls can, however, affect the manufacturing process, inspection flow, and customer delivery.

Because of its high accuracy, the CMM is widely used and, often, totally loaded by all types of quality controls. It might cause a bottleneck effect that clogs the manufacturing process. It might not be available to practice critical inspections, such as the first article inspection (FAI). Worst, it might generate critical delays in shipping the manufactured parts to customers.

There are now several alternative metrology instruments available, enabling quality control managers to unload their CMM and perform accurate measurements directly on the shop floor during the manufacturing process. The measurements obtained with these alternative solutions prove to be insensitive to external instabilities and, most important, very accurate. This white paper explains the problems and impacts of limiting quality control to the CMM, explores complementary portable solutions, and provides QC managers with guidelines to facilitate the migration of quality control to the production floor.

CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

CHALLENGES



**THIS IS AN ESTABLISHED
FACT: THE MARKET NOW
EXPECTS PRODUCTS OF
BETTER QUALITY.**

PRODUCTS OF BETTER QUALITY

Over the past decades, the market's interest for quality products has increased significantly. To meet this demand, manufacturing companies must produce better performing products. To guarantee the performance and high quality of their products, they must achieve more quality controls and better inspections.

This is an established fact: the market now expects products of better quality. This reality is valid for both high-end markets and popular brands.

On the one hand, customers require more quality controls; on the other hand, industry tolerances have tightened. This has a direct impact on the work of quality control teams that experience more pressure because they are being asked to do more complete and accurate inspections in greater numbers and at different stages of the manufacturing process. To meet this demand for more inspections, quality control managers need more metrology equipment and, then, more metrology staff to operate them.

CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

CHALLENGES

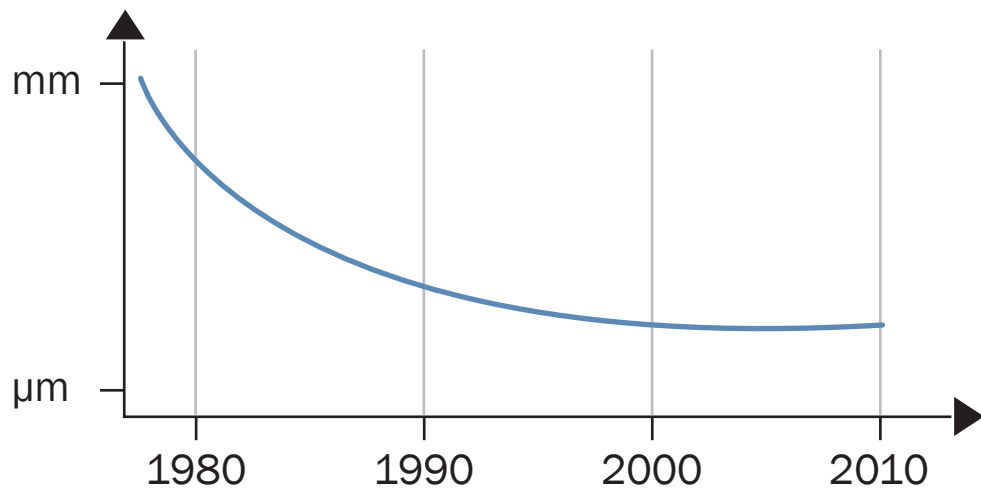


TIGHTER TOLERANCES

This is another undeniable fact: tolerances that must meet quality control standards are now increasingly sophisticated and optimized. To meet these tighter tolerances, quality control managers need more accurate and better performing equipment and more qualified resources to manage them.

EVOLUTION

FLUSH AND GAP TOLERANCES IN AUTOMOTIVE



CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

CHALLENGES



MORE EQUIPMENT, MORE RESOURCES

There are two ways to increase quality controls and meet tighter tolerances: 1) adding equipment and 2) adding staff. These two solutions are feasible in the short or middle term, but they require a large investment of time and money.

Purchasing new metrology equipment, such as a CMM, requires important capital investment. To this expense must be added the installation and maintenance costs. The new equipment will also permanently occupy valuable space in the laboratory, which must be controlled for temperature, humidity, and vibration.

Hiring more qualified personnel to perform more inspections involves time. It is not an easy task to find experienced metrology specialists. Training is, therefore, required to enable new employees to set up and manipulate sophisticated machines.

Although purchasing new equipment and hiring new staff is the ideal solution to more inspections, the reality is different. Companies privilege using equipment to their maximum capacity and adding extra shifts before pausing, analyzing the situation, and considering different solutions. This reaction may have consequences that will impact the complete quality control process.

CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

IMPACTS

BOTTLENECKS

Bottlenecks happen when the manufacturing process is clogged by inspections waiting to be completed on the CMM. The major consequences of these bottlenecks are delays in deliveries to customers. To counter this, quality control managers may decide to reduce the sampling (e.g., going from 10 to 5 to 2 out of 1000 parts) or the frequency of inspections (e.g., going from daily to weekly to monthly inspections on a specific part). They may also limit the inspections made at intermediate steps and only opt for the final inspection in order to accelerate the shipping to the customer.

Restricting inspections at intermediate steps means that only the minimum inspection is performed. No further investigation will be made to improve the quality control process or to proactively identify issues before they occur. This may severely impact the quality of the products and increase quality issues.

PRESSURE

Quality control managers might suffer from the pressure exerted by the production team to ship the parts without delay. Part inspection must follow production in order to ship on schedule. Therefore, metrologists might be asked to make compromises in the execution of their work. They might no longer have the flexibility to perform quality controls as they are used to. Inspecting parts as soon as they come out of production in order to ship them to customers immediately is the reality of many quality control managers.



CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

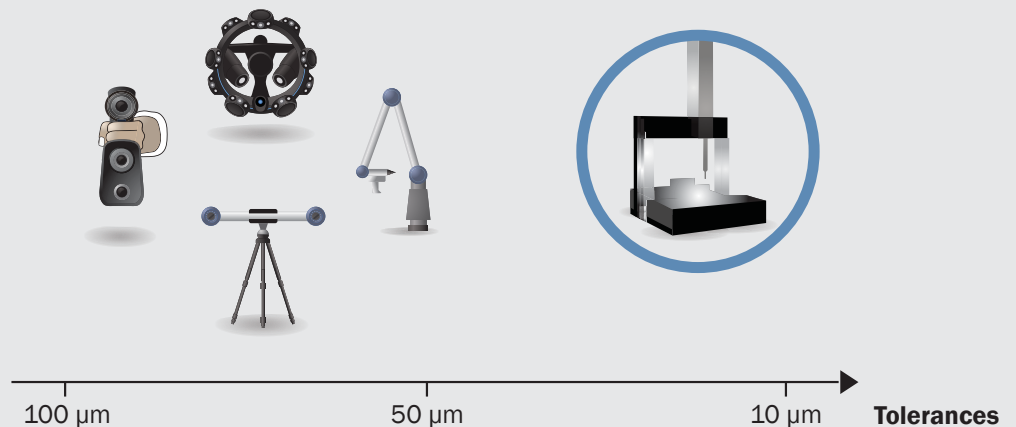
FALSE PERCEPTIONS

NOT ALL ON THE CMM

CMMs have undeniable advantages, but they also have clear limitations. For instance, it is certainly the most accurate measuring instrument available on the market. However, it requires moving the measured part and is often loaded by all types of operations. Therefore, a good way to optimize its key features is to use it specifically for highly accurate measurements, such as first article and final inspections of critical parts. All other controls that do not require a high degree of accuracy do not need to monopolize the CMM. In fact, the high level of the CMM is overkill for most intermediate and sporadic controls and for parts with looser tolerances.

SURVIVAL GUIDE

A non-exhaustive study found that from a tolerance of $50\mu\text{m}$ it is possible to use an alternative solution, such as measuring arms or portable technologies, and reach the level of accuracy required for the part and inspection.



NOT ALWAYS IN THE LAB

Laboratories are sacred places of metrology since they ensure a controlled environment for taking stable measurements. Production floors, however, can be the scene of many external instabilities, such as vibrations, fluctuations, or other changes in the immediate environment. Therefore, it is normal for quality control managers to prioritize the metrology lab to conduct their inspections and quality controls. The problem is, again, that CMMs are loaded, bottlenecks are causing delays, and pressure is high to ship the parts to customers. A solution to these problems is required, and it might be to glimpse outside the lab and consider the use of an alternative solution that meets the same rigorous metrological criteria.

CHALLENGES
IMPACTS
FALSE PERCEPTIONS
SOLUTION
BENEFITS

SOLUTION

Complementing traditional measuring equipment with portable technologies is the solution to increasing QC managers' productivity. Adding new tools to the common metrology kit gives more possibilities, including better use of the CMM, optimizing its use for more inspections, and allocating it for the most important controls. In addition, since portable solutions are flexible, they can either be placed in the lab to centralize all the inspections or moved on the production floor to measure parts of large dimensions that are difficult to maneuver. Thus, the handling of these larger parts is no longer a problem, because portable equipment can go to the part, where the opposite is sometimes laborious. Finally, since portable technologies are easier to use and to set up, they can be operated by less-qualified staff.

KEY FEATURES OF THE SOLUTION



EASE OF USE AND SIMPLICITY OF SETUP

Require less-qualified staff and decrease the time required for every inspection.



PORTABILITY

Give the flexibility to go where the part is.



INSENSITIVITY TO EXTERNAL INSTABILITIES

Track any vibrations that could impact the measurement system.



MEASUREMENT RELIABILITY

Give users confidence that their measurements are accurate, day after day, without any doubt.



EQUIPMENT RELIABILITY

Provide operators with systems that are always available, functional, and trustworthy.



FLEXIBILITY

Enable the measurement of different types of parts, material, and size.



ACCURACY

Allow multiple inspections with a high level of precision to unload the CMM.



ENGINEERING

Address specific needs on the shop floor, in the manufacturing area, near or on the production line.

CHALLENGES

IMPACTS

FALSE PERCEPTIONS

SOLUTION

BENEFITS

BENEFITS



ADDING NEW TOOLS TO THE COMMON METROLOGY KIT GENERATES TWO IMPORTANT BENEFITS:

1 UNLOAD THE CMM AND RETURN TO AN ACCEPTABLE WORKLOAD

This is valid in the case where the bottlenecks were so frequent at the CMM that inspection criteria—sampling and frequency—and working standards had to be reduced. Since adding a portable alternative solution to the metrology kit unloads the CMM, all quality control standards can be restored.

Now that the CMM is more accessible, intermediate stages of inspections can be added to the quality control process to allow for more investigations, which will improve the quality procedures, guarantee products of better quality, and make customers more satisfied.

2 LOWER LEVEL OF EXPERTISE REQUIRED TO OPERATE INSTRUMENTS

Portable alternative solutions can be used by less-qualified staff, who are not metrologists. This may be a relief for quality control managers, because experienced metrology specialists are often difficult to find. This means a shorter learning curve for new employees, which reduces the risk due to staff turnover, especially in large companies. Thus, training new employees takes less time and is less complicated. Experienced metrologists can be dedicated to specific equipment that requires more expertise to operate, such as the CMM.

CHALLENGES
IMPACTS
FALSE PERCEPTIONS
SOLUTION
BENEFITS

The CMM will always maintain its leading position in metrology labs. It is unquestionably the best and most accurate metrology equipment. This is why it should only be dedicated to specific, important, and accurate controls, such as the first article and final inspections of parts with tight tolerances. For these, the CMM is the best, most-qualified measurement instrument, and it is not replaceable by another technology.

Unloading the CMM by adding portable alternative solutions to the metrology kit, however, should be considered. Since these technologies are specifically engineered to address external instabilities—due to their optical components—more controls on the production floor are possible. In addition, since these measuring instruments are easy to use and to set up, they can be operated by less-qualified staff.

Finally, not only can quality control standards be restored, but more inspections can be done, enabling the opportunity to improve the quality control process, be more productive, and obtain products of better quality.

Consider Creaform when evaluating the purchase of a portable alternative solution.

Contact us or visit our product pages on our website.

www.creaform3d.com

