



## Steelcase Testimonial - Automating Shop Floor Inspections

In today's computer and information society, many manufacturers are still using the 19<sup>th</sup> century equivalent of the slide rule to perform gaging on the shop floor. This traditional shop floor gaging involves dedicated fixtures and attribute gages to dimensionally measure manufactured parts. Data collection is tedious and manually oriented. Many manufacturers struggle with how to bring their gaging methodologies into the 21<sup>st</sup> century.

Most manufacturers lean toward some sort of automated inspection process that quantitatively measures parts and stores data so that engineers and quality assurance personnel can make decisions on real time information.

Several key points must be considered when an automated inspection process is to be introduced to the manufacturing floor:

**Robustness:** Harsh and dirty environments are generally the norm for large manufacturing processes. And, shop floor workers don't tend to be the most gentle when handling and using equipment on the floor. For this reason your gaging solution must resist rough handling and non-ideal environmental conditions.

**Reliability:** The gaging solution must have at least the same reliability of the manufacturing equipment. Production floor managers do not want to shut down their lines because a gage has a problem.

**Ease of Use:** Since the gaging equipment will be operated by shop floor personnel, the system must be intuitive and require little or no training to use.

**Limited operator interaction:** The more your gaging equipment relies on operators to do the more variability and operator bias error is introduced to the process. This covers many areas from part handling to data collection and the recording of the data.

**Meet your quality standards:** Your gaging solution must meet the rigors of your quality system. This may include the type of data (quantitative vs. qualitative), tracking of various details about a part check (who checked the part, when was the part checked), and how secure your data must be to unauthorized manipulation.

**Versatility:** An automatic system needs to be versatile enough to quickly accommodate late changes to designs and be able to handle many parts of different sizes. The production environment tends to be very fluid. Your gaging solution must have built in flexibility.

**Accessibility to data:** A gaging solution that doesn't allow real time feedback to engineers or quality assurance personnel causes a lag in the problem solving process. Data must be real time and immediately and conveniently available.

**Cost effective:** An automated solution must be reasonably priced when compared to traditional gaging solutions. If a new system costs more than traditional gaging and doesn't offer significant added benefits, it will be a hard sell to the accounting people.

All of these issues plus the inherent human trait to resist change can add up to significant challenges to the Quality Assurance department. For example, when Steelcase Incorporated (Grand Rapids, MI; USA), the largest office furniture manufacturer in the world, wanted to bring automated inspection to its production floors, it ran into several issues and road blocks. Tony Calduch, Quality Assurance Technician at

Steelcase, says “We wanted to bring our gaging to a new level but felt resistance from several groups. The tooling group had reservations about the quality of the checks, the floor supervisors were concerned about the reliability and additional time that might be required to perform more complex checks, and the operators worried about having to learn how to run new gaging equipment.”

To solve these problems, Calduch turned to Criterion Manufacturing Solutions (Formerly CNC Engineering) (Comstock Park, MI; USA) and their PEGASYS Flexible Gaging System. The PEGASYS (Programmable Electronic Gaging System) utilizes CNC motion technology and Renishaw touch probe to automatically take 3-D measurements, create quick reports, and securely store measurement information. Calduch continues “With PEGASYS we were able to quickly collect complicated variable data and eliminate operator measurement bias that was prevalent in our traditional fixed gaging methods. Once our operators had immediate feedback on their parts, our quality immediately improved because operators could address problems and make adjustments to their equipment themselves. PEGASYS also gave us the capability to quickly add measurements that we didn’t know we wanted at the outset of a project.” In regards to Steelcases specific concerns, “After the tooling group challenged the data from PEGASYS on several occasions and saw that it was correct, they came to rely on its results. The supervisors and operators were surprised at how easy and quickly they could run their own checks. The equipment proved to be as reliable as a lab CMM while performing a much heavier work load.”

Some interesting features of the PEGASYS which make it well suited for shop floor applications include a bar code scanner in which shop floor personnel can start their checks by placing a part on the machine and swiping a bar code. This eliminates the need for workers to be trained on use of computers or complex menu systems. PEGASYS also has the ability to support multiple parts or lines of parts by allowing workers to queue up parts on the machine. While the machine is gathering data on one part a worker may walk up to the machine, place his part, scan the bar code and walk away to perform other tasks. After the PEGASYS has completed checking the current part it will automatically start on the next part in the queue. A remote signal can be sent to a work cell to indicate the PEGASYS has finished checking a part. The amount of time to check a part depends on the size and complexity of a part, but, generally part checks can take anywhere from 1 to 5 minutes.

“I no longer need to organize and correlate the raw data from the old traditional fixed gaging. It was very labor intensive to convert hand written check sheets into usable statistical data. With PEGASYS the data is immediately available on-line to QA personnel, engineers, and operators”, comments Calduch. “We can make timely intelligent decisions based upon real time data. We have even been able to track and see changes in the quality of our raw steel due to the statistical capabilities of PEGASYS.”

#### COST vs. BENEFIT

Cost has long been an issue in changing over to automated gaging. Many parts need to be checked on your single automated gaging solution to make it cost comparable to traditional fixed gaging technologies. In today’s cost conscience economy your budget for automated gaging must be no more or even less than traditional fixed gaging for the same number of parts. Since the cost to build a traditional SPC gage is about \$1,000.00 per SPC point, it is evident that traditional fixed gages can easily cost into the tens of thousands of dollars per part. Calduch has leveraged the PEGASYS to gage, in some cases, over one hundred different parts on a single machine. This significantly reduced his gaging costs. “I see a return on the investment in a PEGASYS by only checking 6 to 8 different parts on the machine. This has resulted in huge cost savings to Steelcase”.

If an automated solution is implemented one of the benefits should be the ability to quickly and easily access data. Ideally, a statistical approach should be taken to monitor the manufacturing process. Gaging should support on-going capability as well as what-if capability studies. This will allow engineering to investigate new manufacturing processes or innovative product designs and how these changes can affect the manufacturing process. Several useful tools such as Design of Experiment studies or Process Qualification studies should be supported by your gaging solution.

The use of a statistical analysis approach can allow processes that are starting to drift to be detected prior to the production of bad parts. This alone could justify the investment in automated gaging depending on the cost of scrapping or re-working parts.

The final area of cost savings should be in labor reduction. An automated gaging solution should require less interaction with your shop floor personnel. This benefit is twofold. Less interaction means less chance for operator bias in your checks. Less interaction also mean less time involved with the check. Even a few minutes less time per check can add up to tens of thousands of dollars per year in labor savings.

## CONCLUSION

Automated shop floor inspection is going to replace traditional manual fixed gaging. The demands of higher quality and lower costs will force it to happen. The challenge is to implement a system that works best for your process. This means finding a flexible, reliable, and cost effective solution that can immediately demonstrate its advantages to both management and the production floor personnel who will be operating the equipment. If you address the eight areas discussed above a reliable cost effective solution can be found to replace the soon to be obsolete fixed gaging methodologies.

(Below is the entry way to a Steelcase plant showing the Pegasys on a wall mural)

