

UNLOCKING "BIG DATA" VALUE WITH CUTTING-EDGE SPC

ENGINEERING CASE STUDIES 02

ADVANCED SPC SIGNIFICANTLY INCREASES PROCESS AND QMS EFFICIENCY

Manufacturing Mastery Since 1924

Central Screw Products Company (CSP) is a 3rd generation machining company, founded in 1924. In 2009, CSP launched as Detroit Gun Works (DGW) as a dedicated division to serve the OEM firearms market. DGW is focused on mission critical machined parts, from difficult to machine materials, with a specialization in suppressor tubes and components.

DGW is a qualified Type 07 Federal Firearms Licensee and maintains a special occupation tax permit (SOT) to manufacture certain restricted items. In addition, Detroit Gun Works is ITAR registered, ISO 9001:2015 certified, and AS 9100 compliant.

Located in the greater Detroit area, DGW has a network of top-notch secondary processors for heat treat, platings, coatings, anodizing, black oxide, and many other processes.

More information at

www.detroitgunworks.com

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Effective process control defines the ongoing success of any precision manufacturing operation. At DGW, cutting-edge QDM (Quality Data Management) tools optimize and drive our internal workflow and QMS. These tools enable us to add real value to customer projects. With enhanced reporting, we save time, cut costs, and meet demanding lead times on complex projects.

Company-wide implementation of Zeiss PiWeb ODM unlocks the value of our data. The data offers critical insight into process metrics that surpass standard QMS requirements, and the end result is increased customer satisfaction and virtually no customer returns.

Unlike the spreadsheets used by most machine shops, our process metrics are logged and permanently archived into a database on our secure server. This library provides a valuable data management resource for customers and an essential reference for new and challenging projects.

OUR TOOLS AND MODULES

Zeiss PiWeb integrates seamlessly with our Zeiss Contura G2 CMM. Although the Zeiss Contura G2 natively outputs PiWeb reports as a standard QMS function, the application of Zeiss PiWeb across our entire operation enables us to identify patterns towards non-conformance early on in the process.

Each CNC work cell on our shop floor is a "smart" workstation, outputting real-time and actionable inspection data to operators in a clear and visual format.

Cp	Inspection Rate	Cpk		Number of Values	106	107	108	109
1.79	[100%]	-3.0532		46	● 137.8690	● 137.8767	● 137.6806	● 137.5
1.10	[100%]	-0.8809		46	● 4.9519	● 4.9522	● 4.9500	● 4.949
3.20	[1 in 30]	2.7157		46	● 1.3694	● 1.3686	● 1.3688	● 1.368
8.78	[Int. Only]	5.2337		46	● 1.2768	● 1.2761	● 1.2761	● 1.276
3.70	[Int. Only]	3.3546		46	● 68.0445	● 68.0458	● 68.0668	● 68.04
0.76	[100%]	0.6600		46	● 5.7000	● 5.7000	● 5.7001	● 5.700
2.52	[1 in 30]	2.0927		46	● 1.5020	● 1.5021	● 1.5026	● 1.501

We understand effective data collection and corrective action relies on a shop-wide implementation of a robust system, not operator mastery alone.

Data collection and analysis on the shop floor occurs through two templates on separate displays at every work cell. Our input report collects data from the operator directly. Caliper measurements, for example, display a clear visual code as the operator enters them: green = within tolerance and control limits, yellow = outside of control limits, red = out of tolerance. Before the operator even submits this data record to the database, immediate feedback is available. The system avoids the risk of manual data entry and human error.

The second template used at every smart workstation is our output report. By default, this displays the last 30 measurements, but each operator can configure the report to show as few or as many results as desired, all at the press of a button.

This output report has profoundly changed the way we manage our production operations. The data displayed includes a visual plot of the measurements (i.e., Average-Min-Max-CP-CPK). Additionally, we developed an algorithm that shows the checking frequency of each production characteristic based on the potential risk of producing a non-conforming part.

Our inspection systems are dynamic and based on process controls, increasing our efficiency without sacrificing quality. DGW has transformed from a company that finds non-conformance to one that uses SPC as a predictive model. We identify trends that show risk of exceeding tolerance and preemptively correct issues.

Our production and quality systems are designed to achieve a predictive process as opposed to a reactive state where questions of methodology or calibration come only after a non-conformance has already been produced.

SMART DATA MANAGEMENT

Data collection and reporting with [Zeiss PiWeb](#) produces a substantial increase in operator efficiency by streamlining in-process inspection with live functional checks and comparative measurements. Data drives our operational decisions, resulting in a lean process where every key metric provides critical feedback.

With so many authors to our quality database, we exercise traceability and understand the difference between operator-generated measurements versus measurements produced by a probe or CMM.

Each PiWeb measurement record is archived and tagged with configurable meta-data. Naturally, this includes date and time, but also CNC work-cell identifier, material type, lot number, and operator name. Our output reports can be filtered for any combination of these meta-data characteristics, allowing permanent traceability for data sets that can be easily accessed.

When we look at measurements collected by the operator, CMM, and [Keyence Instant Measurement System](#) in unison, we can quickly identify outliers. While measuring a critical characteristic up to three times may sound excessive, it ensures our methodology is sound and keeps our measurement tools calibrated and operational. Inconsistencies between data collected across different measuring devices point towards flawed methodology, inadequate operator training, or damaged gauging.

A smart integrated ecosystem for data collection using [Zeiss PiWeb](#) in unison with other tools is the standard operating procedure in our production operation.

Naturally, [Zeiss PiWeb](#) synchs fully with our [Zeiss Contura G2 CMM](#). But, using some creative workarounds, we have successfully integrated PiWeb with our [Keyence Instant Measurement System](#) to import QDAS (Qualitative Data Analysis Software) data directly into our database with 100% automation.

By maintaining close working relations with Zeiss technicians, we also designed and implemented a spreadsheet importer. Now any part of our supply or secondary operations chain that uses spreadsheets for full layouts can submit data, which we automatically import and cache permanently as part of our PiWeb database and archive.



CONCLUSION: BETTER DATA DRIVES BETTER RESULTS

Like the famous blues song says, "It ain't what you got, it's what you do with what you got!" It's not just about capturing data; it's how the data is effectively utilized to add real value. Since expanding [PiWeb ODM](#) exclusively from CMM operations to our entire production ecosystem we have seen our database archive grow from thousands to millions of measurements. Historically, this was data we were always collecting, but not using to its fullest potential.

The company-wide adoption of enhanced statistical process controls at DGW has been a tremendous success. It has streamlined our internal processes while simultaneously allowing us to tackle highly-complex projects with no regression in quality as we increase production capacity or complexity.

Your data has real value. Let us show you how QDM is used to produce superior parts in shorter lead times with higher quality at DGW!



DETROIT GUN WORKS



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[Zeiss Contura G2 CMM](#)

[Keyence IM System](#)

[Zeiss PiWeb](#)

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Check out our openings at www.detroitgunworks.com/careers



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