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WHITEPAPER

# 5 Bottom- Line Benefits of Statistical Process Control

Use SPC to reduce the cost of quality and improve profitability.

**InfinityQS**<sup>®</sup>  
Quality Re-imagined



## SPC Benefits Don't End with Control Charts.

The benefits of **Statistical Process Control (SPC)** start on the plant floor. Real-time data, displayed in control charts, provide immediate feedback to operators, enabling them to assess production line performance, quickly identify significant process changes, reduce manufacturing variability, and ensure product consistency.

However, the most successful SPC software deployments are those that **enable engineers, quality professionals, and managers to make extensive, high-level improvements across their operations**. The same data that operators use on the plant floor can be repurposed and aggregated across processes, products—even across multiple plants—to generate high-level insights that quality professionals could never produce using control charts alone.

**These extended benefits of SPC touch nearly every part of a manufacturing organization and yield dramatic improvements in profitability.** Modern, affordable software solutions enable you to leverage these extended SPC benefits through advanced analytics—made **accessible in the cloud by Software-as-a-Service (SaaS) solutions**.

## Where Are Your Biggest Opportunities?

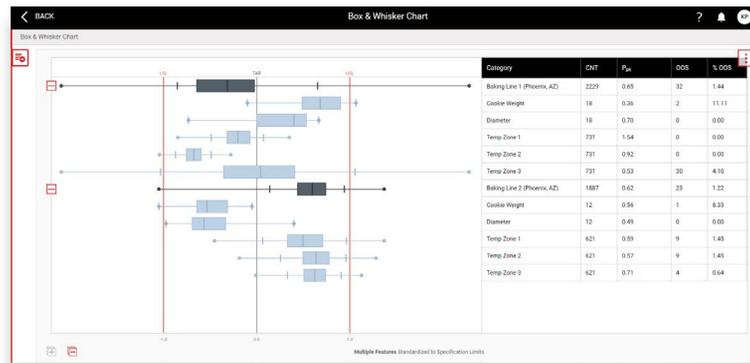
For many manufacturing quality professionals, that question is hard to answer, in part because they aren't aware of how SPC can provide insights into deeper operational layers across all their plants.

Read on to gain an understanding of how you can begin to shift the way you think about—and use—the SPC data you already collect.

## Instant Operator Feedback and Actionable Information

Operators on a plant floor use **SPC-based control charts** in much the same way that healthcare providers use an electrocardiogram (EKG). When the EKG indicates changes in heart electrical activity such as abnormal spikes or lapses in rhythm, the provider can quickly intervene to address the potential health issue.

Likewise, control charts enable operators to assess the health of their machinery, processes, and products. Real-time **SPC software alerts operators** to abnormal situations that could negatively affect the quality of the products they produce, enabling a quick response.

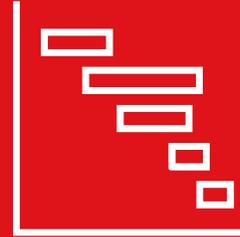


Operators typically use multiple control charts to manage a variety of product features and characteristics (e.g., width, height, length, diameter), as well as process-specific features such as spindle speeds, temperatures, fill heights, and dwell time.

For example, say an operator works in a factory making chocolate candy bars. To the operator and to the company, bar weight is critically important. Regulatory requirements and consumers expect each bar to meet a minimum weight. Often, manufacturers compensate by filling each bar slightly over that minimum. However,

that **“giveaway” translates to higher ingredient costs and lower profits**. Weights need to be just right—not too heavy or too light; machines and processes need to be carefully controlled.

When operators receive information about process variation in real time, they can take immediate corrective action, preventing potentially bigger issues (and costs).



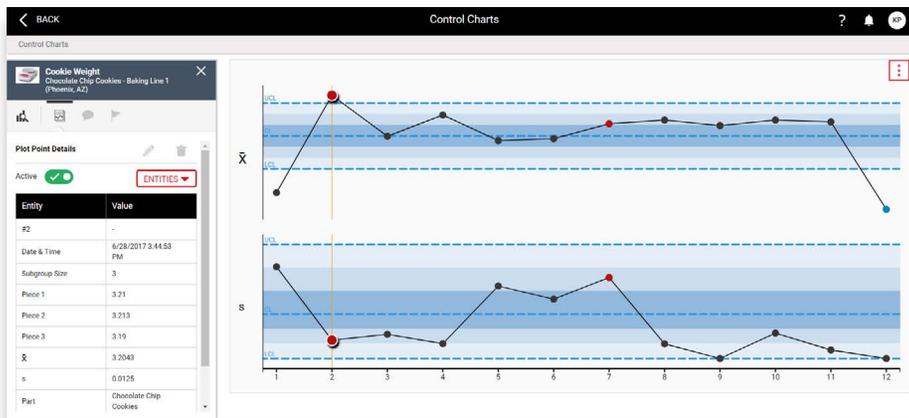
***Control charts alert operators to abnormal situations that could negatively affect product quality.***



## Enhanced Problem Solving

Real-time data, shown visually in control charts, enables operators to continually monitor the production line and ensure critical product characteristics are consistent. **But there's more to learn from SPC data.**

Specific plot point patterns in control charts help operators and quality managers determine the type and source of problems, enhancing their understanding of the process's behavior and enabling them to solve problems quickly.



For example, if a plot point suddenly exceeds a control limit, operators know that something atypical has happened, and immediate action is required to address what changed.

If plot points have steadily increased or decreased over time, the cause might be completely different underlying issue.

**Visual patterns highlight events and empower operators, engineers, and quality professionals to effectively identify and solve problems.**

## Eliminating Critical Defects

A folding carton company provided paperboard boxes for a large consumer goods company. The consumer goods customer was unhappy because the boxes it received were flawed enough that they were causing shutdowns in their own machines. The issues had compounded to the point that **the customer began charging the carton provider** thousands of dollars per hour for downtime that resulted from the folding carton company's quality problems.

To address these quality issues, the company deployed SPC software on their folder-gluer—the last important step in folding carton manufacturing—and trained their operators to read the SPC-based control charts.

Soon, a folder-gluer machine operator spotted a point on a chart that fell below the control limit, indicating a significantly lower-than-expected value. He immediately said, **“That’s weird. If the value is that low, then the machine should be jammed, but it’s not.”**

He looked under the machine where he thought the jam should be. Sure enough, he found a small jam that wasn't enough to stop the machine but was causing a significant performance problem for the cartons coming off the machine from that point.

**The information from the control chart, coupled with the operator's experience, told him where to look to uncover the problem.** The addition of SPC to the process enabled the operator to:

- Identify a major issue that otherwise could have gone unnoticed indefinitely
- Resolve the problem quickly
- Prevent a very expensive situation from getting much, much worse

**Most important, the customer never received any of the defective cartons.**

## Ensure Product Consistency—Now and Over Time

In manufacturing, **product uniformity is essential** for:

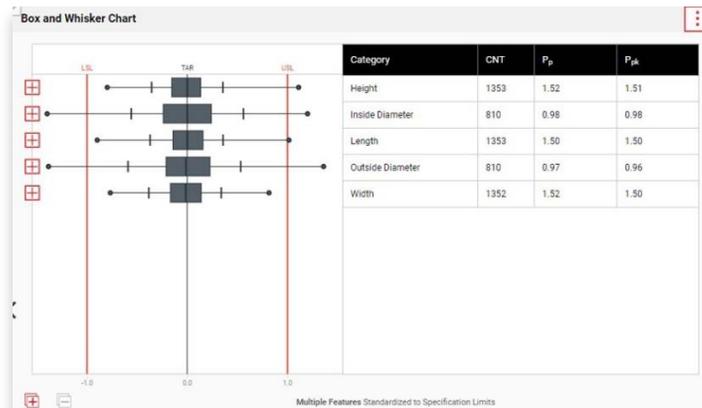
- Cost savings that comes from preventing scrap, rework, and overfill
- Ongoing customer satisfaction
- Compliance with regulatory standards

But producing a consistent, uniform product is harder when you have multiple lines—or multiple plants.

Modern SPC software provides precise data that enables manufacturers to tighten processes, so they are not just “in spec” but **hitting specification targets**. Cloud-based SaaS software makes that data accessible across locations, so every line and plant can be aiming for the same targets.

### Spec Limits vs. Target: Where to Focus

Engineers define specification limits as a means of defining customer requirements. Spec limits also provide guidance for the fit, form, or function of product characteristics. Technically, if parts are manufactured within the upper and lower spec limits, the final product should function as intended.



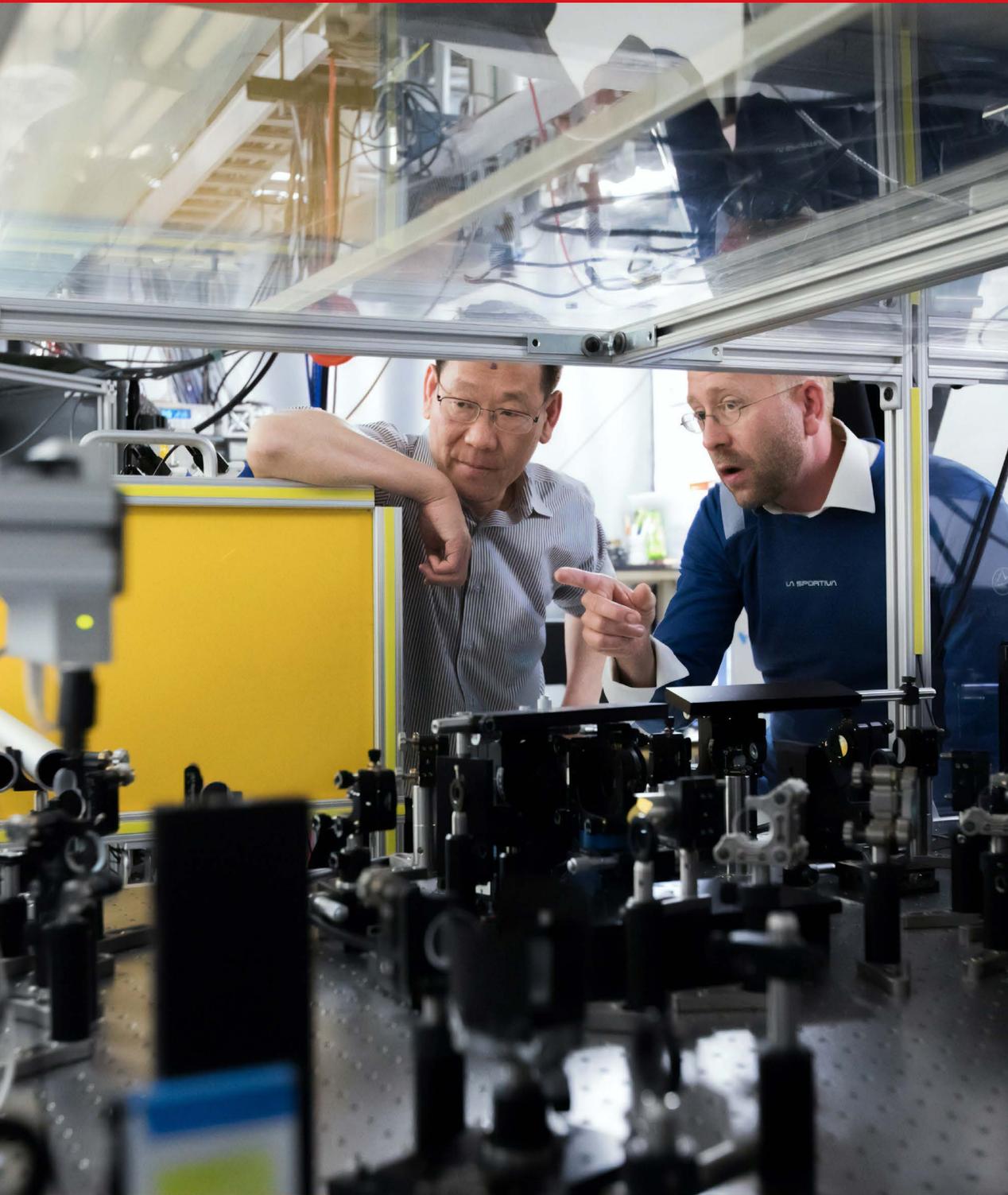
What about the target? Generally, **targets represent the ideal** characteristics of the feature. Since perfection is unattainable and variation is inherent in all manufacturing processes, upper and lower specification limits represent the amount of allowable variation before fit, form, or function will either degrade or fail.

**Quality is all about minimizing variation around the target.** The ultimate goal is to uncover and remove the sources of variation present in every manufacturing operation.

When manufacturers continually reduce variation around the target, product quality increases, costs go down, and out-of-spec products are less likely. The pursuit of quality, focusing on targets instead of spec limits, reduces the costs of operations.

*Use SPC to minimize variability around targets, increase product quality, and ensure consistency—across processes, lines, and plants.*





## Saving Costs and Reputation

How much difference can consistency make? For many manufacturers, their brand and reputation depend on it.

For example, a major manufacturer of automobile transmissions encountered a **spike in warranty claims** for transmission problems about two years after the rollout of a new vehicle. The transmissions in the claims were being made in two different locations. While the quality guidelines were identical, the machinery used to manufacture the products was different in each plant.

Inspection of transmissions and their detail parts from each location revealed that all the transmissions from **both plants were within specification limits**. However:

- At Plant A, critical dimensions of various parts from the transmissions were close to engineering targets and exhibited little variation.
- At Plant B, the parts showed far greater variation, even though all parts fell within the specification limits.

As a result, **Plant B had significantly higher warranty claims than Plant A.**

## Lower Your Costs—Even When Nothing is Out of Spec

Ever heard of a manufacturing operation that is so good that it doesn't produce out-of-spec products? While unusual, they exist. These organizations are generally satisfied with their performance and believe there is little they can do to improve it.

Yet, some of the greatest bottom-line quality results come from these companies. **Even when everything is produced within specifications, they still find big opportunities for reducing costs.**

Consider the example of a spirits manufacturer that was skeptical about using SPC to manage quality. Their rationale? "We haven't had any products fall out of spec for an entire year. What could we improve?"

From supply chain (raw material or component inputs) to packaging, supply chain logistics to distribution, and energy to equipment, your cost base is largely influenced by factors such as waste, rework, efficiency, productivity, and yield.

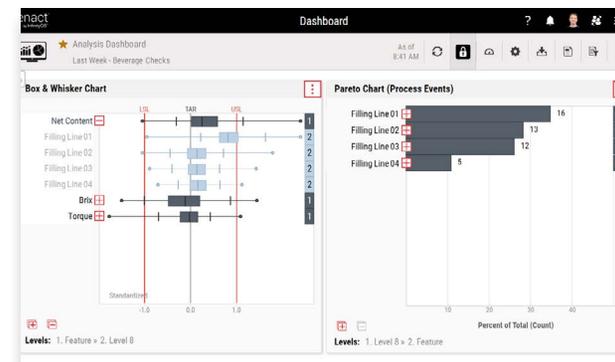
Their production lines used more than 30 rotary head fillers to fill thousands of bottles per hour. The company had to meet the minimum fill volumes stated on the bottle labels. Because the liquid spirits were so expensive to produce, they also tried to minimize overfill. **They decided to use SPC to understand where there might be variations across all their fillers.**

To calculate exact fill volumes, an operator randomly selected five filled bottles every 30 minutes, weighed them, and subtracted the tare (unladen) weights. Over several weeks of data collection, the quality team was proud to report—as expected—that no fill volumes exceeded either the upper or lower specification limit. Everything was in spec.

However, the plant manager was adamant about cost savings and urged the team to look closer. When the data was examined, it revealed that **every bottle was overfilled**—not to the point of spillage, but overfilled, nonetheless. 755 milliliters of a spirit in a 750-milliliter bottle doesn't seem like much; but when multiplied by thousands of bottles, **it's significant lost money for the manufacturer.**

The quality team turned to their SPC software to analyze the variables that could affect fill performance. Statistical tools such as **Box and Whisker charts** (and others) allowed the team to analyze and compare fill volumes by machine, fill head, shift, day of the week, product code, and other variables. When aggregated over time the data revealed where unnecessary variation was affecting fill volumes.

The spirit manufacturer uncovered **multiple significant sources of variability**. For example, every fill head performed slightly differently, resulting in inconsistent fill volumes from one head to the next. Further, there were differences in fill volumes from one shift to the next and from one bottle size to another.



To control the primary sources of variation, the team:

- Put in place Standard Operating Procedures (SOPs)
- Adjusted fill heads
- Performed maintenance items to better control fill volumes in each bottle

**In the end, the savings from overfill alone exceeded \$800,000 a year on a single production line.**

Similar savings applied across all the plant's production lines would save them an estimated \$20 million dollars a year—savings realized on lines products that never exceeded a specification limit.

***For this bottler, nothing was out of spec. No waste, no scrap, no concern with exceeding specification limits. And yet, the savings for just one plant were extraordinary.***

## Pinpoint Opportunities for Improvement Across the Enterprise

When organizations make the mistake of relegating SPC solely to the plant floor, they eliminate the possibility of making huge improvements.

Plant floor data that you collect every day contains rich information. When organizations regularly review that data, they realize they have no idea:

- **How much variation is in their processes**
- **Where they have opportunities for significant improvements**
- **How much money they could save**

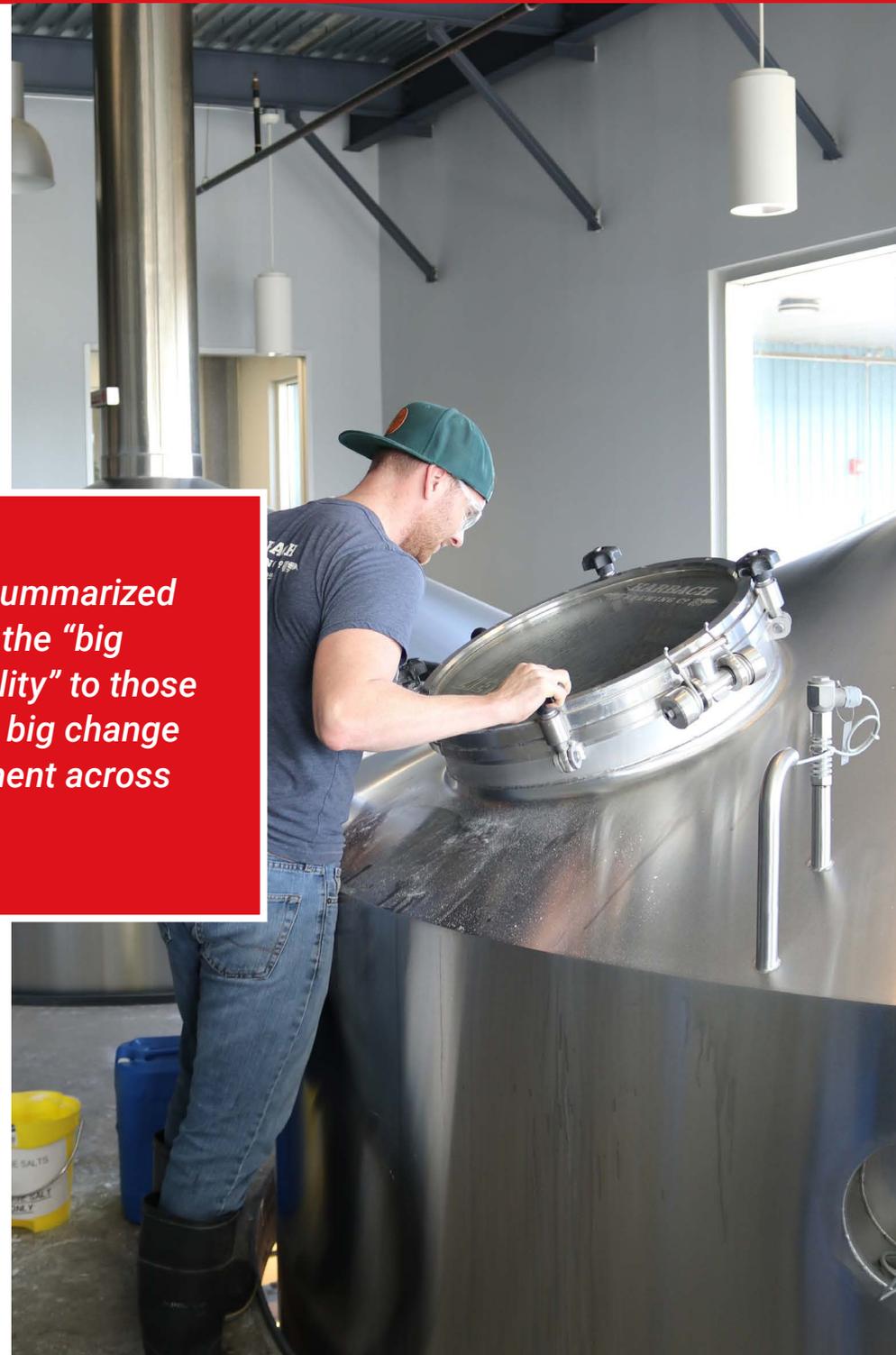
To reveal this kind of higher-level information, manufacturers must switch from a micro to a macro view of quality. Rather than focusing solely on the plant floor, they can leverage tools in modern SPC software to aggregate the data collected across multiple production lines, products, and plants.

SaaS systems typically house data from multiple plants in a single database repository, simplifying data access and analysis. Quality professionals, Six Sigma teams, and engineers can mine those data for insights that can yield extraordinary results:

- Ensuring that the most important quality issues are being identified and dealt with in an expeditious, intelligent manner
- Comparing not just product to product and line to line but also plant-to-plant
- Pinpointing and prioritizing opportunities for improvement across their entire operations

Because of the daily “firefight” of quality, high-level data aggregation and analysis are not commonplace for most manufacturers. But in today’s challenging modern manufacturing marketplace manufacturers need to make it a habit. They need to realize that it’s okay to hit the pause button, step away from the daily fires, and aggregate the data that they already have.

*Aggregated, summarized data provides the “big picture of quality” to those who can drive big change and improvement across all plants.*





## Transforming a Plant from Worst to First

A packaging manufacturer was going to shut down one of its plants because its **quality was the worst of more than 20 operations**.

The closure would have put hundreds of people out of work in a small community that couldn't afford such a hit. Before taking that step, management decided to install SPC software at the plant to discover whether there was any chance to improve quality.

By measuring critical characteristics and key performance indicators across all production lines and product codes in the facility, the management team uncovered a rich stream of information. By summarizing plant floor data and evaluating the big picture, plant management discovered high-level issues—as well as lots of improvement information—that enabled them to concentrate their efforts and improve quality on many levels.

**The result? In less than four months, the plant went from “worst to first” in quality across the entire corporation.**

The plant was saved from closing and their customers, impressed with the gains in quality, began ordering more products from the plant. It was a win-win situation for customers, management, employees, and the entire town.

This plant became a model for business performance improvement through the use of SPC-based quality intelligence. When the same efforts are applied across all the plants in a manufacturing enterprise, the management team gains a strategic advantage for improving performance—and the bottom line.

**That's the power of aggregated, summarized data. It provides the “big picture of quality” to those who can drive big change and improvement across all plants, even into the supply chain.**

## Explore the Transformative Benefits of SPC

One of the biggest mistakes organizations make is relegating SPC solely to the shop floor. When you intelligently leverage the quality-related data and information generated by an SPC system, you can improve business performance across your entire enterprise.

**The difference in cost savings alone will justify any quality investments.** Improving quality makes your company more competitive, enhances its reputation with customers, reduces warranty claims and customer service calls, and increases profitability. And uncovering opportunities for cost savings, waste reduction, and overall improvement directly improves the health of your bottom line.

In addition to dramatically lowering overall costs and improving efficiencies at the plant level, SPC can enable your organization to assess quality across all operations as you identify and prioritize strategic improvements that can result in a significant competitive advantage.

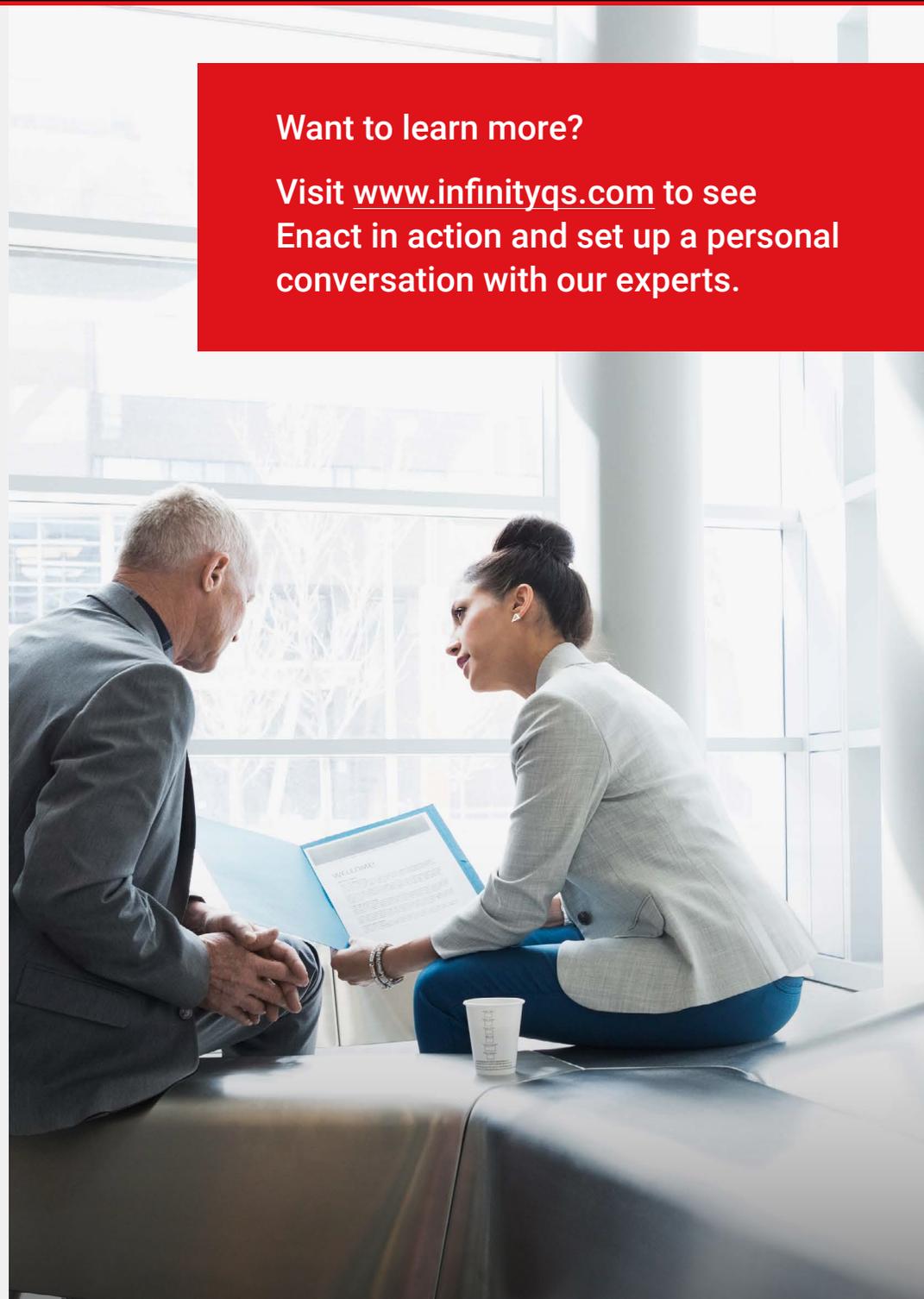
## Is it Time to Change the Way You Use SPC?

**If you're not sure where to find the greatest opportunities for improvement, or just don't know where to start, we can help.**

InfinityQS has cloud-native SPC-based quality solutions, industrial statisticians, and Six Sigma Black Belts on staff who can provide personalized consultation. They'll take a cross-section of your data, aggregate it with our Enact® Quality Intelligence platform, and pinpoint specific opportunities that will help you make a difference at your company.

Want to learn more?

Visit [www.infinityqs.com](http://www.infinityqs.com) to see Enact in action and set up a personal conversation with our experts.



## About InfinityQS

InfinityQS® is the leading global provider of Manufacturing Quality Intelligence software and services. Powered by a robust Statistical Process Control (SPC) analytics engine, the company's cloud-based Enact solution delivers unparalleled visibility and strategic insight across the enterprise, from the shop floor to the boardroom. This extensive deep-dive capability enables manufacturers to improve product quality; decrease cost and risk; improve compliance; and make strategic, data-driven business decisions. Headquartered near Washington, D.C. and with offices in Seattle, London, Delhi, and Beijing, InfinityQS has thousands of customers around the world, including Ball Corporation, Boston Scientific, Graham Packaging, and Medtronic.

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