# Quality on the rise in bakery manufacturing

Just like in your home kitchen, making a loaf of bread with consistent quality comes down to following a proven recipe. But in today's modern bakery, guaranteeing results involves far more than just setting the oven temperature and timer. With bread margins in single digits, tightening a bakery's operating efficiency and controlling weight variation down to a hundredth of an ounce are amongst the many key ingredients to product consistency and corporate profitability. While there are several

***Controlling weight variation down to a hundredth of an ounce is key to product consistency and profitability.***

Quality programs that are required in food manufacturing for regulatory compliance, such as SQF or ISO, leading bakery companies are looking to SPC methods to give rise to their bread margins and to ensure a consistent product for their customers.

Bakery plants often have eighty or more key variables throughout their processes that are considered critical quality control points. Many bakeries have already implemented control systems to help track the data. Testing technology has evolved to provide greater precision and capability via automated scales, inline check weighers, temperature probes and networks of connected PLCs, along with impressive inline vision systems to test parameters in real-time at each step, from mixing through slicing and packaging. However, without proper SPC methods in place, these bakery processes can continue to experience variation that drives up the overall cost of Quality. Lack of statistical process control often translates into excessive weight and giveaway, unnecessary raw material usage, additional inspection costs, and higher product defect rates.


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Attempting to apply SPC methods on paper or in Excel is a common starting point and a good educational experience for shop personnel to begin grasping fundamental SPC concepts and benefits. Paper charts and Excel reports can reveal hidden variation in a process and make a hero of an eager Quality Engineer. But the information may still not be timely or comprehensive in scope. Or be subject to inaccuracies in the data due to manual data entry errors. Furthermore, the inherent inefficiency of paper-based systems can expose the truth that even the most ambitious check sheet procedure captures only a fraction of the data that engineers and managers crave for continuous improvement projects. And the difficulty in maintaining individual Excel files often reveals similar shortcomings when it is scaled to production. Signs of frustration often begin to surface from management and engineers if they don't have access to all

the data they need when a problem arises; to properly analyze previous performance, nor adequate visibility into recent process trends that could be used to prevent out-of-specification conditions and costly product overweights.

An opportunity for bottom-line improvement is often achieved simply by moving from a paper-based (or Excel) system to a real-time, automated solution. **The magnitude of savings possible from making such a move can be assessed by considering the following when using a manual system:**

- **How long does it take to detect and respond to assignable cause variation?**
- **How much time is spent daily or weekly managing data on paper or in spreadsheets and generating regular reports?**
- **Are the production lines capable of consistently running according to specifications?**
- **How much is variation costing the company and how much could be saved if variation could be reduced?**

Most often, the answers to these questions reveal that substantial process and financial improvement is possible through the implementation of an automated SPC system. To further demonstrate the opportunities for improvement that a real-time SPC system offers, the following describes the implementation of a data collection and SPC system at a leading multi-site bakery.

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## CUSTOMER STORY

The Quality team at a well-established bakery had long recognized that yeast temperatures, flour temperatures, and chill water temperatures at the beginning of the process in sponge and dough mixing were key inputs impacting final product quality The team likewise knew that uniformity of dough ball weights coming from each divider was a crucial factor, as was the dry temperature, wet temperature and internal dough temperature at the proof box. The team also focused its efforts on monitoring oven temperatures and bake time, as well as a host of production parameters during the slicing and packaging operations, including bun dimensions and topping coverage.

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Although these numerous parameters had always been checked and recorded, with a paper-based tracking process, analytical and comparative reviews of performance were conducted only periodically and not on a daily basis. Consequently, the identification of control problems often came well after the product was affected.

Through the urging of the Quality team, the company implemented an SPC system with the critical goal of capturing data automatically from gauges, scales, check weighers, vision systems and other automated inspection equipment; then providing real-time feedback to the line operators at the point of production, before any parameter was out of specification. After the Quality team selected WinSPC software, they had the system implemented and fully operational within 30 days.

The Quality team was able to connect the software to production and inspection equipment using standard options built into WinSPC. By setting up the user interface to mimic the work flow of current inspection procedures, the line operators required less than 20 minutes of training to start collecting data and to begin monitoring the process using real-time charts. The Quality team configured rules and alarms for the mixing operations to track for a set number of points falling outside the target zone on the chart using standard SPC methods. The system showed simple onscreen visuals with color-coded alarms that prompted the operator to take specific action,

including entering a note. The system also automatically sent supervisors emails to help keep track of process status and trends. Operators immediately took to the system as they could capture data in less time and with less effort than entering the data into Excel or hand writing results on paper. Supervisors appreciated that responses to violations were immediate and that the corrective actions taken were recorded.

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The team set up similar SPC alerts for tracking dough ball weights. Dividers were adjusted based on de-

cision rules specific to the production equipment to help control material usage and overweights. Additional measurements were done by operators on scales near the divider, with automated outputs from the scale connected directly to PCs to save time capturing data and to ensure that the measurements were accurate. The system was set up to monitor dough temperatures with the proof time to ensure consistency prior to baking, and relative humidity was recorded into the system at the same time.

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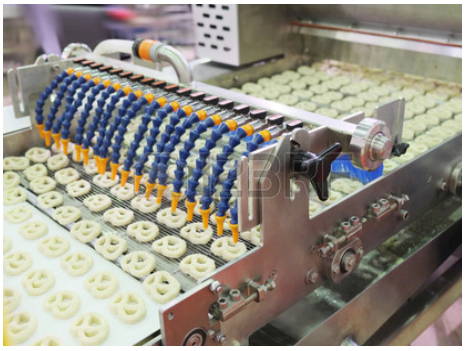

Just like at home, when watching the bread rise through a glass oven door, the first few minutes of baking and evaporation encompasses a critical stage of the baking process. The Quality team automated the tracking of oven temperatures against specification limits to confirm performance and to help identify whether a burner required maintenance. The bake time was recorded and evaluated for variation from target, and then the internal bread temperature after baking was tested to confirm that the gluten had done its job in giving the loaf its form and structure. Once the loaf cooled to the proper temperature and was ready for slicing and packaging, the system was used to track bun length, height and width, as well as record toppings measurements for consistent coverage and symmetry. The next step of sensory checks for smell and taste were evaluated and managed with the other quality data in the system. At final packaging, additional weight checks were entered into the system to validate that the proper label weights were achieved prior to shipping. This last step was a particular focus of analysis because it pointed to potential cost savings in previous process steps -- identifying possible process adjustments to control weight before volumes of bread are produced beyond target levels.

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WinSPC saved all of the production data into a central database to make it easy for engineers and managers to monitor activity across the plant using WinSPC dashboards to drill down to explore variation and special causes. Regular summary reports were generated with a single click for management meetings and sent to customers upon request, saving hours every week when compared to manually creating reports in Excel. The team started using the data analysis tools to analyze performance on recent runs and compare results to historic performance to find continuous improvement opportunities. As an example, Quality engineers filtered data by SKU, by variety, by run and by line to isolate sources of variation and then compared data sets by time period to look for changes week-to-week or month-to-month. The Quality team is now ready for the second phase of the project: to capture data on other process parameters, automate supplier COA's, and provide management with access to dashboard views that monitor the cost of variation in overweights using the functionality of the patented WinSPC Cost Inspector.

**Learn More** -- To learn more about DataNet Solutions contact your sales representative at 248.357.2200 or email sales@winspc.com



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