



case study | Beer Production Company

A North American brewing company uses LeanSigma® to improve yield, ensure quality and reduce costs.

> **client** | A North American brewing company that sells many well known brands of beer.

> **challenge** | In the face of anticipated growth, this beer manufacturer wanted to improve quality and meet customer demand while avoiding costly capital expansion.

> **solution** | Like any Food and Beverage process, beer production creates hidden issues that are difficult to pinpoint with intuition and eye sight alone. They engaged with TBM to save over two million dollars by reducing costly beer loss, standardize product color, and minimize wasteful reprocessing time.

> **results** | Over \$2 million in annualized savings and a 4x return on investment. Can fill losses were cut in half, from 1.6 percent to 0.80 percent. Beer loss between production processes was reduced from 1.8 percent to .45 percent and the gage R&R percentage of tolerance was drastically reduced from 214 percent to 7 percent. Process capability (Ppk) rose from 1.2 to 2.3, with ten times less rework. As the company dives deeper into the Sigma Kaizen process, it expects to drive even greater improvements.

Here is a question that will strike home with people all around the world: What if the beer taps all ran dry? Imagine if the increasingly popular brands of beer simply ran out.

Luckily, we have never come too close to this precipice. When any product enjoys a surge in popularity, capacity and delivery will naturally become issues. And then every manufacturer faces the same issue: to build new capacity quickly or focus on operational excellence. Our client, a North American beer manufacturer, chose to use LeanSigma® to drive new capacity and avoid new capital expenditures.



Using kaizen events and lean principles, the client made great improvements quickly in safety, delivery, quality and cost. In less than two years, this brewery had risen in status within the company from sixth-best plant to number two.

As with any continuous process industry company, a constant flow of carefully controlled product creates hidden issues, difficult to pinpoint with intuition and eyesight alone. And the client still had variation in its processes. Attacking those variations can affect big savings. If just .05 ounces of beer per can spills during a filling process, for instance, it creates an

annual waste of over 25,000, 12-ounce cans per year. This beer manufacturer turned to Sigma Kaizen events to address those hidden issues.

Management began early in 2004 with a bold agenda, targeting Sigma Kaizen projects to correct problems in can filling, beer loss between processes and product color. While there were five major issues tackled in those first months, we will explore these three Sigma Kaizen projects as we enter the world of statistical investigation and beer.

Can Fill

Every minute or so in this brewery, 1,200 thin aluminum cans are filled by around 100 nozzles of a 20-year-old beer dispensing machine. During those two decades of operation, management had become accustomed to the fact that beer would spill over on some cans and under fill others, creating waste. Entire cans that were not quite filled and deemed out-of-spec were wasted. Due to the high speed of the filling machine, even a careful observer with the help of a video camera will not be able to detect a nozzle with a small problem. To pinpoint the problem, a different methodology was needed.

After training in LeanSigma principles, creating a quality map and observing the operation to collect live data, the team tested for equal variances to find the exact location of abnormalities within the nozzle subassembly. Using statistical tools, team members found that they could pinpoint the problem, relay the information to maintenance and save a lot of beer. In fact, losses were cut in half due to this project, from 1.6 percent total loss to 0.80 percent. This represents a savings of about \$160,000 annually.

> About the TBM Food and Beverage Practice

Food and beverage companies that embrace a LeanSigma business system generally achieve double-digit productivity and quality improvements. They are able to leverage operating cost advantages over their competitors and invest those savings in other areas of the business. TBM Consulting Group understands the unique needs of companies who are food manufacturers. We have a team dedicated to helping these companies remove capacity constraints, eliminate unplanned downtime, improve raw material yield, reduce give-aways, reduce wasteful energy costs, and minimize consumer complaints and product rejects. Please call Stephen Smith, Managing Director and Global Practice Leader, Food and Beverage, for more information about TBM.

> Read a White Paper

Read this white paper to learn how small improvements in raw material yield can make big improvements in bottom-line profitability. Find out how they apply the DMAIC process to reduce project time—taking the “define-and-measure” phase to just one week. Review key steps in the process and see how food manufacturers can realize one-to-two percent of annual sales by improving raw material utilization. Download the white paper, *Small Improvements in Raw Material Yield Make Big Improvements to Bottom-Line Profitability*, at the TBM website: <http://www.tbmcg.com/DMAIC>.

“We’ve learned to attack historical problems differently – quickly and successfully this time.”

“Now, we can calculate the standard deviation to evaluate valve performance and make decisions without administration support, which is a very good change. And this is just the beginning! We’ll involve more and more people in Sigma Kaizen events to increase the education level.”



Beer Loss

As beer traveled from one process to the next — from the head tank, for instance, to the filling machine — a certain amount always simply vanished. A 1.8 percent loss from the final brewing process to bottling was the focus of the Beer Loss project. As in most cases, there was no single culprit.

After a Sigma Kaizen team was trained, members worked together on a quality map, spaghetti map and capability analysis. But it was on the shop floor, through observation, that the first breakthrough occurred. Before a batch of freshly brewed beer was released to bottling or the can-fill process, it was measured by a very simple method: visually. The operator would note the volume of beer in the tank through a small window and note the amount. Of course, the amount noted

would change from one operator to the next, depending on the angle from which they viewed the measuring window. A taller operator might see less beer, for example.

Another more sophisticated measuring system was also in place, but it had never been used due to the fact that it had not been installed correctly. One sub-team worked hard to correct the installation on the second measuring system and demonstrated that it worked very well and was more consistent — an advantage in an environment of tight government controls and taxation.

The second improvement came about as team members noticed that the nozzles on a bottle filling machine spit a small amount of liquid between each bottle it filled. Each “spit” was very small, but when approximately a million bottles of beer are being filled in a year, that small amount adds up. After the team pinpointed the problem and its source and, after demonstrating by using special experiments and data that it would have no significant influence on all of the quality characteristics of the beer, changed the machine’s software to prevent it from spitting, the final result was impressive. The rate of beer loss between processes dropped from 1.8 percent 0.45 percent.

“What we learned is to always review the facts with live data and that all questions have answers,” said a Six Sigma black belt who works in the brewery’s Human Resources Office.



Color

Aesthetically it makes sense for all beer of a particular brand to have a uniform color — color is a critical characteristic because it's something we as consumers can see.

Color analysis can also serve as a warning to a brewer of some irregularity in the brewing process, even when all other physical analyses appear normal.

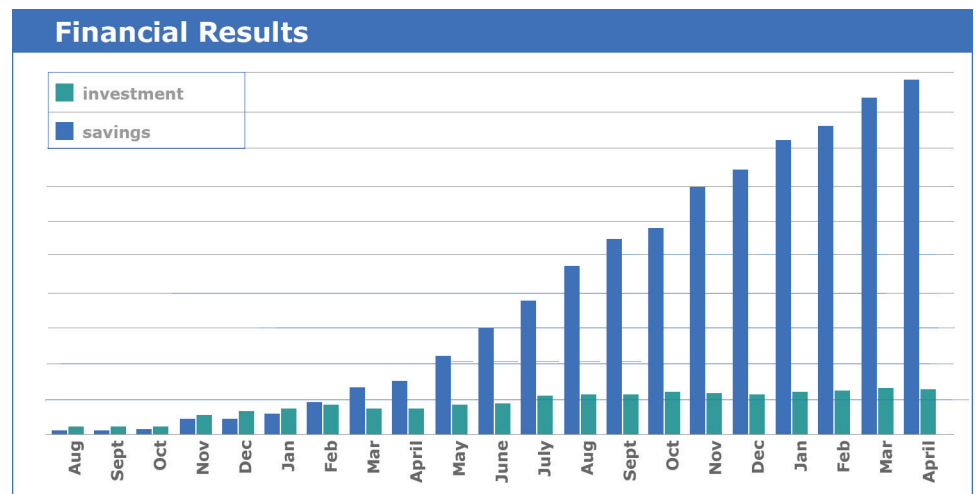
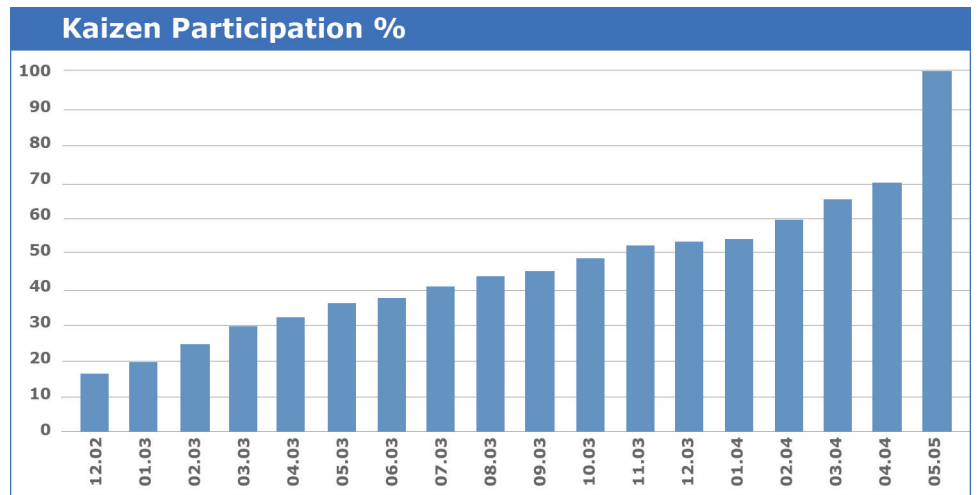
The color measurement system in use at the plant was supposed to be valid, but the Sigma Kaizen team demonstrated that different operators obtained wildly different results depending on the measurement method and the volume of beer measured.

To improve color measurement, several steps were taken, starting with observations, followed by small three-parameter designs of experiment and final optimization of the main factor study. The result of taking these steps was a change in standard operations, much greater visual control and an extensive training program to insure measurement consistency from operator to operator.



The final outcome was that the gage R&R percentage of tolerance was drastically reduced from a disastrous 214 percent to a very good 7 percent. “Measure was the major improvement in this exercise, but the discovery of a lot of opportunities for statistically significant sources of future improvements was the biggest lesson learned,” said Hugo Diaz, the site TPM coordinator and leader of this team. “We now have a lot less reprocessing as a result of color issues,” he added.

After the Sigma Kaizen event, the process capability (Ppk) rose from 1.2 to 2.3, with 10



times less rework operations, which represents a significant return on investment and is a direct result of better color control. That's something to think about when you view the sunlight through a glass of cold beer on a hot summer evening.

Since these first successes, the client has expanded Sigma Kaizen activities to other upstream processes involved in transforming malt into beer. One process that has been studied for instance is the time required for the fermentation process. Patience was required to collect data for this study, as the unit of measure was days!

One of the overarching lessons learned by the various team members was that there are answers to the unique problems encountered in a process industry and that no

problem no matter how entrenched or historical needs to be lived with. The power of the kaizen process, with the help of the statistical and graphical tools of the Six Sigma methodology to build the Sigma Kaizen tactics and strategies, is key to speeding up improvement, and in the case of this client, in finding ways to improve quality and meet increased demand without investing more capital to build new capacity fast.

> **About TBM Consulting Group**

TBM Consulting Group, Inc. is the leading provider of LeanSigma® consulting and training services in North and South America, Europe and Asia. The company's mission is helping manufacturers and service industry businesses create a competitive advantage to generate significant growth in sales and earnings. The company provides the strategic direction and hands-on implementation to guide cultural and organizational transformation.



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