



Sloan Consulting

PRODUCTIVITY, QUALITY, INFORMATION AND BUSINESS SYSTEM SOLUTIONS

Breakthrough Case Study in Success

Business Excellence, Lean, Operational Excellence, and Six Sigma use science to solve business problems. Solutions improve profits. Six Sigma's classic **Define, Measure, Analyze, Improve, and Control (DMAIC)** cycle is handy way to summarize success.

PROJECT: Extrusion Process Improvement in 3-Dimensions

Issue: An ISO certified, multinational, extrusion process manufacturer needed to develop a capacity to quickly alter its production processes to meet changing customer tolerance specifications and other design changes.

The key customer was one of the “big three” American automobile manufacturers. Given the exceptional competitive pressures of the late 1990's, any failure to stay abreast of and create capable processes for meeting customer specs placed their core, \$100 million annual business at risk.

Success in this project was mandatory. The need to retain a \$50 million per year customer meant that the quality council approved this project without a detailed spreadsheet analysis.

Breakthrough DMAIC Strategy, Tactics, and Results

Define: One of their North American plants needed to optimize the bonding of non-woven fleece with the softest hand. In addition, tensile strength, in both machine and elongation direction, isotropic distribution strength, and other physical properties were of immediate interest. Suspected causes (hypotheses) for the product variations included:

- Hypothesis 1 (H_1): Machine process speed, either 2.0 meters per minute or 4.0 meters per minute, had an effect on all physical properties.
- Hypothesis 2 (H_2): The weight of the fabric, prior to the bonding, either 17g/m^2 or 34g/m^2 , had an effect on critical to quality characteristics.
- Hypothesis 3 (H_3) The pressure applied to the product during the production process influenced critical to quality characteristics that were integral to process capability and the customer's tolerance specifications.

Measure: This project – including the production of a Power Point show for senior management - was completed over a period of two days during a nine-month long Black Belt education and training session. Black Belt candidates learned how to use on-line and live Designed Experiments, the Analysis of Variance (ANOVA), scatter diagrams with their regression analyses, quality control charts, data mining, financial simulation and process modeling tools.

Working with appropriate analytic software and under the direction of Mr. Sloan, the hands-on Master Black Belt, a two level, three factor 2^3 designed experiment was created to quantify main effects, two and three factor interactions in the non-woven fabric manufacturing process. This particular plant had a miniature, pilot production line (in effect, a laboratory) which had been built and never-ever used for research until this Six Sigma project.

Analyze: The statistically or economically significant effects which emerged immediately from the first 8 runs of the full factorial experiment. The total cost of the 8 screening experiments and 8 confirmation experiments conducted that morning was \$640. By the manufacturer's estimate, doing the same experiments on the production floor using their traditional methods would have cost \$50,000.

Improve: Experimental results were applied with excellent results. The data produced forged closer relationships between this manufacturer and their primary customer.

Control: All three shifts were trained to produce the new higher quality product using data produced through designed experimentation and the pilot plant.

Financial Results: To understate the value of this project, one morning's worth of work produced a fully animated process flow diagram, 8 different product samples which exhibited not only the best outcome desired product, but also samples of one of the worst outcome products that had cost the company millions in warranty costs, all for only \$640 dollars! The problems were solved.

Total project time, not counting the Power Point sales pitch for breakthrough improvement and the backdrop of an in-progress Black Belt class, was about four hours from start to finish. To demonstrate the point we decided *before* we began to time the entire experimental process with a stopwatch.

Six Sigma can be this fast and this powerful when there is senior management support.

