

CASE STUDY

Nidar

**RESOLVING QUALITY ISSUES IN
FOOD MANUFACTURING WITH
ADVANCED DATA ANALYSIS**

Makers of

The Unscrambler[®] X



CAMO

Bring data to life

Chocolate production consists of several process steps where both raw material quality and storage conditions influence the final product quality. Although chocolate making today is largely based on science such as chemistry and food technology, the 'human touch' and flair based on many years of domain-specific knowledge remains an essential ingredient in the process.

THE CHALLENGE

Nidar AS is a major Norwegian chocolate producer with a 39,000 m² production plant and 15,000 m² of warehousing. Their factory has eight production lines which can produce a wide range of sweets. Over many years, Nidar has invested heavily to make their production processes more efficient, with a continual focus on improving efficiency, quality and health, safety & environmental performance.

Despite the investment in their production processes, the company began experiencing a quality problem in one of their product lines, forcing them to regularly scrap batches. From a business perspective, this resulted in significant waste, downtime, energy use and re-work costs.

While Nidar had long experience using The Unscrambler® software for analyzing sensory data in product development, the application of multivariate analysis methods in process control was new to the company. However, when the quality issue arose, it was evident that to fully understand the complex variables at play, multivariate methods and Design of Experiments (DoE) strategies were required.

THE SOLUTION

To resolve the quality issue, Nidar implemented the following 3-step process:

1. Analyzed historical data with multivariate models

A number of batches, both with and without quality problems, were selected and the process data from each was analyzed with multivariate regression methods and Principal Component Analysis using The Unscrambler® software.

The results of this analysis gave Nidar valuable insights, enabling them to develop more informed hypothesis as to the cause of the quality issue.

2. Applied Experimental Design in full scale production

Secondly, the team at Nidar realized that designed experiments were necessary to fully understand the issues and isolate specific problems. This began by investigating the various steps

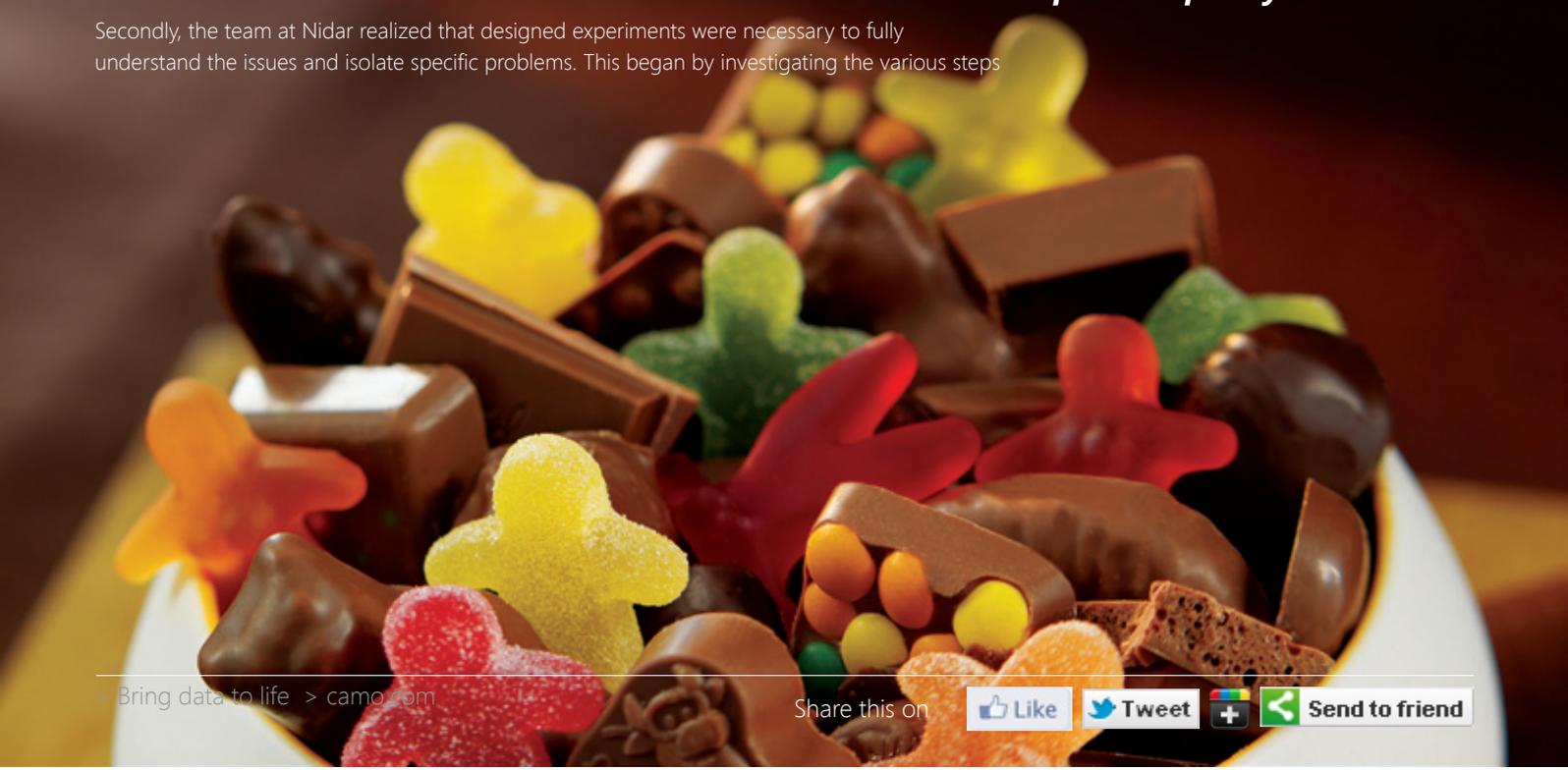
Industry: Chocolate & sweets manufacturing

CAMO Product: The Unscrambler® X

Executive Summary

- > **The challenge:** Quality issue resulting in a large amount of end product being scrapped
- > **The solution:** Used multivariate data analysis and Designed Experiments to identify and manage the variables causing the quality problem
- > **Methods used:** Principal Component Analysis (PCA), various regression methods, Fractional factorial designs
- > **The result:** Resolved the quality problem, enabling Nidar to reduce waste and process failures, saving approximately \$1M per year. The newfound knowledge was transferred to other production lines.

Nidar turned to multivariate analysis to get a deeper understanding and quantify their 'gut feel' of which process variables - and the relationships between them - determined product quality.





As no conclusions could be made without variations in the data to compare, they had to stretch the process settings in different directions, occasionally allowing some batches to be scrapped in order to find the operational envelope where the process was stable even when subjected to changes.

The next phase was to implement experimental plans for important variables across the entire production chain. This analysis revealed that the process of making the chocolate could not be viewed as an isolated event.

For example, the speed at which the process was running was important for the production volume, thus this variable could be regarded both as a critical process variable as well as a response variable in terms of efficiency. Furthermore, the process settings when filling and cooling the product had interactions with the storage conditions such as temperature, time and humidity.

3. Implemented changes in the process settings

Based on the conclusions from the above steps, Nidar implemented changes in the process settings, allowing them to bring production back in line and consistently produce a high quality product which was robust towards changes in the raw material and other factors which may vary without the ability to control them.

“Using The Unscrambler, we were able to identify the critical process variables and how they interact with each other. This gave us better process knowledge which we have transferred to other manufacturing processes”

Siri Sølberg, Senior Process Engineer, Nidar AS

THE RESULT

The manufacturing of chocolate is a complex process which involves measurements of the raw materials, characterizing the intermediate product, understanding the key process parameters influencing final product quality and correct storage of the product. Multivariate data analysis used in combination with Design of Experiments enabled the product quality department at Nidar to get a better understanding and view of the whole process which was used to resolve a difficult quality problem.

From a business perspective, this enabled the company to save \$1M per year on one production line alone. Importantly, the conclusions and knowledge gained from this process were transferred to other production lines and gave valuable insights across the business.

The Unscrambler® software, together with the deep experience and knowledge of the Nidar team, enabled them to deliver on their uncompromising commitment to making quality chocolate and sweets.

At a glance: Nidar AS

- > Nidar’s strategy is to develop sweets for the Norwegian palate, achieved through analysis of Norwegian taste preferences.
- > Nidar produces all types of sweets including chocolates, jelly babies, jellied sweets, caramels, liquorice products, boxed chocolates, marzipan and pastilles.
- > Nidar has a wide range of leading brands including Stratos, Laban, Smash!, Troika, Crispo, IFA, Doc’ Halslinsler, New Energy, Bocca, Bamsemums, Smørbrukk and Extra.
- > Nidar is the largest supplier of sweets to the Norwegian market, with sales in 2006 of NOK 1089 million, approximately 500 employees and 33.2% market share (2007).
- > Nidar was established in 1912. Today, Nidar is a wholly owned subsidiary of Orkla and is a part of the group’s branded consumer goods division, Orkla Brands.

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