CASE STUDY

INCREASED PERFORMANCE IN INDUSTRY:

Data science for better visibility and assertive maintenance.

ST-One

CHALLENGE:

To develop a project that analyzes and optimizes the performance of a production line in a food industry, which was not operating at the ideal speed required.

SOLUTION:

The Solution embraces the installation of the ST-One Hardware in the central PLC, to collect data from the machinery that are part of the line. Subsequently, START™ is used to classify the main variables used in the production process and, with the help of STRUCT™, these are managed and assigned to the appropriate skills. Finally, the data become available on the dashboard from the STASH™ platform, in a dynamic and intelligent way.

GENERATED VALUE:

- Financial profit of approximately U$ 2 million;
- 16.7% increase in machine performance;
- Assertive maintenance, with the replacement of the right part;
- Less waste of supplies, by the delivery of the right amount of product according to the established parameters.
- Improvement in the quality of the product produced, with fewer errors in the next stages of production.

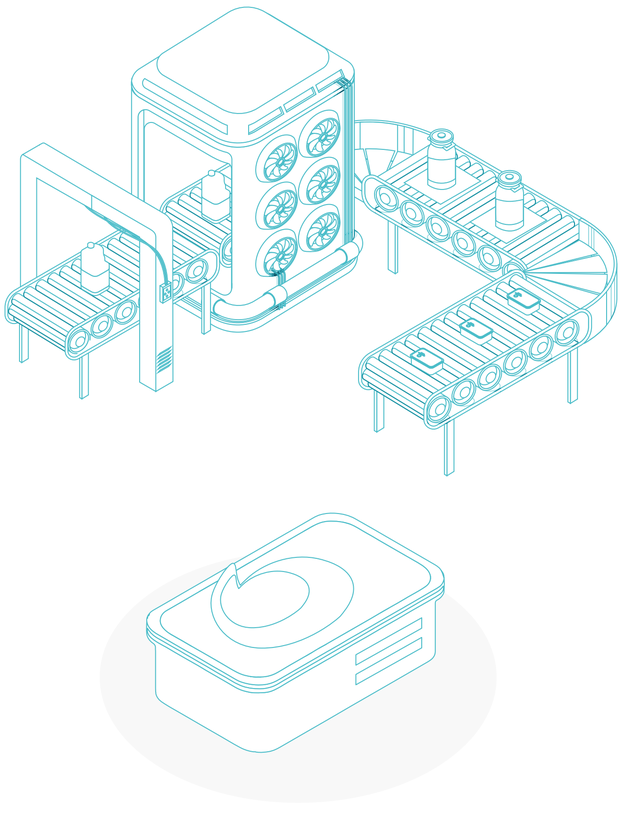
“When observing a difference in performance across the lines, we sought the ST-One Solution with the goal of having more visibility in the factory, in order to find the source of the problem.

(...) With the data collected, we solved issues involving product quality and had a profit of almost US$ 2 million in one year.”

- Continuous Improvement Group Lead.

PART I

OVERVIEW



Data science for better visibility
and assertive maintenance.

The client is a large multinational in the food industry, being considered a reference in the segment and with several headquarters spread all over the world.

Despite the variety of products produced by them, in this case the factory mentioned has cream cheese as its main food produced. The line has recently received investments aimed at digitalization and improvement in the product manufacturing process, which makes it more environmentally friendly and efficient.

The cream cheese manufacturing process encompasses several steps, from dealing with the milk, which is its main ingredient, to packaging the final product. In this context, the first production step is the controlled fermentation of the milk, intending to achieve the appropriate texture and flavor. After that, the addition of the other ingredients begins, such as sour cream and stabilizers. This step has great importance, because it is at this stage that the smooth consistency and acidic flavor (characteristic of cream cheese) are added. Right after, pasteurization occurs (for preservation), followed by acidification (to keep the pH of the cream cheese at a low level), homogenization and packaging.

This case in question addresses more specifically these last two stages of production: the homogenization and packaging.

The factory under discussion had two identical lines that operated in the production of cream cheese. Although the lines were identical, they were running at different speeds: one at 300 units per minute and the other at 350 units per minute.

In addition, it was noticed that the slowest line also suffered from many microstops, which reduces its availability time, impairs the performance of the machines and, consequently, affects the final profit obtained.

Finally, it should be highlighted that the lines are composed of various equipment, such as industrial cookers, accumulator tank, transfer pumps, homogenizer with high-pressure pumps, doser/packer and transfer conveyor.

PART I

OVERVIEW

The filler machine is responsible for filling the containers with the finished cream cheese and ensures that the correct amount of product is dispensed in each package. In addition to dosing, it also fills the product, which is done in a "rigid" format, in the shape of a compressed rectangle, because of its harder consistency.

The proper functioning of this machine ensures more consistency and precision in the production process.

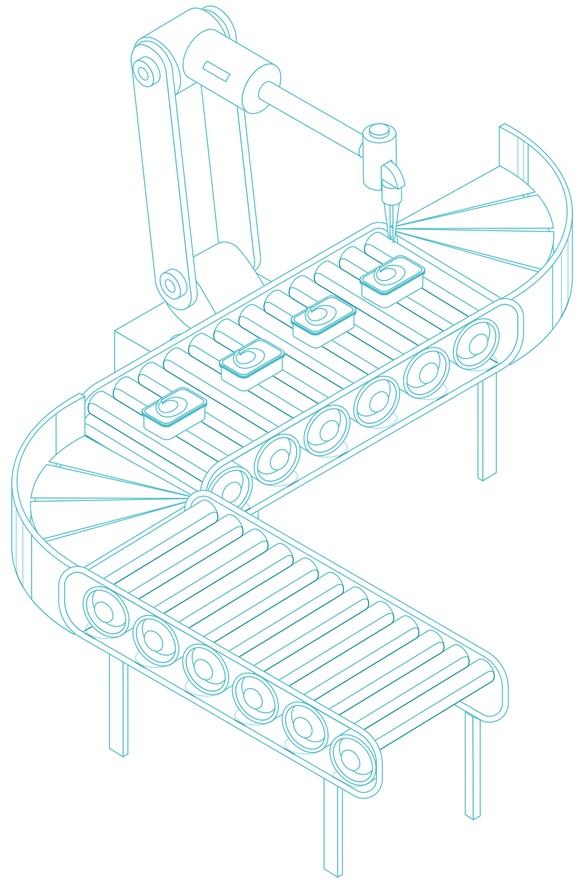
The factory noticed the discrepancy in the running speed of these two lines, because the system itself was signaling that some error was occurring.

Despite this, even with attempts of investigation by the employees, it was not possible to find the source of the malfunction.

This was mainly due to the lack of variables other than the standards shown by the HMI (Human Machine Interface) monitor, which limits and hinders the analysis.

> **Data science, which is part of the ST-One Solution, leads to a better overall understanding of the process, precisely by collecting data and analyzing the most relevant metrics for the industry.**

This resource was used in the plant in order to understand why this difference between the lines was happening.



PART II

ST-ONE DEPLOYMENT

To find out the problem cause, the ST-One Solution was implemented. This solution collects data through the ST-One Hardware, which is connected to the PLC.

It also performs clustering using intelligent algorithms, such as START, and analyzes the most relevant variables with STRUCT.

In addition, it is responsible for creating customizable dashboards, with real-time access, through the STASH platform.

The data was collected from all machines that are a part of the production line. This action was done seeking to have an overview of the line, which enables a more accurate investigation of the problem.

The monitoring encompassed the process speed, the filling level of the tank, and its temperature. The temperature track is justified because it influences the viscosity of the product produced, which could potentially be one of the causes of the failure.

To get to the source of the problem, several intelligent dashboards were created for the complete monitoring of the line. It enabled the analysis of all possible issues. This was carried out in a planned manner, considering the error alert that has been shown in the PLC and based on the expertise of data scientists. Even though its complexity, data collection and analysis process was done without greater damage in the production line.

After analyzing the data collected, the data scientists discovered that the cause of the failure was centered on one machine part: the auger screw thread.

PART II

The main function of this part is to transport the cream cheese from the machine's reservoir to the dispensing point

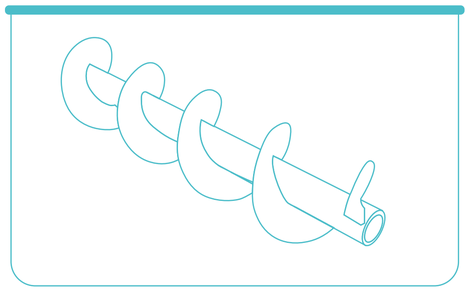


Illustration:
Auger Screw thread

This movement is done through rotation, which pushes the product. It also ensures that each package is filled according to the established amount of product, ensuring the quality standards required by organizations, and helping to maintain brand integrity.

The screw thread, which plays a role of great importance, as already explained, was out of dimension for the proper functioning of the line. This was discovered because, after concluding that the problem was centered in this machine piece, the dashboards were used to reinforce its monitoring.

After considering the data of pressure, speed, etc., which were not at the setpoint, the conclusion was that the problem was in the manufacture of the part, which justified the maintenance and the scheduled pause of the line, without harm the production.

This fact was preventing the production from running within the required time, causing the acknowledged slowness.

In addition to the speed issue, this defect also damaged in other ways, such as the pressure failure, which caused the uncountable micro-stops in the machine.

That’s because the distance between this piece and the inside part of the equipment was big, and, as a result, the heat from the machine reached the cream cheese, heating the product, reducing its viscosity and impaired the pressure.

Thus, the amount of cream cheese that was being delivered was outside the parameter established for its packaging, being insufficient and characterized as machine flaw. Because of this same aspect, the industry also suffered from product loss, as it was discarded when it did not reach the minimum desired portion per package.

The industry also discovered that the output of the controller was saturated, and as a result, the line was not able to reach its determined target. This was identified by analyzing the control parameters[1] of PID (Proportional Integral Derivative), which is responsible for keeping the variable value of a process within the desired measured.

[1] The “proportional” part adjusts the control variable proportionally to the error, the “Integral” section acts over time to eliminate the accumulated error, and the “Derivative” anticipates future behavior of the error by reacting to its rate of change.

PART III

VALUE DELIVERED

By implementing data science through the ST-One Solution, a manufacturing flaw in a component of the production line was identified.

VISIBILITIES OF MACHINES

AVAILABILITY TIME

INCREASE IN QUALITY

EFFICIENCY OF LINES

+ U$2M
IN FINANCIAL GAINS

The visibility afforded by the use of the STASH platform enabled swift and decisive maintenance of the machine, by directly replacing the faulty part. The ability to act specifically on the defective component not only saves time, which can now be allocated to production, but also simplifies the task for those performing the maintenance.

In addition, the availability time of the machine was increased, due to the reduction of microstops. This happens because, with the adjustment of the auger screw thread, the machine began to deliver the products according to the minimum parameter established, no longer being characterized as an error and causing pauses in the production.

This improvement also increases the quality of the product produced, by standardizing delivery and uninterrupted monitoring of the line, making alerts in case of instabilities.

The principal result of using the ST-One Solution, and also the main impact to be highlighted in this case, is the improvement in line efficiency. That is because, as a result of changing the faulty part, the slowest line started to run at the same speed as the others, at 350 units per minute. This arrangement in production resulted in more products produced in less time, resulting in a financial gain of approximately **US$ 2 million.**

Finally, based on the data available on the STASH platform, it is possible to consult the production history track of the line, which is beneficial in several ways, such as providing more assertive decision-making process and better planning at times of shutdown for CIP and maintenance.

CASE STUDY

ST-One

ST-One was founded with the purpose of transforming the industry to a new leap of productivity.

The science developed by ST-One is improved with each new challenge, and makes it possible for digitalization, present in different types of industry, to reach the next stage of connectivity and intelligence.

Data science for better visibility
and assertive maintenance.

UNLOCKRESULTS