CASE STUDY

QUALITY AND MAINTENANCE:

Integrated Boilers: Data Science in the Vaporization Process.

ST-One

CHALLENGE:

To build a project that analyzes and optimizes the steam production of a boiler installed in the utility area of a food manufacturing facility.

SOLUTION:

The Solution embraces the installation of ST-One® Hardware in the machinery to collect data from the boiler installed in the utilities area. Subsequently, START™ is used to classify the main variables used in the process and, with the help of STRUCT™, these are managed and assigned to the appropriate skills.

Finally, the data become available on a dashboard from Stash Platform™, in a dynamic and intelligent way.

VALUE DELIVERED:

◆ 3.7% increase in boiler efficiency;

◆ More than R$ 100,000 in annual savings;

◆ Focus on increasing productivity and ESG, based on the visibility of boiler gas emissions;

◆ Improved maintenance through boiler performance analysis and failure prevention;

◆ More stability by analyzing the conformity of the production parameters.

> "We used the ST-One Solution™ to dive deep into the data analysis from the process.
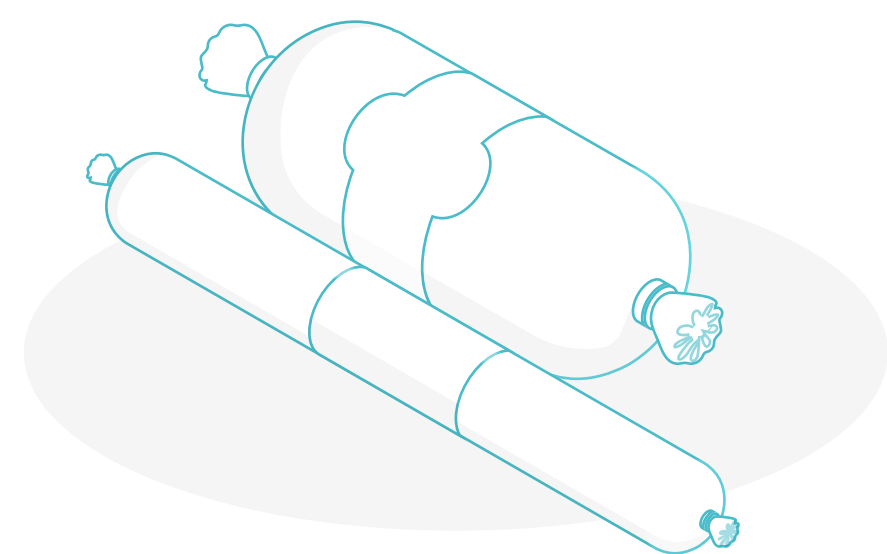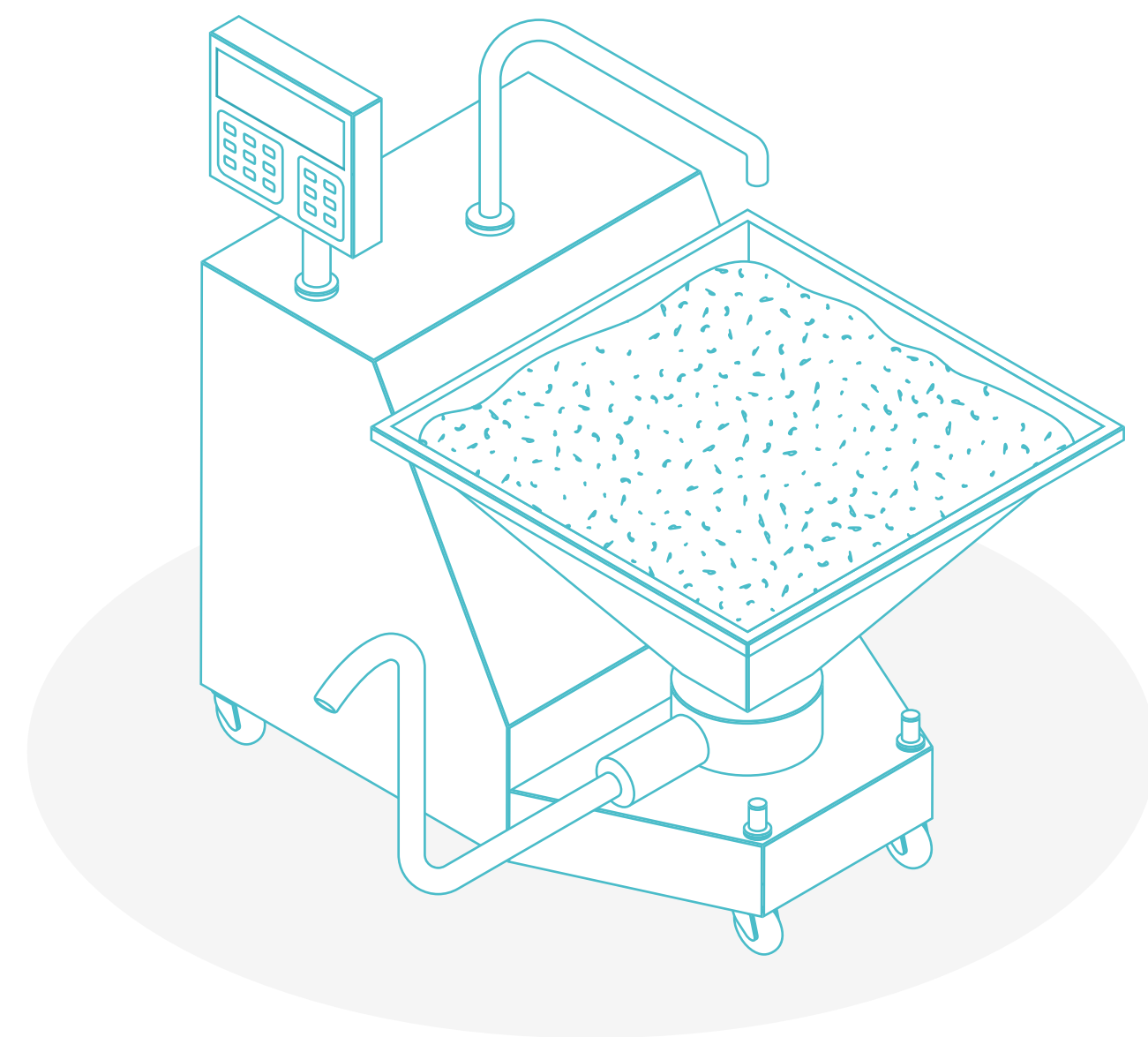>
> With it, we could see the structure in depth, understand steam production, and look for optimization opportunities."
>
> - Maintenance and Utilities Coordinator.

OVERVIEW

The client is a large Brazilian multinational, headquartered in more than 20 countries, recognized as one of the global leaders in the food industry.

The company in question has a strong commitment to sustainability in all aspects, including the reduction of greenhouse gas emissions. The goal is to reduce both direct and indirect emissions that contribute to the greenhouse effect. To this end, it invests in initiatives aimed at the continuous improvement of operational efficiency and the use of innovative technologies to minimize environmental impact.

> With this in mind, the ST-One Solution was used to do a more in-depth analysis of the process data, with the aim of obtaining more visibility in the utilities area**.**

The factory in focus for this case is responsible for the production of sausages, especially premium sausages. The production line for this type of product consists of several stages. First, the meats are selected and seasonings such as salt, garlic, spices, and stabilizers are weighed. After that, the cuttings are ground to a fine, uniform texture and mixed with water and dry ingredients through industrial mixers.

Then, the emulsifier is responsible for creating a homogeneous and smooth paste with the mixture, which is finally stuffed into casings. The sausages are then steamed and smoked in specific chambers until they reach the proper internal temperature. Finally, they are quickly cooled to stop cooking and vacuum-packed to preserve quality.

OVERVIEW

In this process, the boilers in the utilities area provide the necessary steam for the cooking and smoking stages. In this area, the equipment's capacity to generate steam was running outside the ideal parameter, resulting in higher-than-necessary consumption. **The visibility provided by the ST-One Solution™ is intended to improve this steam generation capacity,** especially by understanding the structure in a macro way at first. This effort aims at stability, mainly to keep the indicators within the recommended values, contributing to the food quality. Additionally, the factory intended to use the data collected to justify the purchase of a new boiler, increasing the unit's average production.

Also, those responsible for the line were also particularly concern with the levels of gases emitted by this equipment. By using the ST-One™ Solution, the factory aimed to monitor the oxygen consumption and level of carbon dioxide released during the boiler combustion process.

Finally, instability in steam production results in inefficient fuel usage. Besides the operator manually adding fuel to the boiler, the amount used may not be precise, since it was added on demand. The fuel issue also impacts availability, as the longer time required to open the furnace for supply results in a shorter production time and increased production costs.
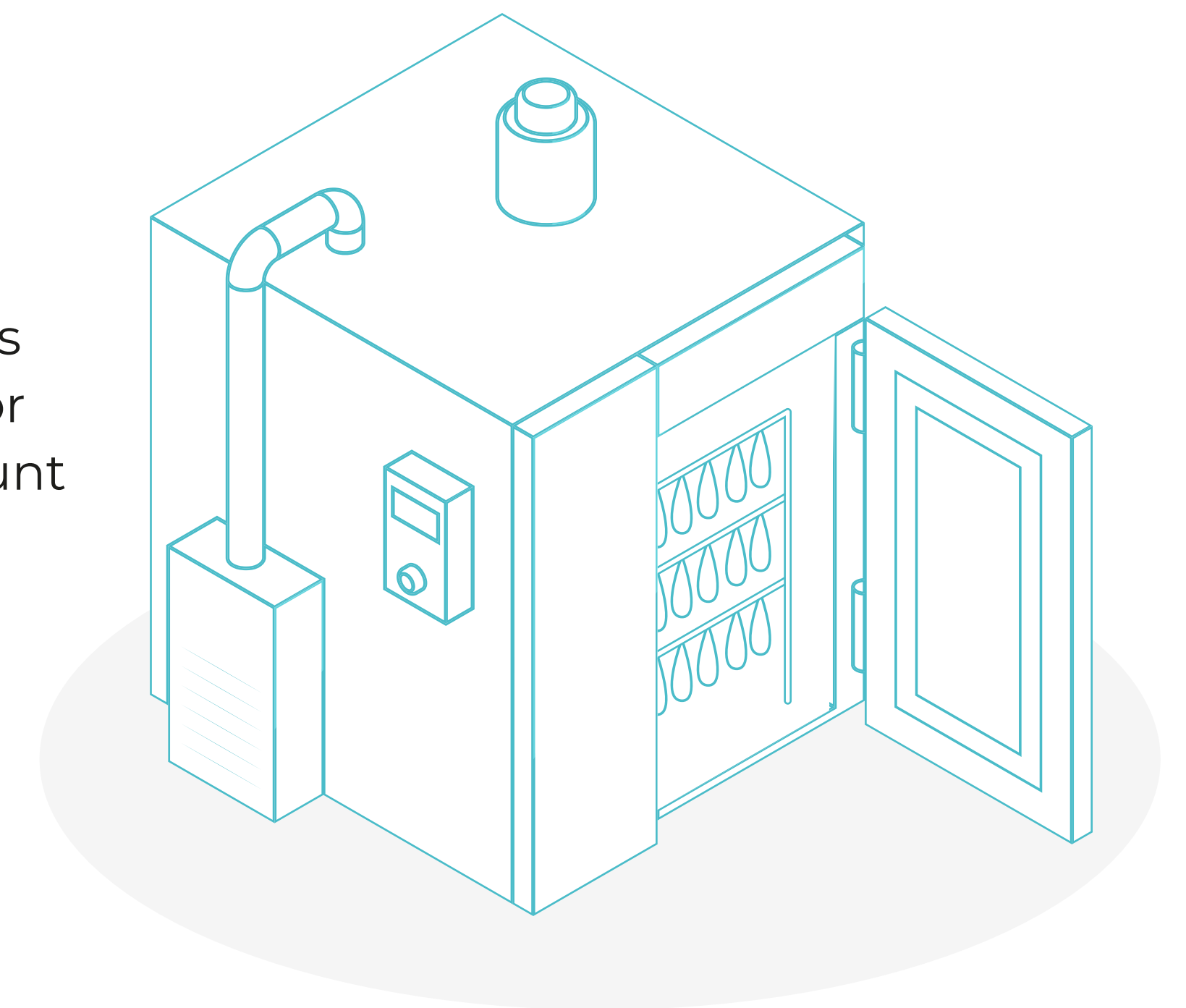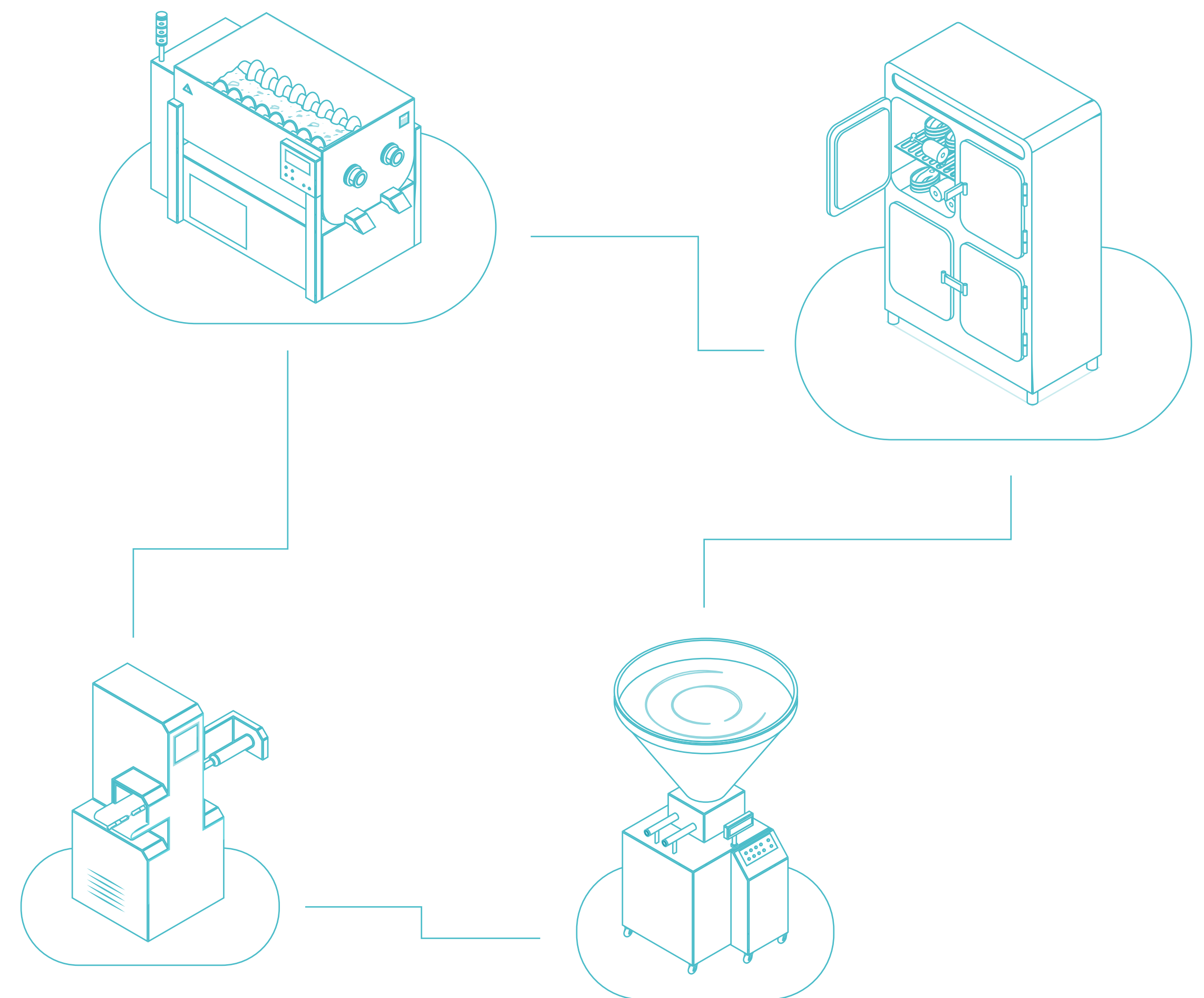
PART II

IMPLEMENTATION

The ST-One Solution was implemented to determine why steam production was not running at its optimum level. This Solution relies on data collection through the ST-One® Hardware, connected to the machinery.

It allows clustering based on intelligent algorithms, such as START,™ and analyzes the most relevant variables with STRUCT™. It is also responsible for creating customizable dashboards, with instant access, through the Stash Platform™.

The project began with meetings between the project stakeholders and the ST-One team. During these meetings, all the architectural mapping of the plant was carried out in person, with the objective of understanding the technological maturity of the plant and, based on this, deciding the indicators that would be monitored.

Due to the experience brought from the production routine, the factory already had some suggestions for relevant KPIs for value generation. This effort was also indispensable for expanding the data culture, especially in reinforcing the importance of a data-driven strategy.

PART II

Therefore, **data collection focused on boiler behavior**. As mentioned earlier, the plant sought to obtain the greatest possible visibility in all stages involving the boiler to explore the reason behind the equipment's instabilities. It was important for the collaborators to determine whether the percentage of steam produced by the boiler, characterized as unstable, was lower or higher than the established baseline. This is because, if the performance was above the rated power, the machine could be overloaded.

To achieve this result, around 15 dashboards were developed, with the first presenting an overview of the boiler. **In just one week, the factory began accessing the first analyses and dashboards**. Among the indicators monitored are the pressure level of the boiler - used to release the steam - and the furnace, the status of the fuel supply port, control of carbon dioxide emissions and water level, combined to failure analysis aimed at maintenance.

The collection and historical recording of gas emission levels was important because, in addition to contributing to the main analysis of steam production, **they demonstrated the plant's concern with ESG strategies.** This control was done through a correlation and compliance analysis dashboard, monitoring whether the level of carbon dioxide emissions is within predetermined limits.

Data is also collected for monitoring the boiler water level, due to its direct influence on the steam production, and the status of the fuel feed port, due to a suspicion of excessive consumption.

From the historical record of all the indicators mentioned, it was possible to identify bottlenecks in the production of steam for the final stage of sausage production, as well as to make adjustments in the processes according to the results of the analyses. This is the result of collaborative work, which involved the sharing of analysis techniques between the two teams involved. The analytical insights developed during the meetings, facilitated by the visibility of the boiler and subsequent steps, were essential in the decision-making process aimed at saving resources.
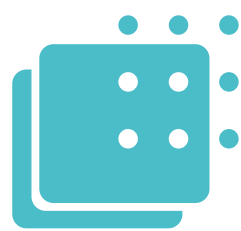
PART III

IMPACT

Using data science, implemented through the ST-One™ Solution, it was possible to optimize the boiler's steam production.

OWNERSHIP TO TAKE NEW STEPS ENVISIONING SUSTAINABILITY

INCREASE IN PRODUCT QUALITY AND PRODUCTION LINE VISIBILITY

3,7%

OF MONTLHY EFFICIENCY, GIVEN THE BOILERS' STEAM PERFORMANCE.

USD17,000

IN ANNUAL SAVINGS FROM THE OPTIMIZED USE OF FUEL.

From the exploratory data analysis, greater visibility of the production line was achieved, resulting in more efficiency. This applies to the boiler's steam level and the dependent steps. Consequently, **the plant achieved more than 3.7% increase in efficiency per month,** considering the yield of steam produced by fuel.

This optimized use of fuel resulted in USD 72.71 saved per productive day, **totaling USD 17.000,00 in savings over the year.** This represented a 10x return on investment. This positive impact was only possible through the exploration and analysis of the data, also made available in dynamic visualization graphs. This allowed the identification of steam production points above what was necessary, which, consequently reflected the excessive consumption of firewood.

In line with this reasoning, the analysis of the correlation between the level of carbon dioxide (CO_2) emissions and steam production, due to combustion, made it possible to align the plant with sustainable development strategies and goals. This concern with maximum and minimum parameters from the factory, both in environmental and production matters, results in greater process stability and an increase in the quality of the product produced.

Finally, the plant planned to create a real-time monitoring room for operational use, with intelligent and customized dashboards that will be displayed on televisions. This action demonstrates the value placed by employees on informed decision-making, stemming from data culture.

ST-One

UNLOCKRESULTS

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.