Case Study

Innovation on Dairy Product Manufacturing Line

Adding a second line, increasing throughput, enhancing automation, and removing plastic packaging in a dairy manufacturing facility.

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Introduction

The client that is the subject of this case study is a leading producer of premium yogurt products. The company has an excellent reputation for quality, and it has a very loyal and expanding customer base.

The manufacturing line we upgraded and enhanced produces yogurt and oats products. The original line was only semi-automated, many of the processes were labour-intensive, and there were multiple inefficiencies the company wanted to improve.

When the team approached us at SF Engineering, they had general objectives they wanted to achieve:

- Add a second production line within a small footprint
- Increase automation on the line to reduce the requirement for operators and, as a result, alleviate the recruitment challenges currently facing the food processing industry
- Optimise the remaining manual processes to improve the working conditions of operators and, as a result, alleviate the challenges of staff retention
- Improve process controls (for example, adding ingredients by weight rather than estimating by eye)
- Increase throughput on the production line
- Make the product more environmentally friendly, particularly in relation to the packaging

Pre-Design Stages

Concept Study

With the above general objectives in mind, the company commissioned SF Engineering to conduct a concept study to identify potential solutions.

Our engineers assessed options based on available space within the factory, existing equipment, the nature of the product they were producing, and the technologies available on the market. We then presented a number of options to the customer, allowing them to make comparisons on factors such as the best utilisation of space, best utilisation of existing equipment, most economical solution, and maximum removal of manual input.

With each of the various options, we produced detailed estimates on capital investment, expected production output, and ongoing operating costs, including the required staffing levels, power usage, maintenance requirements, etc.

This information enabled our client to complete a full financial analysis of their operations to assess the impact of each of the options that we presented. In doing this analysis, there was a strong emphasis on the company's future strategic direction in addition to the immediate needs of the business.

Following this financial analysis, the company selected one of the options that we presented in our concept study as the basis for progressing the project. The option they selected would significantly increase automation on both the existing and the new line. It would also involve making use of some existing equipment, while adding new and highly advanced equipment (including bespoke equipment) to achieve the required objectives.

Open Competition

As per best practices in the industry, the preferred solution was opened to multiple suppliers to submit an offer. SF Engineering submitted a proposal, competing with other equipment manufacturers in the industry.

Our track record of success, past history of projects with the company, and the work we did during the concept study, gave the client the confidence they needed to place the order with us.

Design Stage

At this point in the project, we had a detailed understanding of the customer's objectives and requirements. We also had the concept that we initially created to further refine and develop.

For context, the product consists of two separate pots which, after filling and sealing, are connected together to be sold as one – one pot contains a yoghurt, and the other pot contains a cereal mixture. Both the yoghurt and the cereal are packaged in two separate rooms and, after processing, are conveyed to a third room for assembly into a single product followed by final packaging and palletising.

The Importance of Flexibility

A key part of this project from the perspective of our team at SF Engineering was flexibility. As we further developed the concept and designed the new line, new opportunities presented themselves. Our client was keen to explore these opportunities to ensure the final solution was as good as possible.

This meant the solution changed as we moved through the design process. Our team thrived on the level of innovation that was required in this project as we overcame challenges and developed fully bespoke solutions that exceeded the customer's expectations.

Upgrading the Ingredient Pots Process

The ingredient pots produced on the line featured cereal such as oats and granola, as well as fruit and chocolate. On the original line, only cereals were weighed. Fruits and chocolate were manually filled by eye. As fruit and chocolate are the most expensive ingredients on a price-per-kilo basis, it was important the new solution was able to control giveaway.

To achieve this objective, we selected an Ishida multihead weigher that is specifically designed for small target weights of a couple of grams. We paired this multihead weigher with a new bulk feed system to further automate this part of the line.

The new weighing system enables the customer to guarantee the target weight at an increased level of throughput. It also automated the process and greatly reduced the need for operators on this part of the line.

After the pots pass the weighing and filling sections, a spoon is added. They then go through a tray sealer and metal detector before moving into the packing room.

While the above process is being completed, the yogurt pots are filled and also move into the packing room via a conveyor.

Upgrading the Packing Process

The original line was quite manual and involved the two pot types (yogurt and cereal) arriving via a conveyor to a packing station. Operators would push the two pots together, with the combined pots then being conveyed to a sleeving and shrink-wrapping machine. A plastic label was then applied which, when shrunk, also helped to keep the pots together. A conveyor would then take the shrink-wrapped product downstream to a further manual process, where the individual products were packed into multipacks, destined for supermarket shelves.

The upgraded process operated at higher speeds, removed many of the manual operations, and was also designed to work with a new pot type that clipped together. Clipping the pots together removed the need for environmentally damaging shrink-wrap plastic.

To ensure the system could run at speed continuously, we also added a buffering solution. This enables upstream ingredient and yogurt filling processes to continue during periods of downtime in the downstream packing processes. This reduction in the need to stop and start machines makes the overall production line more efficient while helping to maintain high average throughput rates.

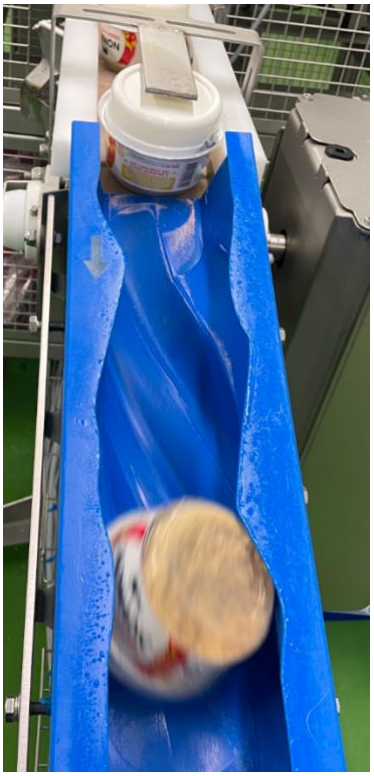
During the design phase, it was identified that the manual operation of clipping together the new, more environmentally friendly pots would still require significant labour. SF Engineering, working together with our client, explored options for automating the process of clipping the pots together.

Innovation at SF Engineering

Automating the clipping together of the two pots would bring considerable benefits to the client, as manually clipping the pots would require eight operators to achieve the desired throughput rates. With an automated solution, those eight operators could be better utilised in other areas of the operation.

As there are no off-the-shelf commercially available equipment for assembling the double pot, our engineering team got to work designing a fully bespoke and highly innovative solution for the customer.

Firstly, we added two more buffer stations to build in additional flexibility and adaptability to the packing process. We then designed from scratch a fully bespoke, one-of-a-kind, two-tier unit with the following features:



- Yogurt pots are fed out of a buffering station to the new unit via a conveyor
- The yogurt pots are flipped and indexed to the top tier of the new bespoke unit
- The ingredient pots are indexed to the bottom tier of the unit
- Pneumatic cylinders push the pots together, clipping them into place
- The pots then exit the bespoke unit fully assembled
- They exit onto a chute that flips them the right way up
- They then move on to the downstream labelling and carton-filling processes

The new bespoke yogurt pot clipping machine was fully tested, refined, and optimised at our facility before being sent to the customer's production line for installation and commissioning.

Additional Project Considerations

Footprint Challenges

The footprint available for the two production lines was very restricted. We designed an innovative solution to meet the customer's requirements without the need for infrastructure development.

Environmental Objectives

The new yogurt pot filling and packing process facilitated an improvement in the product's environmental credentials in multiple ways:

- The plastic spoon that was put into the ingredient pot was replaced with a bamboo spoon
- The pot clipping solution eliminated the plastic film that previously held the pots together
- The clipped pots are now packed into cardboard boxes where they used to be packed into plastic trays

The overall impact is a significant net reduction in the amount of plastic used in the production of this product.

Installation Sequencing

We built and installed the new line first. This allowed the customer to run both the new automated line and the previous semi-automated line at the same time. The customer was able to build up stock levels of their product while also getting peace of mind that the new solution that we developed was fit for purpose.

Once the new line was proven to be effective, our team replaced the old line, upgrading it to our new automated solution.

Results Achieved

All the initial objectives of the customer were achieved with the solution we designed:

- Addition of a second line – the second line was installed within the existing footprint
- Increase in automation – previously manual processes are now automated, while previous semi-automated processes were improved
- Improve working conditions – the few manual processes that remain have been optimised and are now easier for operators to complete

- Improve process controls – ingredients are now added to the pots automatically by weight rather than manual operator estimates
- Increase throughput – we committed to a 10 percent increase in throughput per line compared to the original semi-automated line's capabilities. As the project progressed, we were able to ramp this up to a 20 percent increase with the potential, under optimal conditions, of achieving 33 percent higher throughput levels.
- More environmentally friendly product – a large percentage of plastic was removed from the product

Patricia Molloy, Sales & Marketing Manager at SF Engineering, said: “Our customer is a highly valued client at SF Engineering, and we were proud to have the opportunity to work with them on such an important, innovative, and advanced project.

“The solution we developed is now a crucial part of our client's business development strategy. We are also delighted to continue working with them on making improvements to other parts of their manufacturing operations.”

Get in Touch

To find out more about this project or to speak to a member of our team about a new food production line solution that you are planning, please get in touch. We can also offer expert advice on how to make your food production processes more efficient and less costly, with a fast return on investment. Contact us today.

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