JMP® CUSTOMER STORY

Dairygold

Milking the data for all its worth

CHALLENGE

In a commodity market like the dairy industry, scientists and engineers working to process raw materials into consumer products must overcome extreme variability in the raw materials. At Dairygold, a prior Lean training program had focused on improving many processing efficiency challenges but had not addressed process effectiveness, including eliminating defects, rejects, downgrade and scrap.

SOLUTION

While the company's Six Sigma initiative had targeted specific individuals for analytics upskilling, Data Science and Analytics Manager Kieran O'Mahony decided to focus on raising the analytics capability of the whole organization JMP serves as an end-to-end process-enabling tool for everything from data processing to AI.

RESULTS

Since its rollout, JMP has helped solve many diverse challenges at Dairygold. Scripts developed in JMP and distributed across the organization have only further accelerated the business value. "We are trying to ensure that as many colleagues as possible get trained up on using JMP so that if and when problems arise and they get called to investigate, we are all speaking the same language," he says.

jmp STATISTICAL DISCOVERY FROM SAS

At Irish dairy cooperative Dairygold, a dynamic process-enabling tool helps develop the analytics capability of the whole organization

The domestication of milk-producing animals dates back many thousands of years, with archeologists linking the earliest known evidence of dairying to Anatolia in the seventh millennium BC. An industry that traces its roots to the Early Neolithic period may not be what typically comes to mind in thinking about analytics. But just as dairy farmers' ancestors adapted to a marketplace increasingly driven by technological advancement, processors like Irish dairy cooperative Dairygold are not only accepting analytics but thriving in a digital transformation on par with – or perhaps even a step ahead of – high-tech manufacturing industries.

"Dairygold is a traditional organization – it's been growing for over 100 years," says Kieran O'Mahony, Data Science and Analytics Manager at Dairygold. "Because the business has been around for so long, it has both generated and captured a huge amount of data across almost every facet of the organization." And what makes Dairygold so unique is that, traditional though it may be, the company has long seen that data as a way of surfacing and extracting business value. "Data can no longer be seen as a by-product of a business activity or process – rather, data has to be seen as a valuable asset for the business, and like every asset, it needs to be generating a return for the business," he explains. And Dairygold is doing its best to milk that asset for all its worth.

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> Data Science and Analytics Manager

Consistent products from inconsistent materials

Commodity markets have an array of unique challenges virtually by definition. In Ireland, where most large-scale milk processors are owned by cooperatives like Dairygold, the organization's owners are also its raw material suppliers. Dairygold's mandate, therefore, is to maximize the value that can be given back to owner-suppliers for every liter of milk they produce.

But whereas consumer demand for the end product – be it cheese, milk powders or some other dairy derivative – may remain relatively constant over the course of the year, raw materials vary greatly both in quantity and composition. The dairy business is extremely weather dependent; in winter, cows are housed indoors and feed primarily on silage, whereas in the summer months they can graze on fresh grass outside. With weather conditions in Ireland being so varied, changeable and unpredictable, the window for cows grazing on pastureland is also changeable. Couple that with different feed types, breeding and lactation cycles, and it is easy to understand how such factors can have an impact on the milk's chemical and nutritional content – protein, fat, lactose, somatic cells, vitamins, minerals, etc. Unlike other industries, variation in raw materials is not always a quality issue to be rooted out, but rather a variable that can be anticipated and adjusted for.

"For every single supplier, we take samples of their milk and analyze for chemistry and microbial levels," O'Mahony explains, adding that Dairygold collects milk from almost 3,000 farmers once or twice daily, 365 days a year. These samples are used to determine payment levels for milk suppliers, based on the quality of milk supplied. Testing occurs not only on milk from individual suppliers but also in aggregate as it is offloaded from the tanker where milk from multiple farms is mixed. Once the milk enters Dairygold's fully enclosed, integrated processing systems, additional routine in-process sampling is used to generate additional test results that are then used as part of the milk standardization process; this ensures that there is very little variation in the chemical parameters of products leaving the business.

Adherence to strict quality controls ensures that every time a customer purchases a Dairygold product, they will find the product performs and tastes exactly the same regardless of the season in which it was produced. The key challenge, O'Mahony explains, is to understand both historical trends and current conditions from a seasonality perspective and to manage the

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volume of raw material stock on hand at any given time. Furthermore, there is a predictive element to understanding and projecting future conditions. All of this, he says, must be undertaken while also working within the same set of quality standards that Dairygold's customers have come to expect.

And therein lies the challenge: to produce consistent products every single time from inconsistent raw materials, sourced daily from thousands of suppliers, each with differing levels of constituents, that will change depending on the time of the year and will be impacted by the ever-changeable weather conditions In Ireland. "That's why the dairy industry is a very dynamic environment. It's a very complex, and at times unusual business," O'Mahony says, and one where data analytics can be extraordinarily powerful.

Developing the analytics capability of the organization at all levels

When O'Mahony joined the team at Dairygold in 2016, his goal was to develop the data analytical capability of the business, not just through incremental continuous improvement but, as he describes it, through a "recognition that we need to have respect for the data, be more data-driven, embrace the use of data and embrace automation."

Though Dairygold had initiated a Lean program as early as 2008, which helped to improve efficiency, the organization still needed to improve process effectiveness – that is, eliminating defects, rejects, downgrades and scrap – and making processes more consistent, reliable and predictable. These were the key primary targets of building up the organization's analytical capability and with proactive rather than reactive analytics, moving away from what O'Mahony describes as the "data-rich but information-poor" reality of all too many organizations that have been slow to undergo digital transformation.

When O'Mahony began casting around for the right software solution, he says, JMP® statistical discovery software was the obvious choice. "JMP was the market leader. It utilized strong

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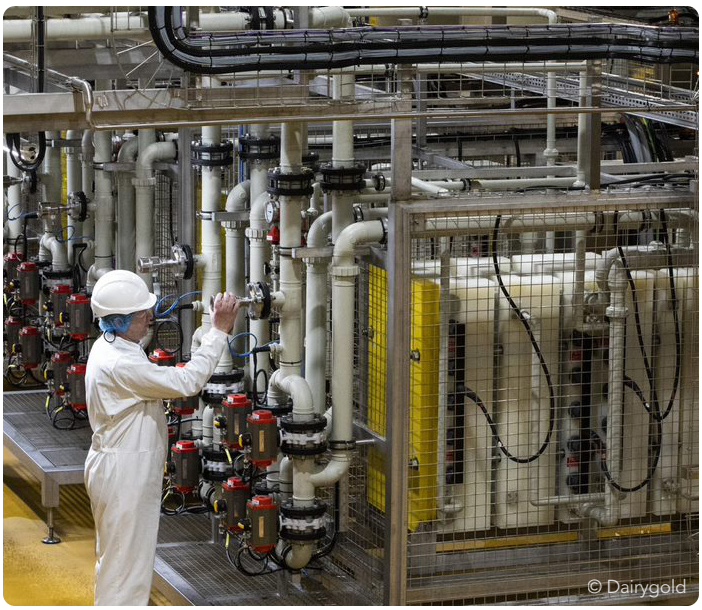
Being an analytics-capable organization means having a powerful process-enabling tool, not just software

O'Mahony attributes the speedy uptake of JMP at Dairygold to the fact that the tool is useful to such a broad variety of roles: on one end of the spectrum, statistical experts can use JMP to automate data capture, query and analysis – and do so in a code-light way that can easily be rolled out to operators. Even though some may be highly skilled in coding languages, he explains, the industry is moving more toward embracing products that require less coding because it's more efficient. "Even a lot of the people who are extremely technical and proficient in JMP aren't proficient in writing code," he adds.

At the other extreme, statistical novices can use the same tool for basic data visualization. Graph Builder, O'Mahony says, "is very intuitive for new users because you don't need to understand anything to do with analytics to be able to extract insights from your data via the simple drag-and-drop environment. That's hugely beneficial for new users and something that people really like."

"The amount of information that you can extract from JMP in such a short time – and in particular, the multivariate element of it – is amazing. You can quantify the amount of variation that multiple factors will have on the output. That's gold from a new user's perspective … you can take a couple of theories and stick them together and get the answer very, very quickly. It makes for less complex analysis and a more intuitive feel for the data."



Furthermore, JMP has helped Dairygold to overcome barriers to data access and streamlined the pre-processing steps that O'Mahony says are an essential precursor to machine learning. "You really need to understand the architecture of the data that exists in the business – where it is, how it's being captured, how frequently it's captured, what's being done with it, who is doing this to it and how long the data will be valid for," he explains. "You need to have that really solid foundation in place before you ever go off and look at AI."

The secret, O'Mahony says, is seeing JMP as a process-enabling tool, not just a software. And having one tool that is many things to many people is exactly in the spirit of what it means to be an analytics capable organization. Each can use the tool to their own ability to optimize their domain within the broader business.

A single JMP® script transfers best practices for statistical process control from one lab to the whole organization

One of the strategic areas where O'Mahony has focused significant development efforts is in statistical process control (SPC) and process understanding, particularly in the lab environment. O'Mahony has identified and trained individuals he terms "SPC champions," as well as individual operators who capture the data and enter it manually into logbooks.

"It's important for people to recognize how to read the charts for a breach of the statistical rules," he explains. "I liken SPC to an early warning detection system that raises a flag to tell you that something unusual has happened and that the probability of it happening by chance alone is very small; in other words, an external influence has caused the issue to occur."

Those systems are based in part on a scripted SPC chart dashboard O'Mahony created in JMP that enables users to look at a single screen using a tab-based system that displays near-real-time process information. "When it can be proven to work in one lab, then you can just cut and paste it to another lab," he says. "That's the value of having a script ready to go."

Scripts like this help raise the analytics capability of the entire business when rolled out to users in different departments or fields of expertise. The proof is in the pudding. And SPC, O'Mahony notes, has been deeply embraced across many labs at Dairygold. Now he is focusing on expanding established best practices into other areas where the opportunities afforded by SPC implementation are less recognized.

"We are trying to ensure that as many staff as possible get trained up on using JMP to the Green Belt level," he adds, "so that if and when problems arise and they get called to investigate, we are all speaking the same language. That way, they're well-positioned to be able to reach for the most appropriate tools, apply those tools correctly to the data type that we have and answer the important questions."

With JMP®, engineers were able to quickly pinpoint inefficiencies in current processes

Evidence of the impact analytics is having at Dairygold is evident across many examples ("and so diverse as well!" O'Mahony adds), since simply understanding the factors contributing to delays in a very large supply chain can quickly add up.

With almost 3,000 milk suppliers having their milk collected twice a day by 26,000 liter tankers, to transport almost 1.5 billion liters of milk annually back to the sites for processing, the efficiency of the mechanical pumps used to transport the milk from tankers to milk silos is critical. If these pumps start to slowly fail over time, then it may result in undesirable queuing of tankers at the milk offload bays. This increases the amount of time tankers spend on-site and ultimately eats into the daily collection schedule of haulers. In turn, this could potentially result in haulers starting to favor some pumps over others, which could result in additional delays." By careful analysis and comparison of pump offload rates across different pump models, it is possible to identify the pumps that need to be serviced first at each of the sites, while also allowing us to understand the mean time between failure for each pump, thereby allowing the optimization of service intervals of our equipment, which in turn improves our efficiency," O'Mahony explains.

Looking to the future, O'Mahony says, that value can only be scaled up as the analytics capability of the whole organization grows, from the farmers who supply the milk to the operators and lab scientists to the Six Sigma trained colleagues and beyond – across all facets of the business. And, he adds, "Value isn't always just cost savings. It can be improvements in safety or quality or customer service or process knowledge or sustainability." All those possibilities make for a bright future indeed.