



Project Summary

Organization:

GEA Process Engineering

Location:

Lichfield and Pahiatua,
New Zealand

Project Objective:

- Design and construct the world's joint-largest and most efficient milk drying plant in Lichfield, Waikato, New Zealand, with a capacity to produce 30 tons of milk powder per hour.
- Deliver the world's first milk processing plant capable of withstanding an earthquake in the highly seismic area of Pahiatua, Wairarapa, New Zealand.

Products used:

AECOSim Building Designer, AutoPIPE®, AutoPLANT®, MicroStation®, Bentley Navigator, ProjectWise®

Fast Facts

- AutoPIPE allowed the team to create a seismic loop for the Pahiatua plant, enabling 900 millimeters of movement in all lateral directions to provide structural integrity in the event of an earthquake.
- In terms of material usage, energy consumption, and waste, the Lichfield milk processing plant is now the most efficient facility of its kind in the industry.

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- ProjectWise helped to enhance collaboration and information mobility, improve productivity, and optimize time and costs.
- GEA utilized AutoPIPE to prove design integrity and ensure regulatory compliance for the Pahiatua plant, which was built in a seismically active location.
- Bentley i-models accelerated data transfer and enhanced design coordination to streamline decision making and meet deadlines for both projects.

GEA Uses Bentley Technology to Deliver Innovative Milk Processing Plants for Leading Dairy Manufacturer

Bentley's Design Integration and Collaboration Applications Ensure Data Integrity and Accelerate Information Sharing for Sustainable Plant Projects

Unique Processing Plants Call For Collaborative Design

To meet continued growth of dairy consumption in China and other export destinations, global dairy manufacturing leader, Fonterra, initiated the design and construction of two new milk drying plants in New Zealand—one in Pahiatua, and the other in Lichfield. With each of these projects demanding new approaches to ensure profitability and sustainability, Fonterra retained leading international technology group GEA Process Engineering, New Zealand (GEA) to deliver complete turnkey solutions. Both projects presented unique challenges and required collaborative efforts among consulting structural engineering and construction companies to produce energy-efficient, sustainable facilities within tight time frames and budgets.

Because the Pahiatua plant was to be built in one of New Zealand's most highly seismic locations, GEA designed the plant to withstand earthquakes—the first milk processing plant of this kind in the world. Producing 55,000 tons of milk powder annually, this NZD 100 million facility weighs upwards of 20,000 tons with concrete, reinforced steel panels and columns, and includes a 15-ton-per-hour spray dryer, and a drying tower standing 40 meters high.

Equally challenging is the Lichfield whole milk drying facility, similar to one already built by GEA for Fonterra in Darfield, New Zealand, which was then the largest in the world.

Capable of producing 4.4 million liters of raw milk (equivalent to almost two Olympic-size swimming pools) into 700 tons of milk powder daily, this processing plant was designed with the best performing, most efficient spray dryer currently available on the market. The NZD 120 million Lichfield facility includes a drying chamber, which is 18 meters in diameter and weighs approximately 200 tons, that during assembly was lifted 34 meters above the roof of the building to be installed.

To investigate novel design methods, collaborate among the dispersed project teams, and ensure sustainable solutions for its client, GEA required comprehensive, collaborative modeling and analysis applications to deliver these two world-class facilities on time and within budget.



With two new unparalleled milk processing plants in New Zealand, Fonterra can better meet the growing demands for milk powder in South East Asia and around the world.

AutoPIPE Optimizes Design Integrity

"The [Pahiatua] plant was straightforward in its design except for the base isolation construction, which posed some engineering challenges," commented GEA project manager Gary Reynolds. Recognizing that traditional design methods were not sufficient to support high loads in the event of an earthquake, GEA explored innovative design methods to build the first seismic base isolated dryer tower in the world. However, while the main building was base isolated, the ancillary structures were not. This extra design consideration coupled with the short two-year design, build, and commission time necessitated a very accurate design to keep the project on schedule.

GEA used Bentley's AutoPIPE to create a seismic loop on all supply lines, giving the lines enough slack while still being adequately supported. This design enabled the safe supply of water, chemicals, and high-pressure steam while allowing 900 millimeters of movement in all lateral directions to ensure structural stability in the event of an earthquake. GEA relied on AutoPIPE for accurate modeling, examining different loading scenarios to prove the design integrity of the dangerous piping between the base isolated and non-isolated auxiliary structures and meet all regulatory design standards. The entire plant is constructed on a friction pendulum-bearing base isolation system, consisting of 50 triple action pendulum bearings making it capable of withstanding a 1/2500-year seismic event without losing structural integrity.

“The commissioning of this new plant was one of the smoothest and most efficient [projects] on record at Fonterra.”

— Robert Spurway,
Chief Operating Officer Global
Operations, Fonterra

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Contact Bentley

1-800-BENTLEY (1-800-236-8539)
Outside the US +1 610-458-5000

Global Office Listings

www.bentley.com/contact

ProjectWise and Bentley Navigator Improve Collaboration

Over 3,000 staff members worked more than 1 million hours to deliver the 30,000 kilogram-per-hour whole milk drying facility at Fonterra's Lichfield plant. In the interest of completing the project to accommodate timing when cows begin milk production for the season, GEA faced critical time constraints in delivering this unique turnkey project. The numerous project participants who were geographically dispersed required a single interface to help efficiently and effectively manage, share, and distribute engineering and design data to keep the project on schedule. For the first time, GEA implemented the use of Bentley's ProjectWise to optimize collaboration and ensure timely completion.

Using ProjectWise, GEA enhanced file-sharing capabilities and accelerated accurate information mobility, enabling instant live updates of design data among teams across numerous geographic locations to ensure all design models and project documentation were kept current. Real-time access to accurate data allowed the time-sensitive projects to progress smoothly. Bentley's comprehensive project management software streamlined workflows among a widely distributed workforce and provided a connected data environment to maintain continuity and ensure coordinated designs throughout the project. The team used Bentley Navigator extensively for design review and monitoring progress. ProjectWise allowed the exchange of model design data among the different sites and enabled the instant generation of new and updated i-models, optimizing collaboration and enhancing efficiency and productivity.

“For the first time, GEA was able to have a project with design teams in different locations all looking at the same live data through the use of ProjectWise and i-model technologies,” commented Andrew Hawes, Design Technical Manager, GEA.

i-models Provide Foundation for Accurate Design Sharing

To design the buildings and create the 3D models for both milk processing plants, GEA and its structural engineering and construction partners used AECOSim Building Designer, AutoPLANT, and MicroStation. Using the same modeling and design applications, and transferring the models as i-models, facilitated accurate and secure sharing of data among the different organizations and office locations, and on-site during construction. The use of i-models for information exchange enhanced optioneering and decision making through accurate design sharing. i-models also helped the project teams resolve issues, minimize costs, and accelerate delivery time to meet project deadlines and stay within budgets. For the Pahiatua plant in particular, “Bentley's i-model technology allowed the

fast, accurate, and secure model transfer needed for a project this difficult enabling the project to be designed, built, and commissioned faster than many simpler projects previously taken on,” stated Hawes.

Integrated Technology Facilitates Sustainable Turnkey Solutions

Operating sustainably is a priority for Fonterra and is at the forefront of GEA's design solutions. GEA utilized Bentley technology to align with Fonterra's commitments to water efficiency, reducing emissions and waste, and determining alternative methods to using energy more efficiently.

With energy efficiency as a key focus for the project team, GEA designed the Lichfield plant to require very little process water. The evaporator condensate is filtered through the membrane of a high pressure, reverse osmosis system, enabling the water to be reused during processing. As a result, Fonterra has reduced its demand for ground water for the site. In terms of material usage, energy consumption, and waste, the Lichfield milk processing plant is now the most efficient facility of its kind in the industry. Using ProjectWise and Bentley's collaborative design applications enabled GEA to develop sustainable processes to make plant management easier and reduce the overall cost of ownership for Fonterra. Fonterra Chief Operating Officer Global Operations Robert Spurway stated, “The commissioning of this new plant was one of the smoothest and most efficient [projects] on record at Fonterra.”

Like Lichfield, the Pahiatua site also includes a reverse osmosis plant, this one capable of processing up to 2 million liters of water per day recovered from the milk drying process, and purifying it for reuse in the plant. This treated water is returned to the process, making this groundbreaking, earthquake-resistant facility also virtually self-sufficient in water usage, keeping disposal costs down and ensuring that Fonterra has no need to increase its water resources. “The plant will also produce boiler feed water of very high quality using less chemicals to protect the steam system from corrosion, increasing the life expectancy of the plant and reducing operating costs,” commented Reynolds. Now commissioned, the Pahiatua plant began production within two years of GEA receiving the order, providing Fonterra another industry-leading site in New Zealand.

Using Bentley's integrated design technology, GEA delivered two sustainable solutions that efficiently managed the use of natural resources to ensure a safe, secure source of quality milk. With the rise in milk powder consumption in China, South East Asia, and the Middle East, the new milk processing facilities will enable Fonterra to meet growing dairy demands around the world.