"The support of the math group increased our confidence that the procedures we have in place met or exceeded international best practice. This event is an efficient process to have a large group of experts looking at a specific industry issue" - Fonterra

As a world-leader in dairy innovation, Fonterra faces a constant challenge to deliver the highest quality dairy products that are guaranteed to meet food industry standards. Fonterra have been coming to Mathematics in Industry Study Groups (MISG) since 2011 with increasingly commercially significant queries, to help improve their industrial processes as the continuously work to push the frontier of best practice.

PAST CHALLENGES

2013 Fonterra Challenge -

As cheese ripens over a period of months, the chemical composition and micro-structure of the cheese continues to change. These changes impact customer-relevant properties, such as taste, smell, texture and crumbliness. Fonterra needed a means to predict the outcomes of the cheese ripening process months before the cheese matures using only initial fat, protein, salt, and moisture contents ratings. Two approaches were undertaken:

Machine Learning - The MISG sketched out the use of machine learning techniques to relate initial chemical composition testing with final human sensory testing.

Model of Cheese Ripening - Like many such processes, cheese ripening can be modelled using standard differential equations. MISG used available research on cheese ripening and mathematical models for protein breakdown to build the model.

Both models provided Fonterra with a way to predict cheese quality months ahead of when it would be ready for distribution using NIR scanning of ingredients. Fonterra is now gathering more data to further validate and optimise the models.

2014 Fonterra Challenge

Fonterra has the only brine cheese plant in the Southern Hemisphere, which can process up to 3.5 tonnes of cheese an hour. MISG developed mathematical models that Fonterra can use to accurately predict brining times and simulate different brining conditions. This tool enables Fonterra to optimise their processes for speed and quality.

2012 Fonterra Challenge

Fonterra use statistical process control charts to calibrate automated measurement data against laboratory measurements. MISG developed a methodology for setting chart limits that outperformed current techniques and enabled Fonterra to make better business decisions.

2011 Fonterra Challenge

MISG's used mathematical methods to prove definitively that Fonterra's sampling methodology was accurate enough to meet quality and safety requirements.

Case study prepared by

KiwiNet
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