
**Project Title** - Considering the meat quality question to facilitate coldstore energy reduction

**Host University** - Massey University

**Industrial Partner** – The Meat Industry Association (MIA)

## Academic Supervisor(s)

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## Industrial Supervisor(s)

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## Project Description

Aotearoa-New Zealand's (A-NZ) food production sector creates products onshore and sold overseas that require temperature control to maintain product quality. Consequently, A-NZ has many widely distributed coldstores, which are a large component of energy usage. The red meat industry represents the majority of product (by volume) that is exported in a frozen condition. Recent energy prices have been recognised as putting meat industry profitability under pressure.

For frozen food facilities two emerging opportunities deserve investigation to mitigate energy pressure. Frozen food storage temperature has a global standard set point of -18 °C. At COP28 (UN climate change conference) shifting global frozen food temperature to -15 °C to reduce energy usage by approximately 10% was tabled. This represents an opportunity for A-NZ's red meat sector and associated energy providers to implement and create a more sustainable energy system.

Simultaneously, drive exists within A-NZ to have a more responsive user base for electricity services. As large energy users often in rural settings, coldstores are a target for reducing load when supply struggles to meet demand. When coldstore doors are kept closed, heat ingress is low, and temperature changes slow despite the refrigeration system being turned off. Likewise, when surplus energy is generated, it may be possible to store this energy by reducing coldstore temperature. These strategies have additional benefits in reducing the local network's peak load requirement, reducing capital infrastructure costs, and creating a more resilient energy network. Beyond infrastructural benefits, individual coldstore owners can also use these strategies to minimise energy use in peak price periods.

Irrespective of either energy cost reduction strategy, the primary concerns of meat processors are product quality, customer acceptance and shelf-life. Execution of increasing the frozen food temperature or using coldstores to buffer energy, will require absolute confidence that these strategies have negligible effect on product quality. Any quality reduction, resulting in damage to brand reputation or sales, or more dramatically, food losses, will negate economic and sustainability benefits of either energy reduction strategy.

For A-NZ, supply chains are unique in that meat is from grass feed animals (creating a unique flavour and fatty acid profile more prone to oxidation), while our supply chains are some of the longest in the world (creating larger shelflife challenges).

This proposed project comprises three parts reflecting one project, per year of the Doctorate programme:

Part 1: Industry immersion evaluating frozen food regulations and mapping coldstore energy use to evaluate the energy strategies outlined above and to identify critical control points for frozen meat products with the aim of identifying where the best impact for energy use strategies and associated infrastructure may be for economic and social benefit.

Part 2: Follow red meat products through -15°C compared to -18°C pathways that incorporate oscillations to temperature for a cool store buffer strategy, to establish effects on physical, chemical and shelf-life parameters.

Part 3: Evaluate sensory properties of frozen red meat products with the effect of -15°C and -18°C pathways with temperature oscillations associated with a cool store buffer strategy.

## Student Time Split

**University base for student (university, campus, department):**

School of Agriculture and Envornment, Massey University, Palmerston North

**Industry base for student (company, site, address):**

MIA, Featherston St, Wellington

**Expected Time Split Between University and Industry Partner (in months):**

28 months at university, 8 months in industry

**Rationale for Time Split**

Doctorate students need a firm support network within their University. Massey University provides an enviable suite of skills to address this important energy usage research. Massey has an international reputation in industrial refrigeration with the expertise of Dr Love and Prof East. Dr Schreurs is an expert in red meat production. Prof Hort leads Massey University's Food Experience and Sensory Testing facility that conducts food sensory acceptance studies. This expertise combined with industry perspectives of the Meat Industry Association (MIA) creates a formidable team in which a PhD student will obtain a range of research skills to become a leader in food refrigeration.

The doctoral candidate will spend at least eight months (at least 20% of time) with MIA taking part in their immersion programmes. There will be industry mentoring, discussion and potential summer internships in processing plants or coldstores to understand and map cooling processes, energy use and understand critical control points for food safety and quality.

For the remaining 80% of the time there will be laboratory and data analysis work to do at University, including conducting sensory science which takes a significant amount of training.

## Application

To apply for this project please first read the guidance document and then then complete the application form on the Applied Doctorates Scheme website.