Cold Chain Workshop

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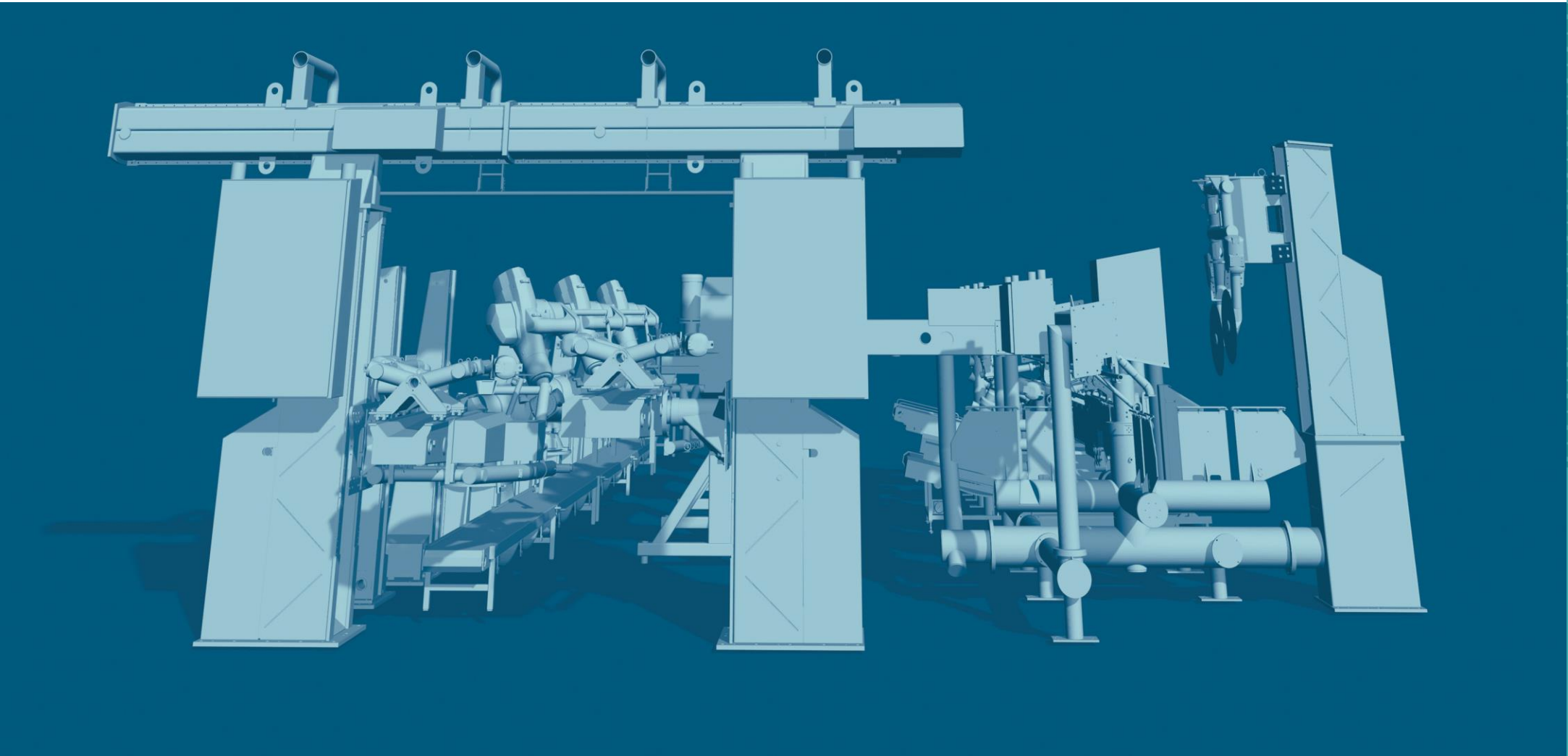


Who are we?

The Australian Meat Processor Corporation or AMPC is the rural research and development corporation for the red meat processing industry in Australia.

As the research, development and marketing service provider for Australian processors, AMPC runs programs of activity that are funded by processor levy payers, private contributions and the Australian Government.

Our mandate is to provide research, development, extension and marketing services that improve the productivity, profitability and sustainability of the industry.

Advanced Manufacturing

Advanced Manufacturing

Strategic aspiration: Strategic aspiration: Human product handling is halved through technology advancement to reduce injury rates, maximise yield and processing efficiency by 2030.

- Industry 4.0
- Objective Measurement
- Hands off solutions
- Investment and Adoption

Sustainability

Sustainability

Strategic aspiration: Processors recognised as global leaders in environmental stewardship and acknowledged as responsible businesses having positive impacts on their communities by 2030.

- Communities and Decarbonisation
- Clean energy transition
- Responsible water management
- Waste valorisation and circular economy

People and culture

Sustainability

Strategic aspiration: By 2030 be seen as a vibrant and progressive industry of choice for employment, offering a diverse range of careers and underpinned by a vast range of training options.

- Attraction
- Retention
- Development
- Safety and Well-Being

Technical market access and trade

Strategic aspiration: By 2030, Australia is the preferred trading partner for premium red meat products globally, with unrivalled access to high value markets.

- Marketing and Promotion
- New Products
- Market Access
- International Competitiveness

Product and process integrity

Sustainability

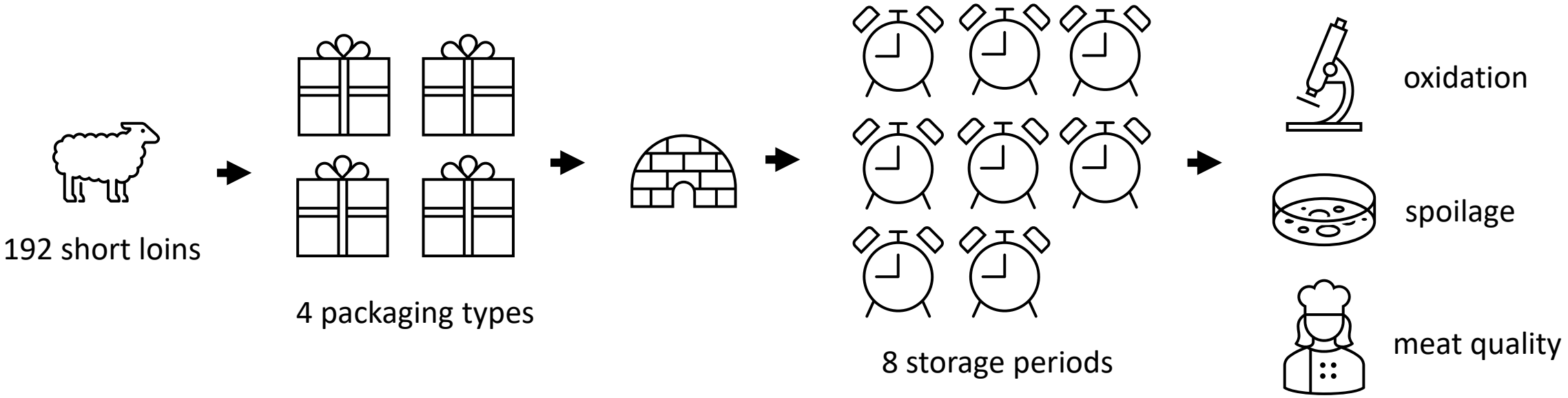
Strategic aspiration: The Australian red meat industry maintains and further enhances its international reputation for safe, sustainably sourced, wholesome red meat products.

- Traceability & Integrity systems
- Animal Welfare
- Food safety

Case study 1:

i) Can chilled lamb achieve the same shelf life as chilled beef (20 weeks supported by science, 120 days used)?

ii) Are there packaging effects on the quality and shelf-life of chilled lamb held for up to 20 weeks?



Packaging	Brand	Manufacturer	Thickness, µm
PACK 1	Eco-tite® Recycle Ready Shrink Bag	AMCOR Pty Ltd., AUS	50
PACK 2	Cryovac® Barrier Shrink Bag	SealedAir Pty Ltd., AUS	50
PACK 3	Foil Pouch	Unbranded	155
PACK 4	Biovac™ Recyclable Vacuum Pouch	Grounded Packaging Co., AUS	100

Trial conducted in a commercial processing plant.

Chiller temperature -1.2 degrees Celsius, +/- 1.1 degrees Celsius

Findings

1. **Product safety**
   - While the total count of viable microorganisms (TVC) increased, levels did not exceed the upper limits defined for microbial spoilage in either domestic and export markets (log 7 CFU/g) and there were no packaging effects.

2. **Product flavour**
   - **Rancidity** levels were measured using lipid oxidation (T-bars) and showed no rancidification.
   - **Freshness**-total volatile basic nitrogen (TVB-N) concentrations measure protein breakdown and are an indicator of freshness. TVB-N concentrations increased between Week 1 and Week 14, but remained within defined limits for fresh lamb meat and would be acceptable to consumers.

3. **Tenderness**
   - Protein breakdown occurred during week 1 in all packaging. From week 1- week 20 there was no difference in shear force (tenderness) between the packaging types

4. **Colour**
   - Once the packs were opened and product was re-packed for retail display (held at 3-4 degrees Celsius), pack 4 (biodegradable) showed some discolouration after 48 hours. This packaging allowed oxygen to pass through it. Packs 1-3 showed an acceptable level of discolouration after 48 hours.

Summary- Chilled lamb can achieve the same shelf life as beef and can be stored up to 20 weeks without affecting safety or quality regardless of packaging. Once on retail display, lamb chilled in biodegradable packaging shows discolouration after 48 hours.

Case study 2:

i) What is the effect on the safety and quality of lamb and beef chilled then frozen?

ii) Is there a difference between the safety and quality of lamb and beef frozen at -12 degrees Celsius compared with product frozen at -18 degrees Celsius?

Scientific research

- ***Effect of long term chilled (up to 5 weeks) then frozen (up to 12 months) storage at two different sub-zero holding temperatures on beef: 1. Meat quality and microbial loads***

Benjamin W.B. Holman, Cassius E.O. Coombs, Stephen Morris, Matthew J. Kerr, David L. Hopkins

- ***Effect of long term chilled (up to 5 weeks) then frozen (up to 12 months) storage at two different sub-zero holding temperatures on beef: 2. Lipid oxidation and fatty acid profiles***

Benjamin W.B. Holman, Cassius E.O. Coombs, Stephen Morris, Kristy Bailes David L. Hopkins

- ***Effect of long term chilled (up to 5 weeks) then frozen (up to 12 months) storage at two different sub-zero holding temperatures on beef: 3. Protein structure degradation and a marker of protein oxidation***

Benjamin W.B. Holman, Cassius E.O. Coombs, Stephen Morris, Matthew J. Kerr, David L. Hopkins

- ***Effects of chilled and frozen storage conditions on the lamb M. longissimus lumborum fatty acid and lipid oxidation parameters***

Cassius E.O. Coombs, Benjamin W.B. Holman, Eric N. Ponnampalam, Stephen Morris, Michael A. Friend, David L. Hopkins

Methodology and findings

Methodology

Beef was chilled for 0, 1, 3 and 5 weeks and then frozen at -18 degrees Celsius and -12 degrees Celsius for 1, 2, 3, 6 and 12 months.

Lamb was chilled for 0, 2, 4, 6 and 8 weeks and then frozen at -18 degrees Celsius and -12 degrees Celsius for 1, 2, 3, 6 and 12 months.

Tests were done on safety and quality at each frozen period and temperature.

Findings

1. The aging period of product during the chilling period changed the quality and shelf life of the product.

2. Frozen storage stopped changes in quality and safety for 12 months.

3. Red meat can be frozen at -12 degrees Celsius (up to 12 months) without impacting the safety of quality of the product.

Safety of Australian red meat

Processes and interventions

- **Carcase trimming**
  - Blue light tech to reduce waste, focus trim
- **Washes**
  - For example, hot water washes, lactic acid sprays- according to market requirements.
- **Visible contamination** monitoring on product and contamination resulting from processes.
- **Microbial monitoring**
  - Swabbing carcases
  - Baseline studies of E.coli and salmonella
  - US market requirements for trim product (Shiga toxin producing E.coli or STEC)

What are the industry R&D challenges?

Industry R&D challenges are generally the same as for any other industry, ie,

1. Thinking strategically and proactively
2. Identifying R&D options and technologies to address problems and challenges
3. Finite resources for R&D
4. Prioritising R&D
5. R&D adoption

Thank you