



Energy Efficiency Training Week

Cold chain energy efficiency & technology

Industry Stream

Patrick Crittenden, Energy Efficiency in Emerging Economies, IEA

Bangkok, 2 April 2019

 IEA #energyefficientworld

Cold chain
energy
efficiency and
technology



Leveraging digital technologies
for industrial energy efficiency
and productivity - application of
innovative technology across the
food manufacturing cold chain

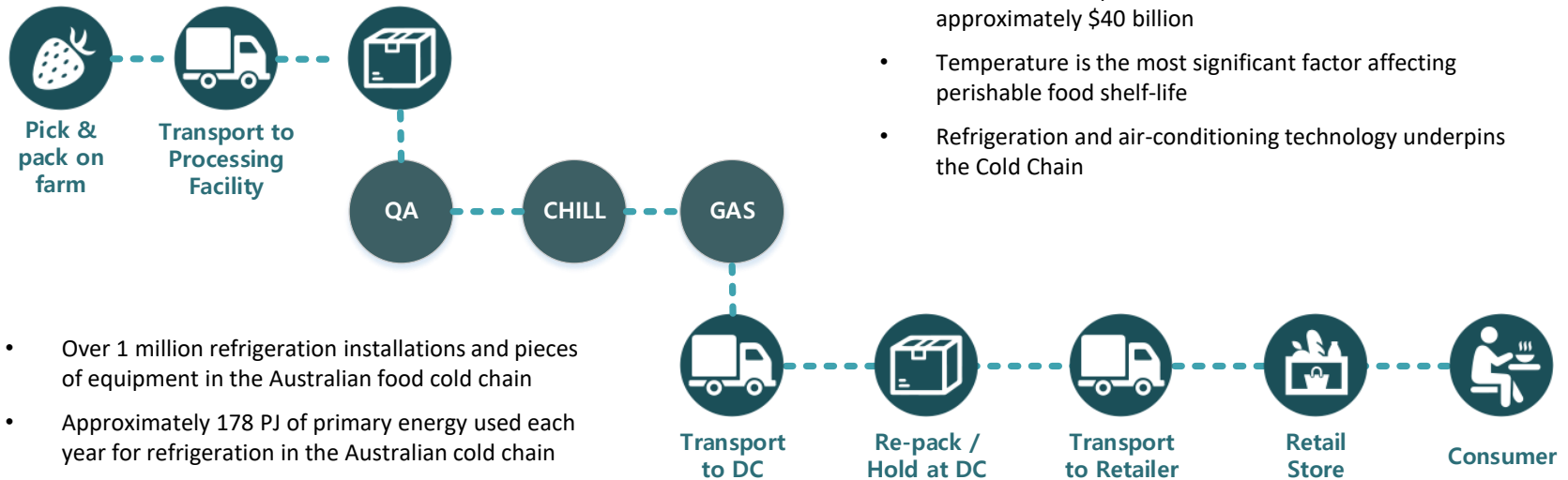
April 2019
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The Food Cold Chain



- From “paddock-to-plate”



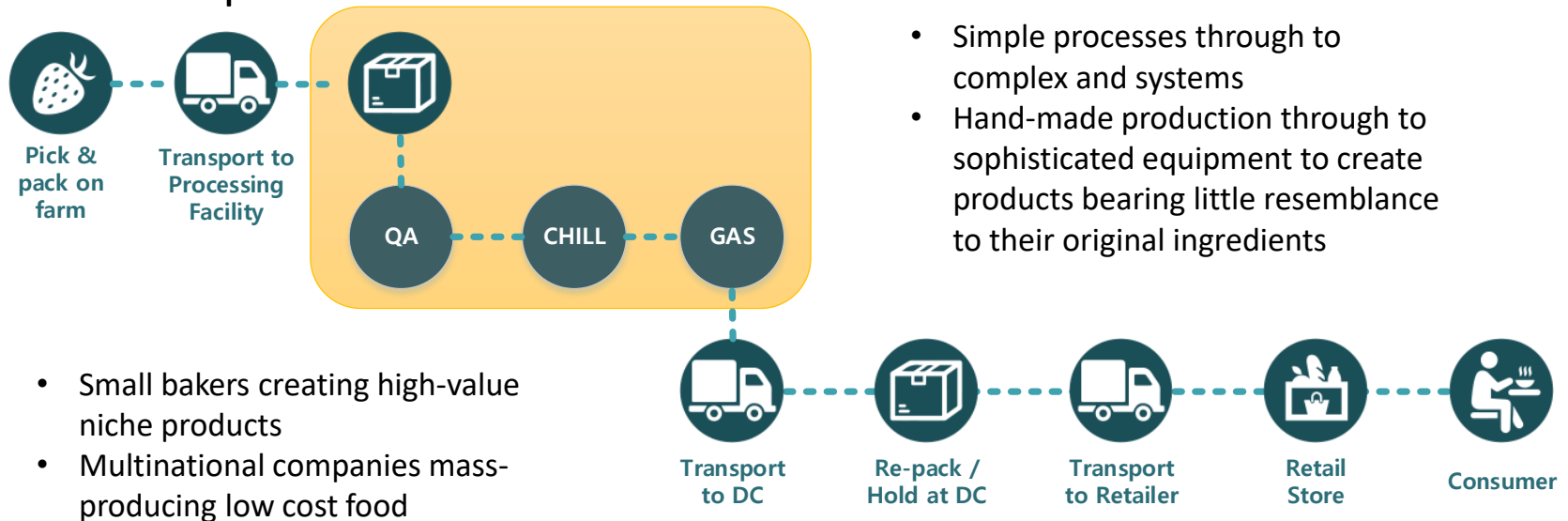
- Perishable food production in Australia is worth approximately \$40 billion
- Temperature is the most significant factor affecting perishable food shelf-life
- Refrigeration and air-conditioning technology underpins the Cold Chain

- Over 1 million refrigeration installations and pieces of equipment in the Australian food cold chain
- Approximately 178 PJ of primary energy used each year for refrigeration in the Australian cold chain



Food Manufacturing

- Businesses that transform raw materials (generally of animal or vegetable origin) into food products for intermediate or final consumption



- Simple processes through to complex and systems
- Hand-made production through to sophisticated equipment to create products bearing little resemblance to their original ingredients

- Small bakers creating high-value niche products
- Multinational companies mass-producing low cost food



Cold Chain Failure



- Approximately one-third of all food produced for human consumption is wasted (a cost of about USD 1 trillion per year).
 - The UN FAO estimates the carbon footprint of global food waste is equivalent to 3.3 billion tonnes of CO2 per year
 - At the same time, global food production must increase by 60% by 2050
- Almost one quarter of food waste is due to deficient refrigeration or a cold chain failure
 - Yet in developing countries, only 20% of perishable food is refrigerated
- Over the past 12 years, global production of refrigerators has doubled
 - 15% of the world's electricity consumption is now used for refrigeration equipment
- When the cold chain fails, we don't just waste food... we waste energy, water all the other inputs



Augmented Innovation



A confluence of technologies underpins the opportunity for supply chain and value chain transformation:

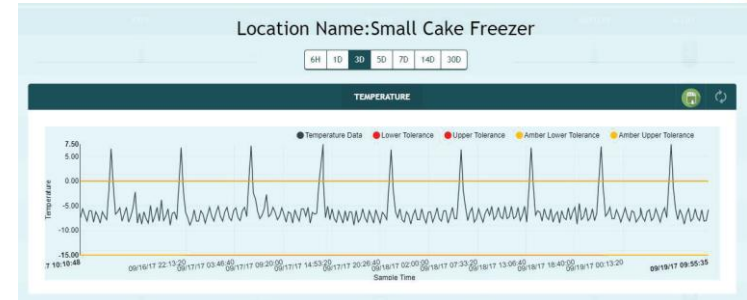
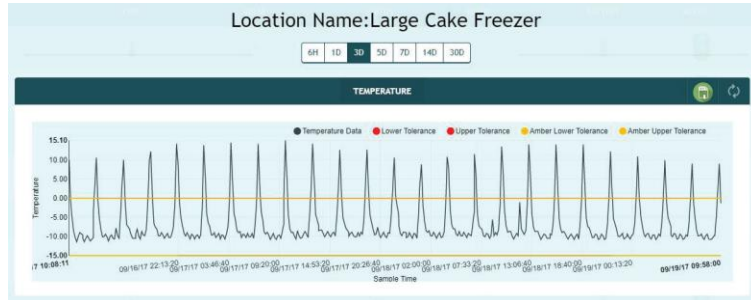
- Cloud-based solutions
 - Storage, collaboration & access applications
- New communication systems (LPWAN, 5G, nanosatellites)
 - Ubiquitous low-cost global network connectivity
- Internet of Things (IoT) & Edge Computing
 - Data capture & distributed processing
- Big Data Analytics
 - Unprecedented business intelligence capability
- Blockchain
 - Transaction transparency & accountability
- Machine Learning (ML) & Artificial Intelligence (AI)
 - Sophisticated predictive modelling



Leveraging Technologies



- US ice cream cake producer installed CCP Technologies (ASX:CT1) wireless LPWAN automated IoT monitoring and analytics solution.
- Case study: a small walk-in freezer was shown to be sub-optimal due to high frequency and high temperature defrost cycling (8 cycles per 24 hours up to -11°C). The running cost of the freezer was \$372.30 per month.
- The defrost cycle frequency was reduced to three cycles per 24 hours and the peak defrost temperature was reduced to -14°C .



- This adjustment reduced the power cost from \$372.30 per month to \$244.13 per month, a saving of \$128.17/month (52%).



Leveraging Technologies



- Buddy Technologies (ASX:BUD) is a real-time energy and water monitoring system
 - Reducing energy use
 - Drives energy efficiency
 - Supports environmental strategies

- Granular measurement & reporting
- Tuning specific systems
 - heating, ventilation and cooling
 - general lighting & computing
 - plant & equipment

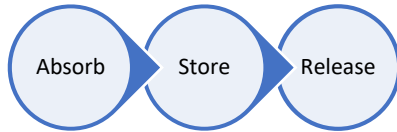


- Case study: Nestlé – the largest food company in the world – initially installed Buddy Cloud & IoT products in its Kingston facility in Jamaica
- Significantly reduced its energy costs
- Supports “Nestlé Behaviours” program which aims to mitigate Nestlé’s energy usage across its near 500 factories

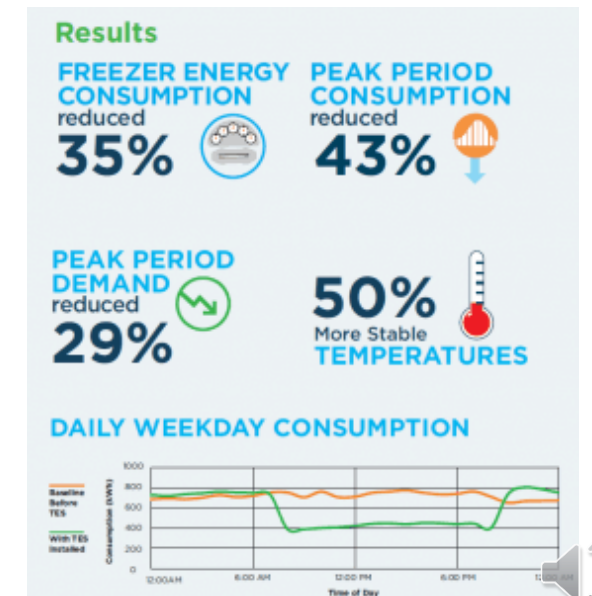


Leveraging Technologies

- Thermal Energy Storage (TES)



- Case study: Viking Cold Solutions installed their TES solution in a 8,600m² industrial low-temperature cold storage warehouse
- Phase Change Materials (PCM) combined with 24/7 remote monitoring and intelligent sub-system controls to increase energy efficiency by an average of 26% in frozen food cold storage



Challenges

- Government regulations which inhibit innovation
 - For example, Food Safety laws which do not encourage automated temperature using contemporary technologies
- Misdirected commercialisation incentives

Opportunities

- Foster innovation in policy settings
- Support & incentivise cold chain businesses to embrace technologies which drive energy efficiency and productivity... which can yield diverse socio-economic benefit



References



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- CCP Technologies Limited
www.ccp-network.com
- Buddy Technologies Limited
www.buddy.com
- Viking Cold Solutions Inc
www.vikingcold.com

About Us



- Based in Australia, Mainline Solutions is a professional services firm providing executive-level management consulting to public and private sector clients.
- We inject our skills and experience to drive organisational improvement - looking to stretch, grow and streamline for better outcomes.
- Whether structural, strategic, tactical, operational or informational improvements are required, we have a deep pool of talented professionals with decades of industry and government experience.

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