Energy Efficiency Training Week
Cold chain energy efficiency & technology

Industry Stream
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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

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The Food Cold Chain

- From “paddock-to-plate”

- 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
- 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

QA

CHILL

GAS

Transport to DC
Re-pack / Hold at DC
Transport to Retailer
Retail Store
Consumer
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 and all the other inputs
Augmented Innovation

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

- Cloud-based solutions
- New communication systems (LPWAN, 5G, nanosatellites)
- Internet of Things (IoT) & Edge Computing
- Big Data Analytics
- Blockchain
- Machine Learning (ML) & Artificial Intelligence (AI)

- Storage, collaboration & access applications
- Ubiquitous low-cost global network connectivity
- Data capture & distributed processing
- Unprecedented business intelligence capability
- Transaction transparency & accountability
- 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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  Australian Alliance for Energy Productivity

- Cold Hard Facts 3, 2018
  Australian Government, Department of the Environment and Energy

- Food Wastage Footprint
  UN Food and Agriculture Organisation (FAO)

- Industry as a partner for sustainable development
  International Institute of Refrigeration

- 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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