

# Managing Energy Use in Apple Stores

The Growing Kent and Medway 'Business Sustainability Challenge'

## Managing Energy Usage in Apple Stores

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James Turner- Refrigeration Consultant



# Project Deliverables

## **We Aim to Achieve a Better Understanding of Energy Consumption in Apple Stores to Help Growers Meet Net Zero**

- We are monitoring energy use in multiple Gala apple stores  
Two temperature regimes tested 0.5-1.0°C stores vs 1.5-2.0°C stores  
Two CA regimes are being tested 5/1 (5% CO<sub>2</sub>/1% O<sub>2</sub>) vs DCA storage
- GridDuck are providing greater granularity on electrical use across farms

GridDuck have Installed electrical clamps and sensors on chiller packs, cooling fans, CO<sub>2</sub>-Scrubbers, N<sub>2</sub> Generators, defrost heaters. Energy consumption data is uploaded to GridDuck on-line DashBoard allowing easy interpretation of energy usage.

- Stemy Energy aim to monitor energy usage of stores to identify periods where energy saving measures can be best achieved and energy savings can be aligned with peak demand in energy markets.

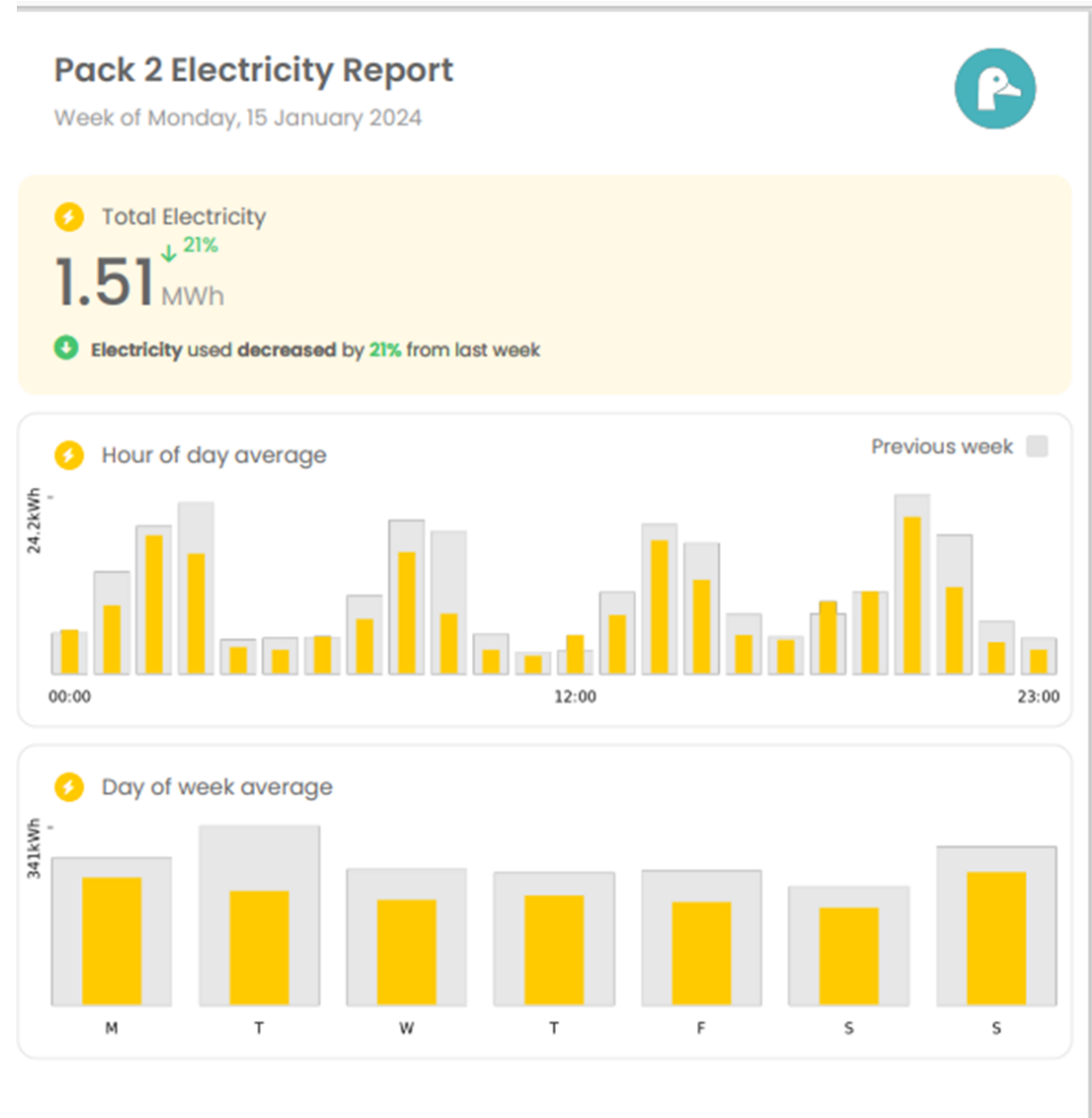
Stemy Energy have Installed monitoring equipment within Dixell thermistors- to measure temperature and energy use and-manipulate store temperature.

## The GridDuck Dashboard

- Provides information on hourly/daily energy usage for each piece of equipment monitored and produces an aggregated total Consumption
- Data accessible via the GridDuck app accessed via phone or computer



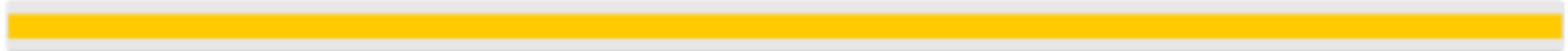
Example of a power clamp



## Individual Store Energy Use breakdown of stores running at different temperatures

### ⚡ Device Breakdown

Pack 2



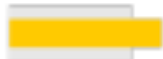
Store 27



Scrubber



Store 26

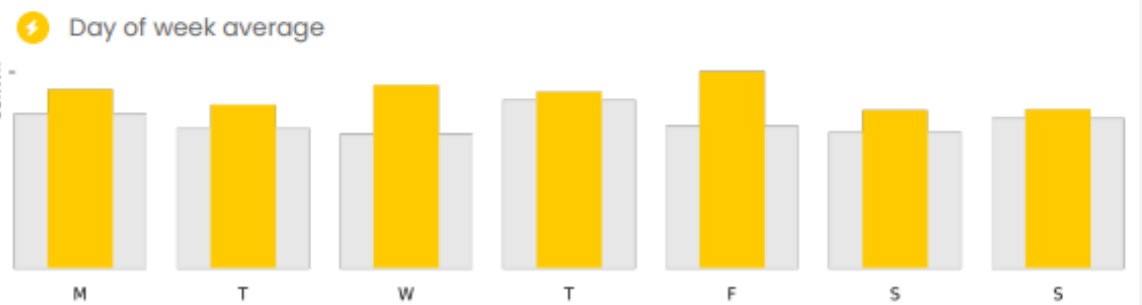
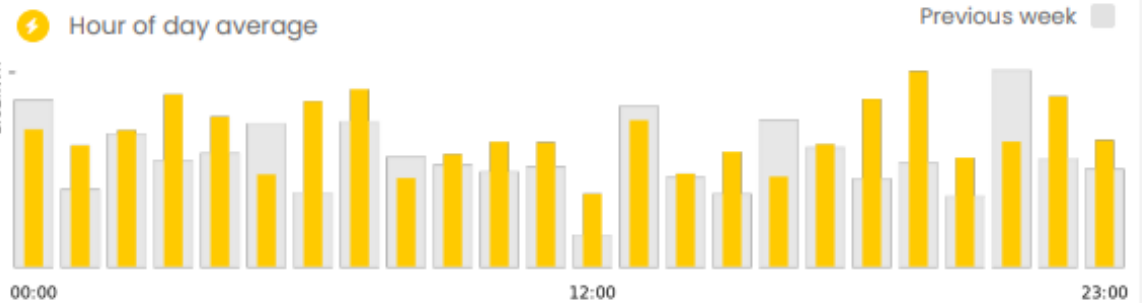
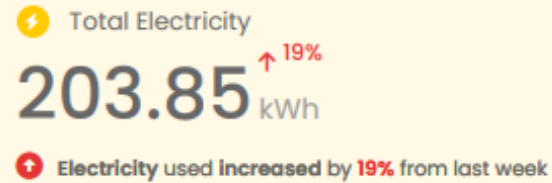


Other





- Energy Consumption can be broken down to individual pieces of equipment
- CO<sub>2</sub> Scrubbers
- Nitrogen Generators
- Defrosting equipment
- Chiller packs
- Weekly reports sent via e-mail including a comparison with previous week/time period



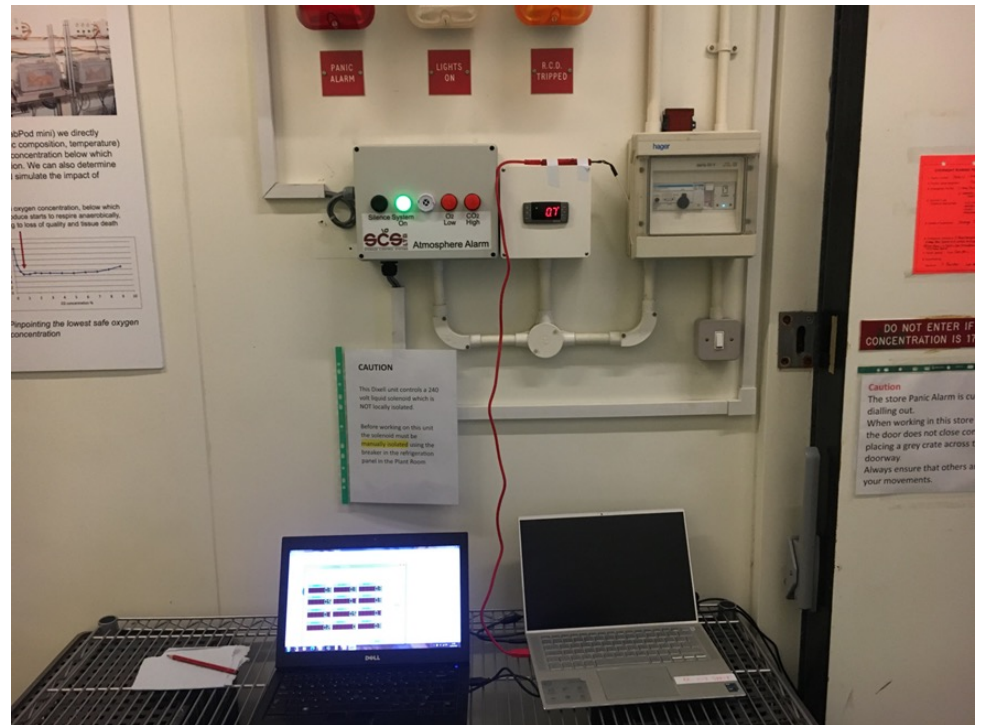
Temperature and humidity sensors were inserted into apples inside fruit in netted samples placed at top-middle and bottom of the bin stack





## Energy and Temperature Monitoring –PQC-

- Stemy Energy are deploying advanced artificial intelligence to make real time adjustments to cold store operations to increase their energy efficiency
- At the same time allowing businesses to monetise their ability to consume energy more flexibly by participating in Demand Response,
- Demand Response is a scheme run by the National Grid paying consumers to shift consumption away from peak times, reducing pressure on the energy system whilst creating a new revenue stream for growers.
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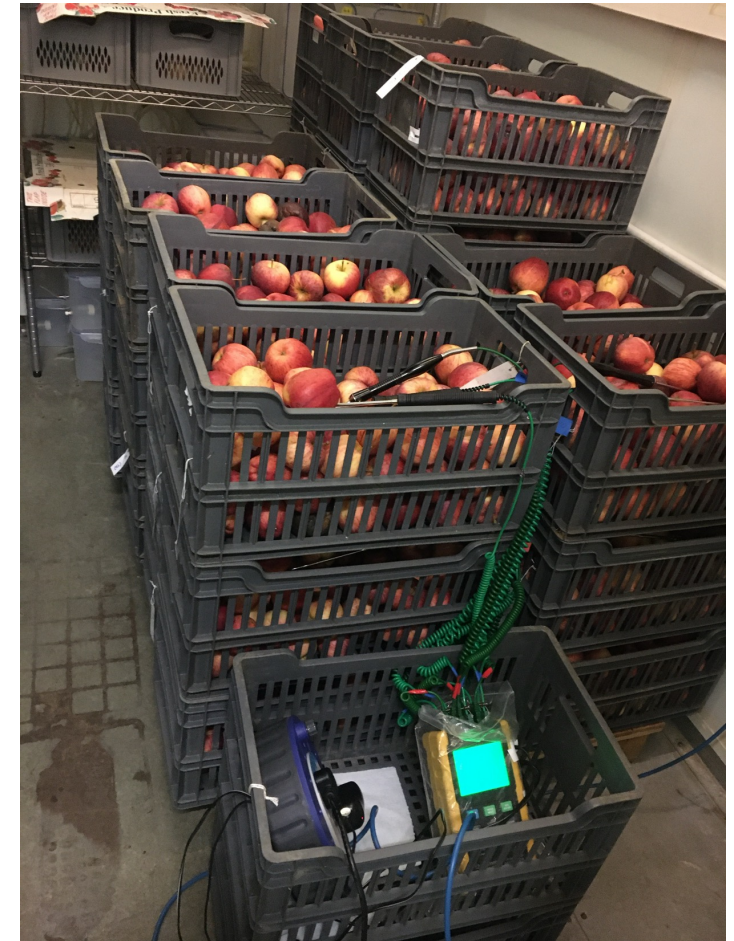
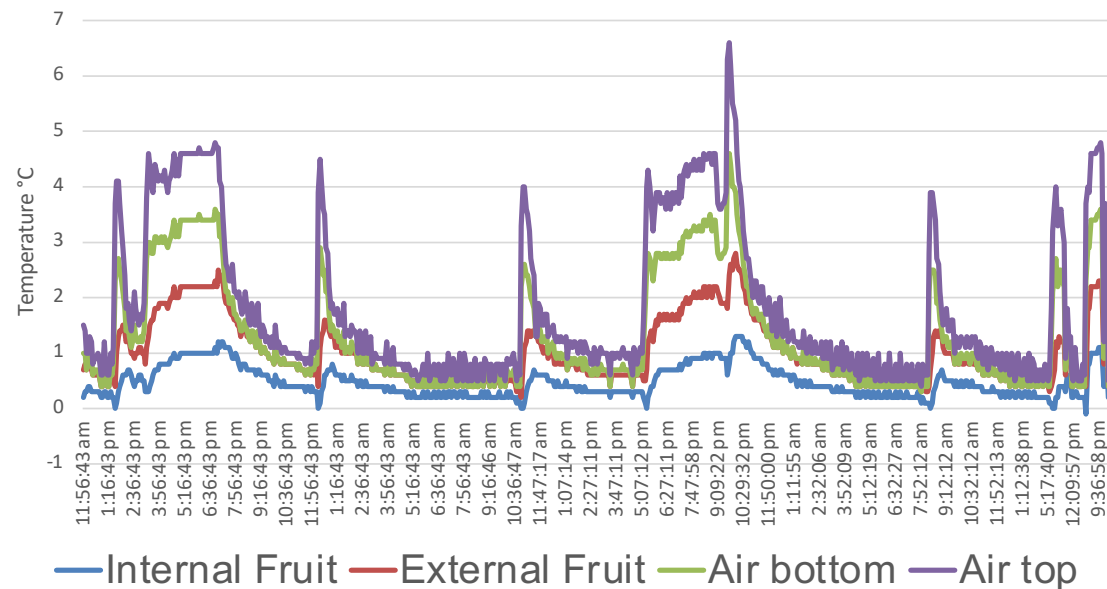




## Temperature Monitoring in Gala apples in the Produce Quality Centre

- At the Produce Quality Centre we have been following changes to fruit temperatures when temperatures have been raised from 0.5 to 1° C over a 4 hour period

Gala Store Temperature Modulation between 0.5°C and 2°C



# Managing Energy Usage in Apple Stores

- Stemy Energy and the PQC will investigate the impact of modulated temperature on thermal capacity of stored fruit and the impact changes in store temperature have on fruit quality during storage.
- British Apples and Pears, and the PQC will work together to develop a greater understanding of the State of Britain's Apple Storage Infrastructure. We plan to develop a questionnaire to send out to growers early in the New Year.

Project Duration: September 2023- March 2024-

## Contacts

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