

## ASDA °city

**Case Study:** Asda/Ethos Data Monitoring

**Project:** Energy and Carbon Reduction Strategy

**Asda drives down energy consumption by 35% since 2010 with the help of Star Refrigeration and City Facilities Management.**

*Strategic insight data services provided by Star Refrigeration's data monitoring business, SDA, saved Asda 5GWh on energy costs and over 1,100 tonnes of CO<sub>2</sub>e over the last four and a half years across six sites optimised with Ethos software.*

A collaboration between Star Data Analytics, a subsidiary of Star Refrigeration and City Facilities Management has helped supermarket giant Asda reduce both energy costs and CO<sub>2</sub> emissions. Asda's Chilled Distribution Centres (CDCs) located across the UK are now fitted with Star's proprietary Ethos software, which monitors energy performance data from the cooling plants 24/7 and makes recommendations for optimising energy efficiency.

Through focusing on energy optimisation and reduction, Asda has driven down its property related energy consumption by 35% since 2010. This has been achieved by reducing energy use in all of the company's stores and CDCs, through initiatives such as LED lighting and efficient machinery operation. Asda has been in business for almost 100 years.



Ethos Digital Twin



## ASDA and StarCare

The supermarket chain introduced the UK's first self-service supermarket in 1963. In 1984 Asda took the decision to create chilled distribution centres (CDCs), strategically located throughout the UK, to service its growing number of stores.

The Asda's CDCs require megawatts of cooling to maintain temperatures in chambers storing chilled and frozen products.

Over the last 37 years, Star Refrigeration has installed refrigeration plants at all nine of ASDA's mainland UK CDCs. A programme of planned preventative maintenance is in place to deliver maximum asset life, safety, reliability and performance.

This is provided through StarCare, a Star Refrigeration service, for all their CDCs' refrigeration plants. This proactive maintenance regime is delivered through Star Refrigeration's local maintenance teams.



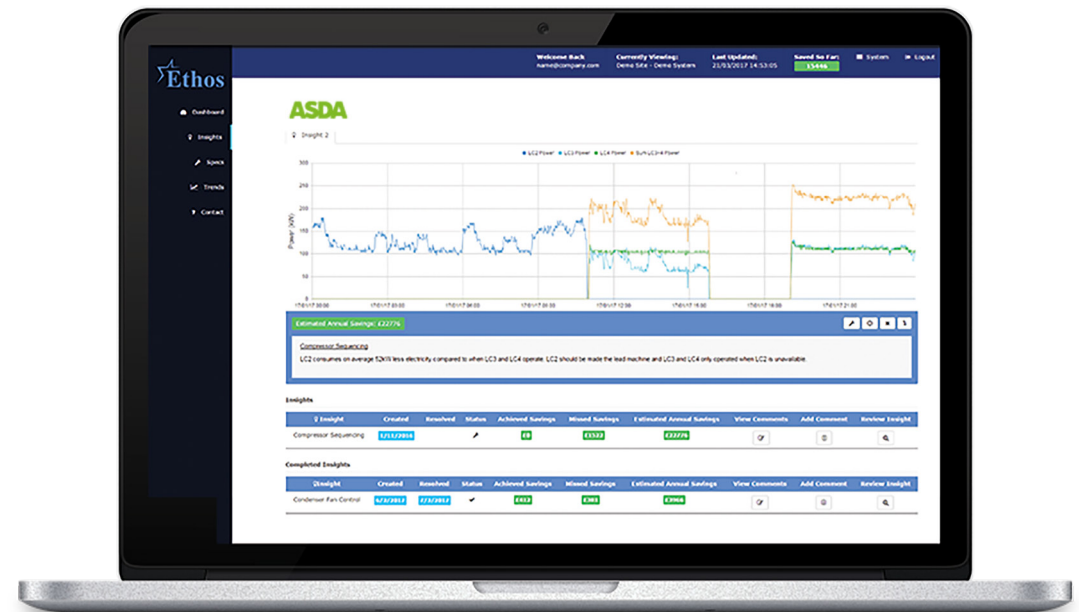
*ASDA Plant, Rochdale*

## The Solution

For over 20 years Asda has worked in close partnership with City Facilities Management to drive innovation and a wide range of efficiencies across the company's retail environment.

The UK retail chain has embraced its corporate responsibilities, recognising the part they can play to reduce the environmental impact of their operations and has turned its focus on fulfilling a promise to build a better world and a more sustainable future. With help from City Facilities Management, Asda has achieved significant carbon savings through the reduction of energy and through avoiding use of energy during peak periods where CO<sub>2</sub> emissions from the electricity used are higher.

City Facilities Management not only targeted the traditional quick wins type of energy savings such as LED lighting, VSDs and door control, they were looking for the next way to reduce overall energy use.



## CDC Performance Optimisation

When City Facilities Management became aware that Star Refrigeration had developed Ethos, a data led, performance optimisation service for refrigeration and heat pump plants, the company decided to pilot the service at one of Asda's CDCs in 2017. Although Ethos was still in its infancy with only one or two trial sites at that stage, City Facilities Management was keen to explore the potential benefits for ASDA.

Ethos is a bespoke data driven analysis software designed by a team of award-winning senior refrigeration consultants, field engineers and software engineers. It collects data from refrigeration plants in real time and the cloud based software then compares actual operating performance with a computer model of theoretical performance at the given ambient conditions and operating temperatures.

This comparison of actual performance with the 'digital twin', highlights any energy gap and enables the SDA team to identify problems and suggest corrective actions to reduce energy usage and meet environmental goals.



Anne Flanagan, Business Development Manager at SDA, said...

***“The benefit of Ethos could be compared to having an MRI scan instead of an X-ray. It can see so much more and provides targeted energy reduction advice which is data backed.”***

***“Additionally, Ethos can help maintenance teams by confirming or identifying the requirement to take action and will also capture the resultant energy saving.”***



Ethos can also help owners of temperature controlled facilities meet their Climate Change Agreement (CCA) targets, ensuring they receive a 92% reduction on the Climate Change Levy. It can also assist with the government’s Streamlined Energy and Carbon Reporting (SECR) requirement in order to provide more transparent reporting of energy use. The technology can work in different ways from headlining instant saving results to a combination of smaller recommendations that optimise different parts of the system.

Ethos is able to find hidden energy saving optimisations even on well-maintained plants. For Asda, two of the major energy saving measures were: optimisation of compressor Vi and modifications of defrost set points.

Most of the savings were made through the integration of changes with current maintenance activity. The remaining savings were made through upgrades that had already been planned through scheduled capital investment plans such as control upgrades and component overhauls.



## Bedford – The Trial Site

Ethos installation date	2017
Store Volume	210,000 m <sup>3</sup>
CO <sub>2</sub> e Savings	760 Tonnes CO <sub>2</sub> e
kWh Savings	3,270,000 kWh

Star installed Ethos at Asda's Bedford site in 2017 as a trial. The trial proved to be successful with City Facilities Management reporting in 2018 that electricity usage had been reduced by 14%.

*Dean Stewart, Energy Reduction Coordinator at City Facilities Management said...*

***“The results show that had no works taken place on site the refrigeration system would have consumed 6.38MWh. Due to the works that took place on site the refrigeration system actually consumed 5.50MWh. This is a reduction of 14%.”***

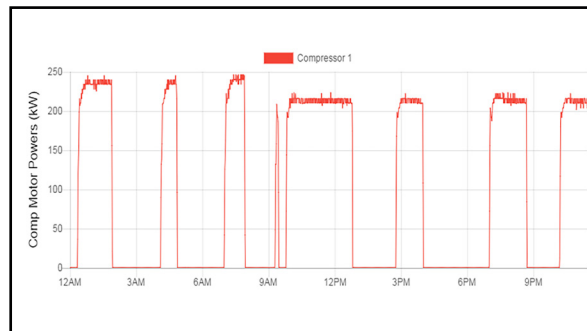
***“This trial demonstrates that Ethos is an excellent tool to***

***identify and implement corrective actions to improve refrigeration efficiency and performance.”***

Over the coming years, Ethos continued to obtain energy savings related to the operation of the plant and overall energy consumption was reduced by 20%. From 2017 to 2021 Asda Bedford made total energy savings of 3,270,000 kWh which is equivalent to 760 tonnes of CO<sub>2</sub>e.

The corrective actions taken at the Bedford site combined a number of strategies including targeted maintenance and service activities, plant adjustments based on fluctuating ambient and load conditions, modifications to liquid control, purging of air and calibration of temperature sensors.

An example of an action that offered Asda instant energy savings at their CDC is shown below.



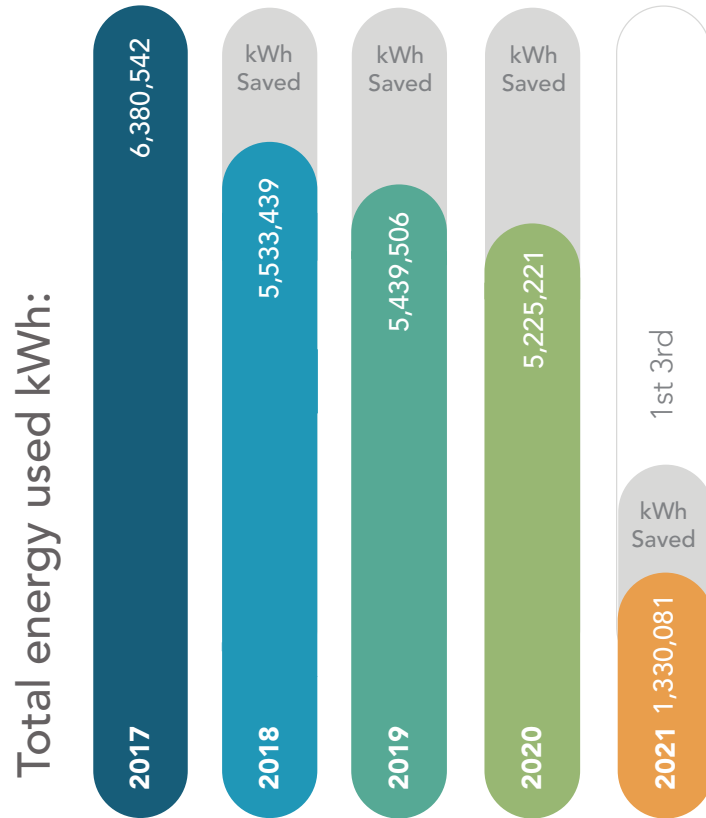
It demonstrates the value of Ethos as an instrument to continuously monitor plant performance and identifies where mechanical and human changes have affected plant efficiency. Many are undetectable through traditional technology or maintenance routines due to the complexity of large industrial cooling system.

SDA's experienced refrigeration engineering analysts are able to study and detect patterns in system performance and recognise where corrective actions are necessary.

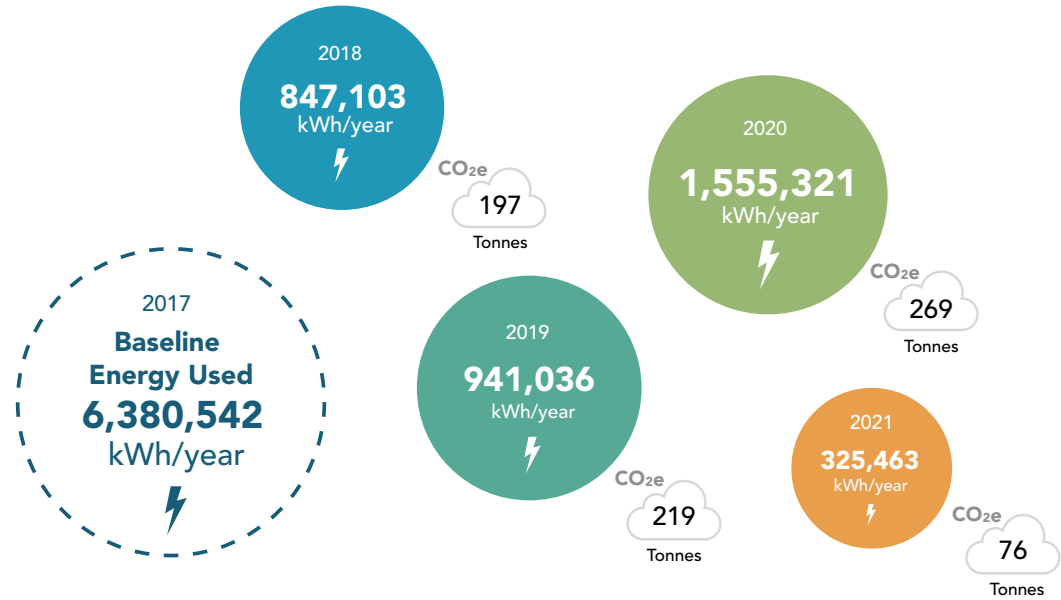
When the Ethos digital twin highlighted a significant difference between the expected and actual energy use of a compressor, SDA's analysts assessed the system and concluded that the Vi was no longer optimised. SDA informed Asda of the issue and Star's maintenance team made the appropriate corrections.

On another occasion, the SDA team advice was to calibrate the economiser valve actuator. The economiser was brought back to normal operation and this resulted in an increased efficiency of 12% on that plant.

# ASDA Bedford



**Total Savings:** 3,270,000 kWh ⚡ 760 tonnes CO<sub>2e</sub> ☁



\* Energy savings measured from January 2018 and referred to 2017 energy consumption.  
Emissions based on 0.23314 kg CO<sub>2e</sub>. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.

# Rochdale

<b>Ethos installation date</b>	2019
<b>Store Volume</b>	335,000 m <sup>3</sup>
<b>CO<sub>2</sub>e Savings</b>	130 Tonnes CO <sub>2</sub> e
<b>kWh Savings</b>	556,000 kWh



Rochdale Plant

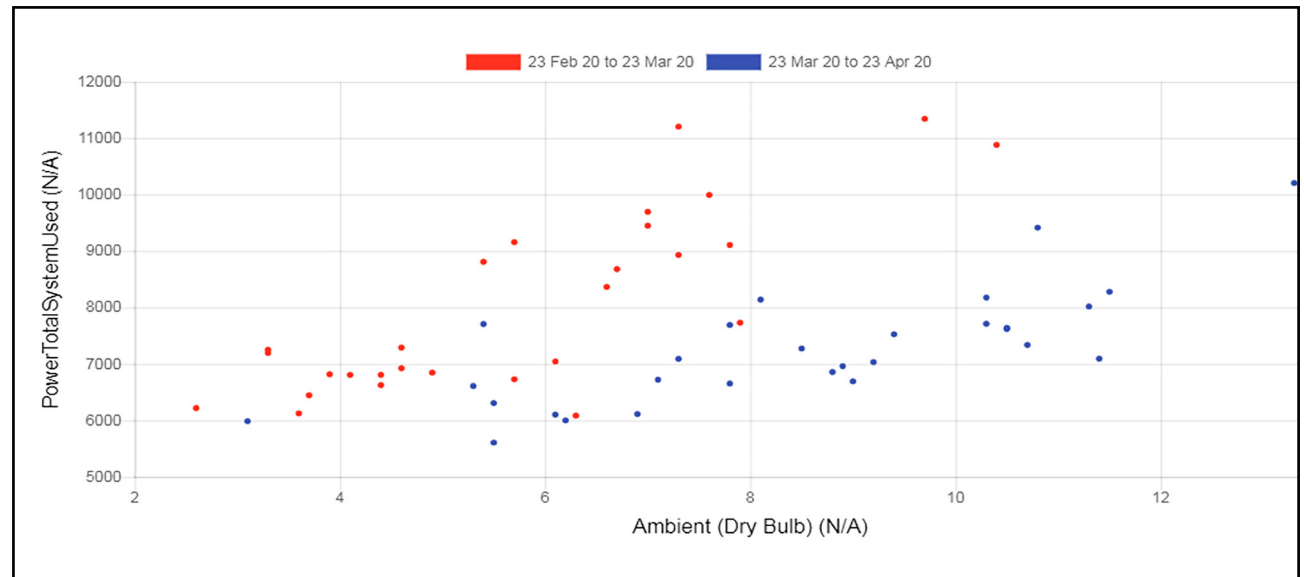
\*Additionally, there were adjustments made to optimise the plant operation that were not instantly visible but contributed to a general decline in energy consumption.

The Ethos install was completed at the Rochdale CDC at the end of 2019. In a relatively short space of time, energy consumption was reduced by 13%, saving Asda 130 tonnes of CO<sub>2</sub>e from being released into the atmosphere.

The main saving was through optimisation of set points for the control of the defrosting cycle. This was implemented at the end of March 2020.

A high condensing temperature was identified by the Ethos software and control settings adjusted following SDA's refrigeration analysts recommendation.

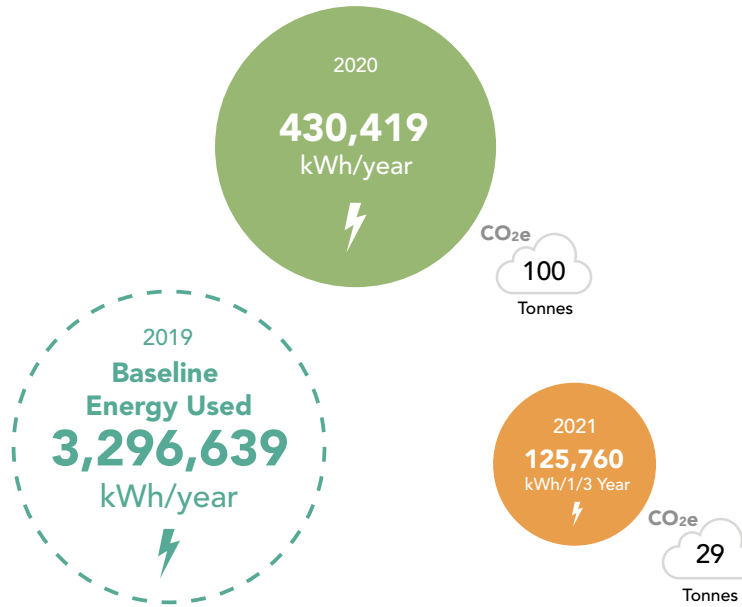
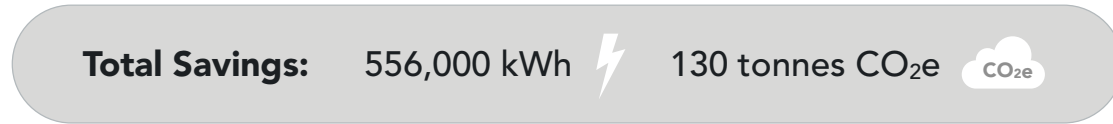
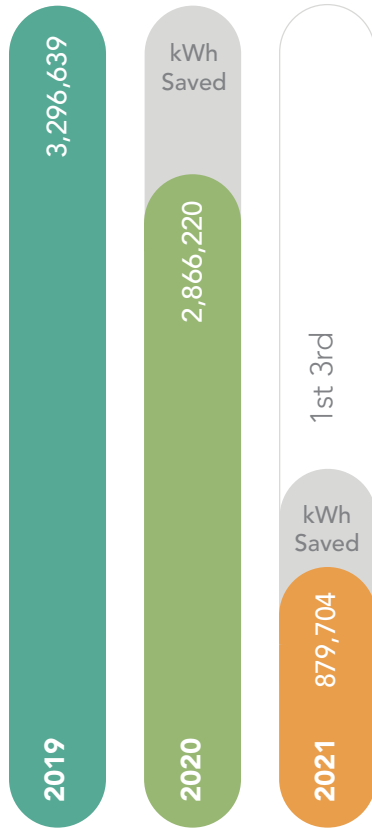
The results are shown in the graph below. Each dot represents the energy used on one day - red dots show the energy used the week before the change in control settings and blue dots the week after. The graph takes account of the differing ambient conditions in March and April.



# ASDA Rochdale



Total energy used kWh:



\* Energy savings measured from January 2020 and referred to 2019 energy consumption.  
Emissions based on 0.23314 kg CO<sub>2</sub>e. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.



## Wakefield

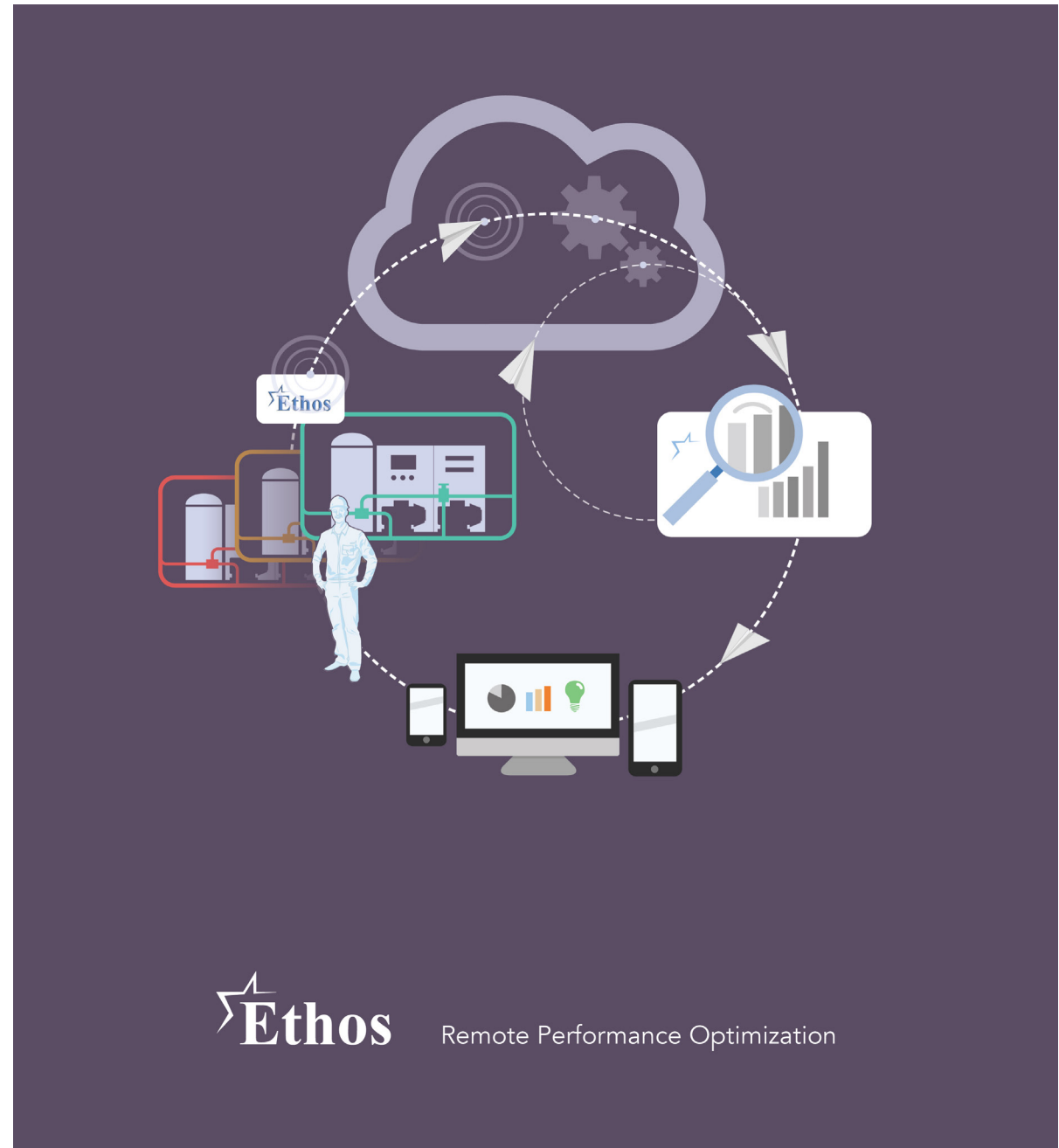
<b>Ethos installation date</b>	2019
<b>Store Volume</b>	226,000 m <sup>3</sup>
<b>CO<sub>2</sub>e Savings</b>	60 Tonnes CO <sub>2</sub> e
<b>kWh Savings</b>	256,000 kWh

Ethos was installed at the Wakefield site in October 2019. Improvements implemented as a result of the installation resulted in a savings of 216,000 kWh in 2020 compared to 2019.

This trend looks set to continue through 2021 as energy consumption from January 2021 to April 2021 was down by 101,023 kWh year on year when compared to 2020.

The recommended actions taken included optimising oil return to help improve evaporator performance.

There were also float changes to improve the high side control. Prompt intervention when the cooling plant drifted from optimum parameters was also instrumental in gaining energy benefits performance.

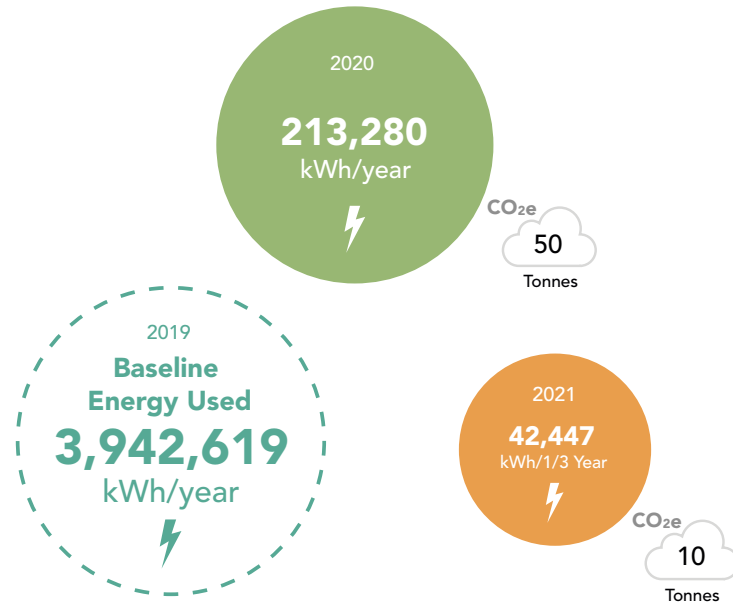
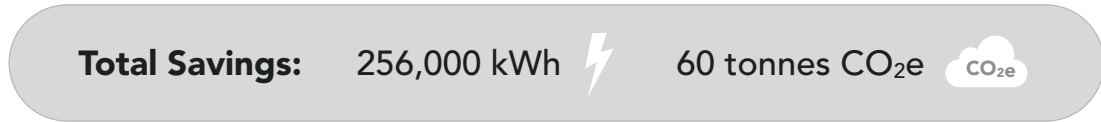
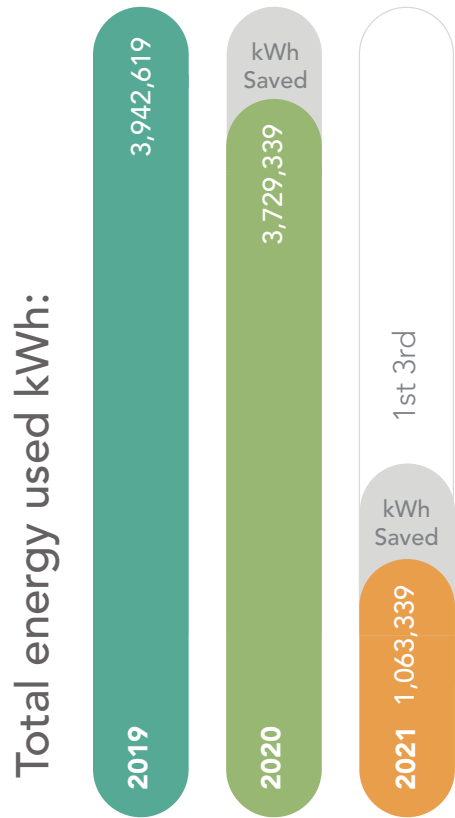


**Ethos**

Remote Performance Optimization

*Ethos flow of information*

# ASDA Wakefield



\* Energy savings measured from January 2020 and referred to 2019 energy consumption.  
Emissions based on 0.23314 kg CO<sub>2</sub>e. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.

## Bristol

<b>Ethos installation date</b>	2020
<b>Store Volume</b>	285,000 m <sup>3</sup>
<b>CO<sub>2</sub>e Savings</b>	53 Tonnes CO <sub>2</sub> e
<b>kWh Savings</b>	231,000 kWh

Ethos was installed on the Bristol site towards the end of 2020.

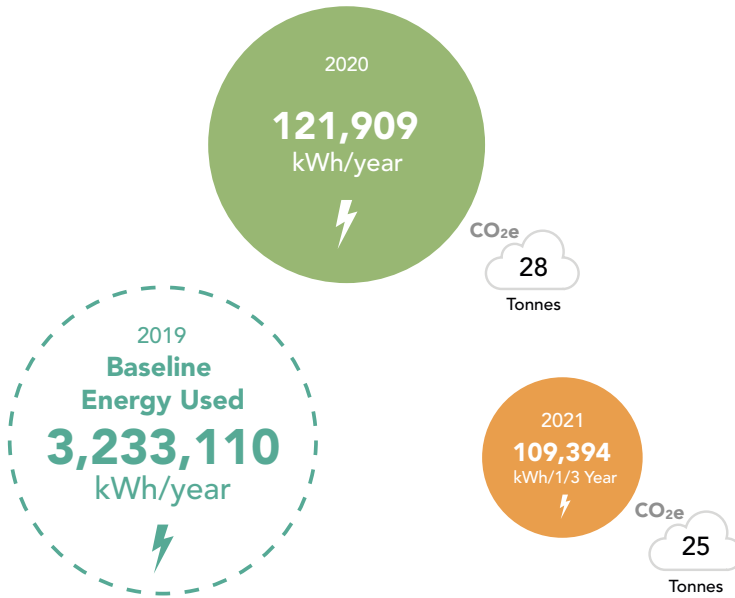
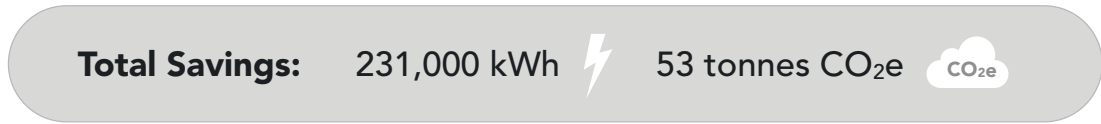
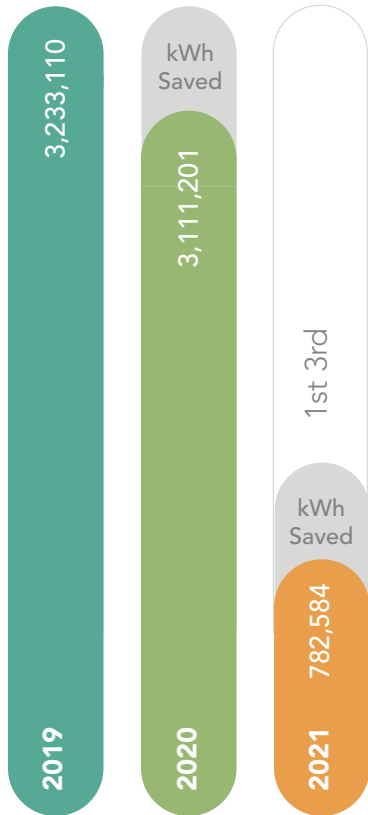
There were some early energy saving opportunities identified through setpoint changes which optimised temperature of the hot gas required for the defrosting of the coolers.

As a result, some energy savings were captured at the end of 2020. These savings continued to be realised in 2021 with a 10.5% reduction in energy use for the first third of the year compared to the same period in 2020.

# ASDA Bristol



Total energy used kWh:



\* Energy savings measured from January 2020 and referred to 2019 energy consumption. Emissions based on 0.23314 kg CO<sub>2</sub>e. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.



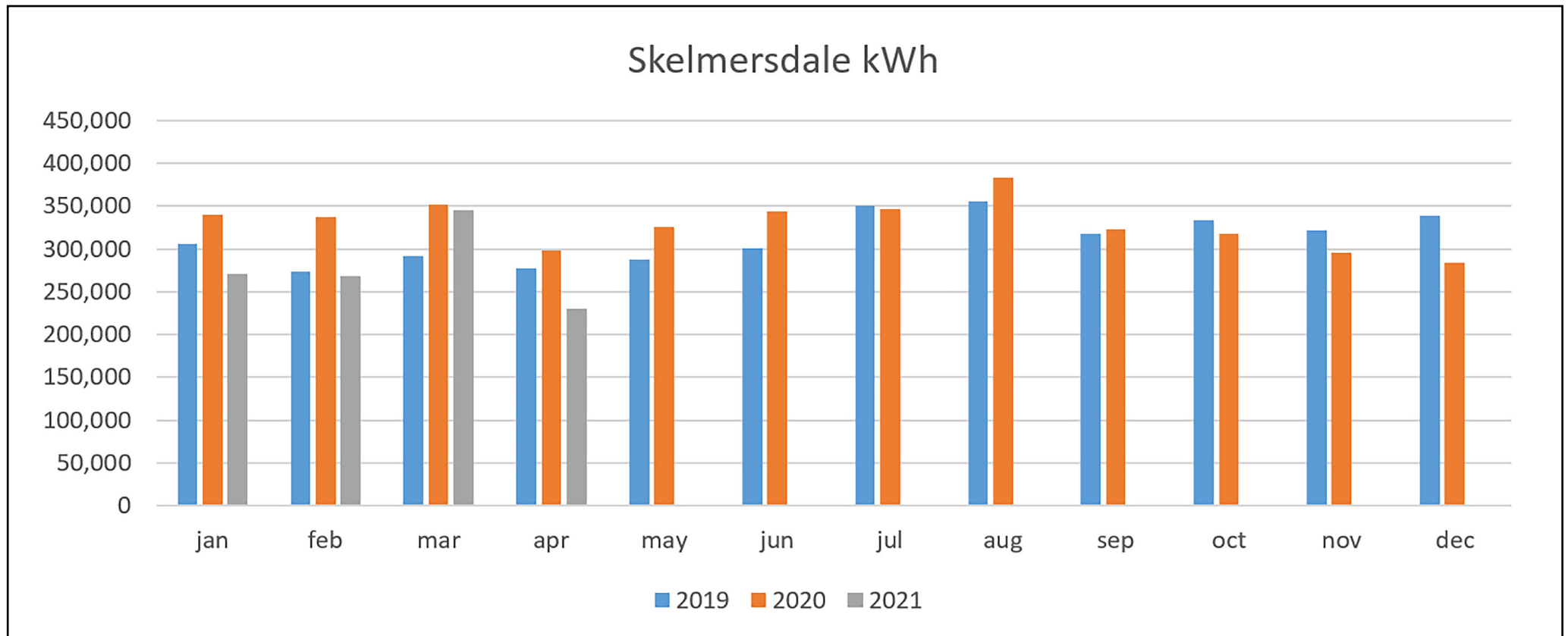
## Skelmersdale

<b>Ethos installation date</b>	2020
<b>Store Volume</b>	226,000 m <sup>3</sup>
<b>CO<sub>2</sub>e Savings</b>	40 Tonnes CO <sub>2</sub> e
<b>kWh Savings</b>	170,000 kWh

Skelmersdale has been monitored since early 2020. At the point of implementation there was an upward trend of increased energy from 2019 to 2020. Ethos helped reverse this upward trend over the remainder of the year and in the last three months of 2020, a saving of 67,000 kWh was recorded when compared with 2019. This reverse in energy consumption breakthrough has continued in the first third of 2021, with an overall 13% reduction recorded.

SDA is expecting this trend to continue throughout 2021 based on regular performance assessment of the data from Ethos and corrective action.

Actions taken to save energy included repair of economisers, cleaning of condensers and cooler defrosts optimised to improve cooler performance.

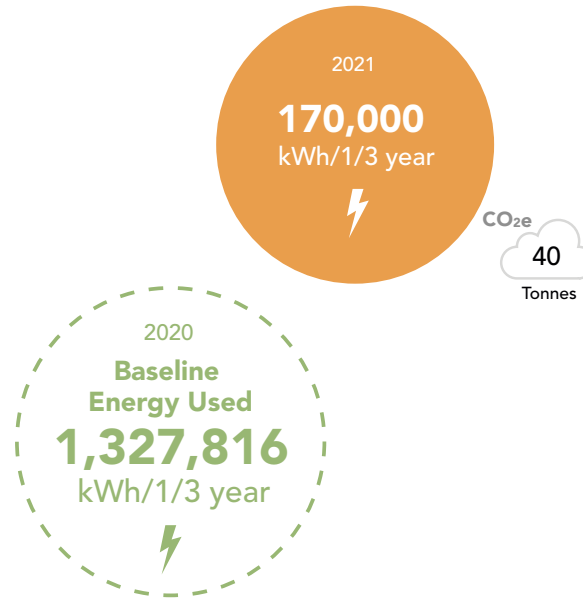
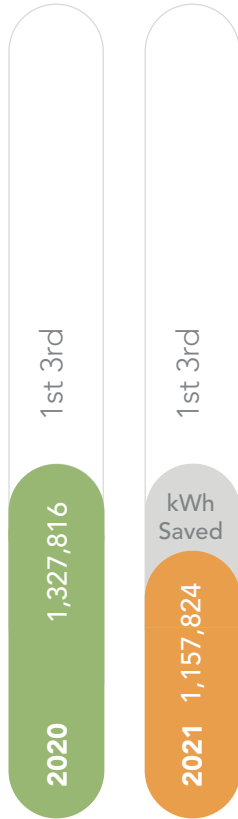


# ASDA Skelmersdale



**Total Savings:** 170,000 kWh ⚡ 40 tonnes CO<sub>2</sub>e ☁

Total energy used kWh:



\* Energy savings measured from January 2020 and referred to 2019 energy consumption.  
Emissions based on 0.23314 kg CO<sub>2</sub>e. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.

# Falkirk

<b>Ethos installation date</b>	2020
<b>Store Volume</b>	190,000 m <sup>3</sup>
<b>CO<sub>2</sub>e Savings</b>	50 Tonnes CO <sub>2</sub> e
<b>kWh Savings</b>	213,000 kWh

At the Falkirk site Ethos began monitoring the plant in early 2020 and reported a saving of £27,000 so far in 2021.

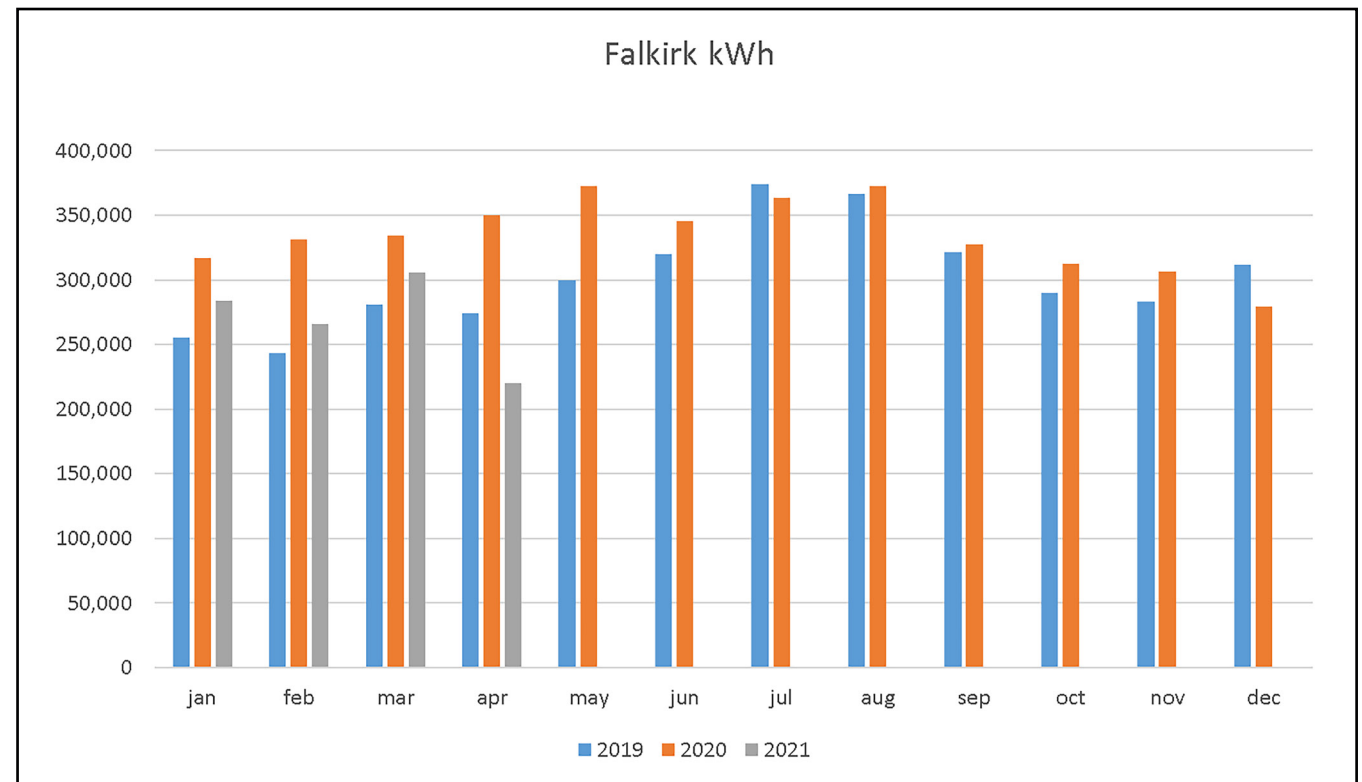
Like Skelmersdale, Falkirk was showing an increase in year on year energy consumption at the point of installing Ethos. Following installation, this trend reduced as Ethos brought consumption back into line with 2019.

Energy is now heading in the right direction and so far this year ( to end of April 21 ) the year on year savings are up to 213,000 kWh and 50 tonnes of CO<sub>2</sub>e.

Actions taken at Falkirk include turning off coolers to reduce the defrosting energy requirement and spacing out the timing of defrosts to reduce the requirement to heat glycol with the electric heater. The recommendations were implemented in June and were a factor in the reduction of energy use seen in the second half of 2020.

Other actions include:

- Optimisation of high stage evaporating temperature in May 2020
- Cooler set point optimisation in December 2020
- New condenser fan belts in January 2021
- Ammonia top-up in January 2021

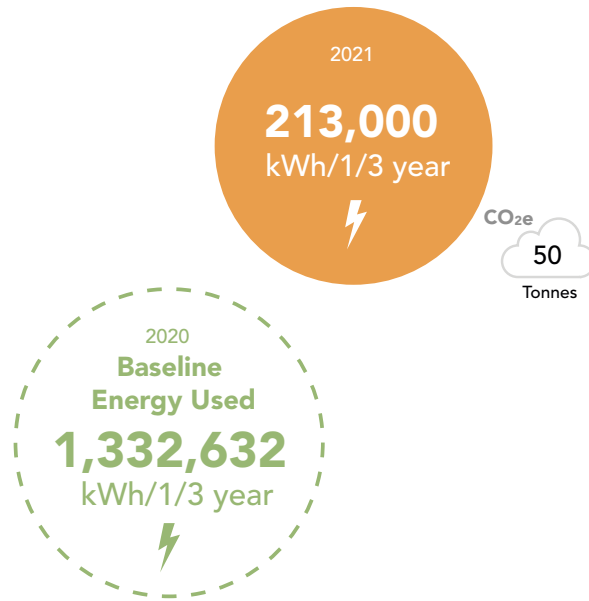


# ASDA Falkirk



**Total Savings:** 213,000 kWh ⚡ 50 tonnes CO<sub>2</sub>e ☁

Total energy used kWh:



\* Energy savings measured from January 2021 and referred to 2020 energy consumption.  
Emissions based on 0.23314 kg CO<sub>2</sub>e. <https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2020>.



## Lutterworth, Isis Reach and Washington

Ethos was added to these sites at the end of 2020 and beginning of 2021. Star Data Analytics is currently working closely with Star Refrigeration's maintenance team to reduce energy use through the identify actions. It is expected that these sites will show a downward trend in energy consumption alongside the other CDCs soon.

## Conclusions

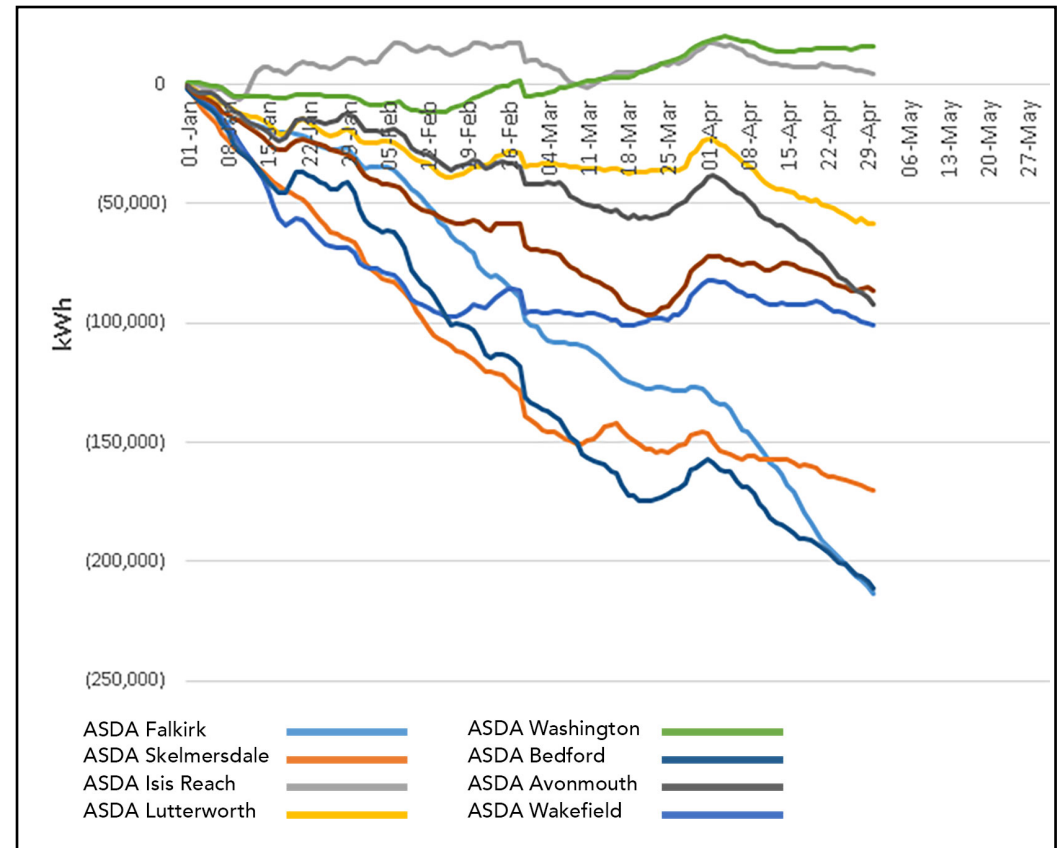
A holistic approach that encompasses an energy efficient refrigeration system design, low global warming potential refrigerants, comprehensive control system and proactive and planned preventative maintenance are fundamental steps to optimising ASDA's energy consumption and CO<sub>2</sub>e footprint.

This is further enhanced through the use of Ethos which fine tunes the refrigeration system's controls and delivers tangible year on year savings. Going into 2021 Asda find themselves in the position where energy consumption on seven out of nine of their CDC sites is on a downward trend year on year. Ethos will continue to monitor plant performance to ensure that optimal energy is maintained, and energy savings continue and strengthen.

Investment in aftercare has reaped significant rewards for Asda. The company is leading the way in carbon reduction strategies and is the first supermarket to take this pioneering data led approach using digital twins to save energy on their distribution centres. The company have used the above benefit of Ethos to meet and exceed their Climate Change Agreements targets.

Through the collaboration between Star Data Analytics and City Facilities Management, Asda has saved thousands of pounds in running costs and significantly reduced its carbon footprint, which is becoming more and more important for business, as the UK strives toward a net zero future.


Power Consumption - Asda Sites 2021 Energy Decrease



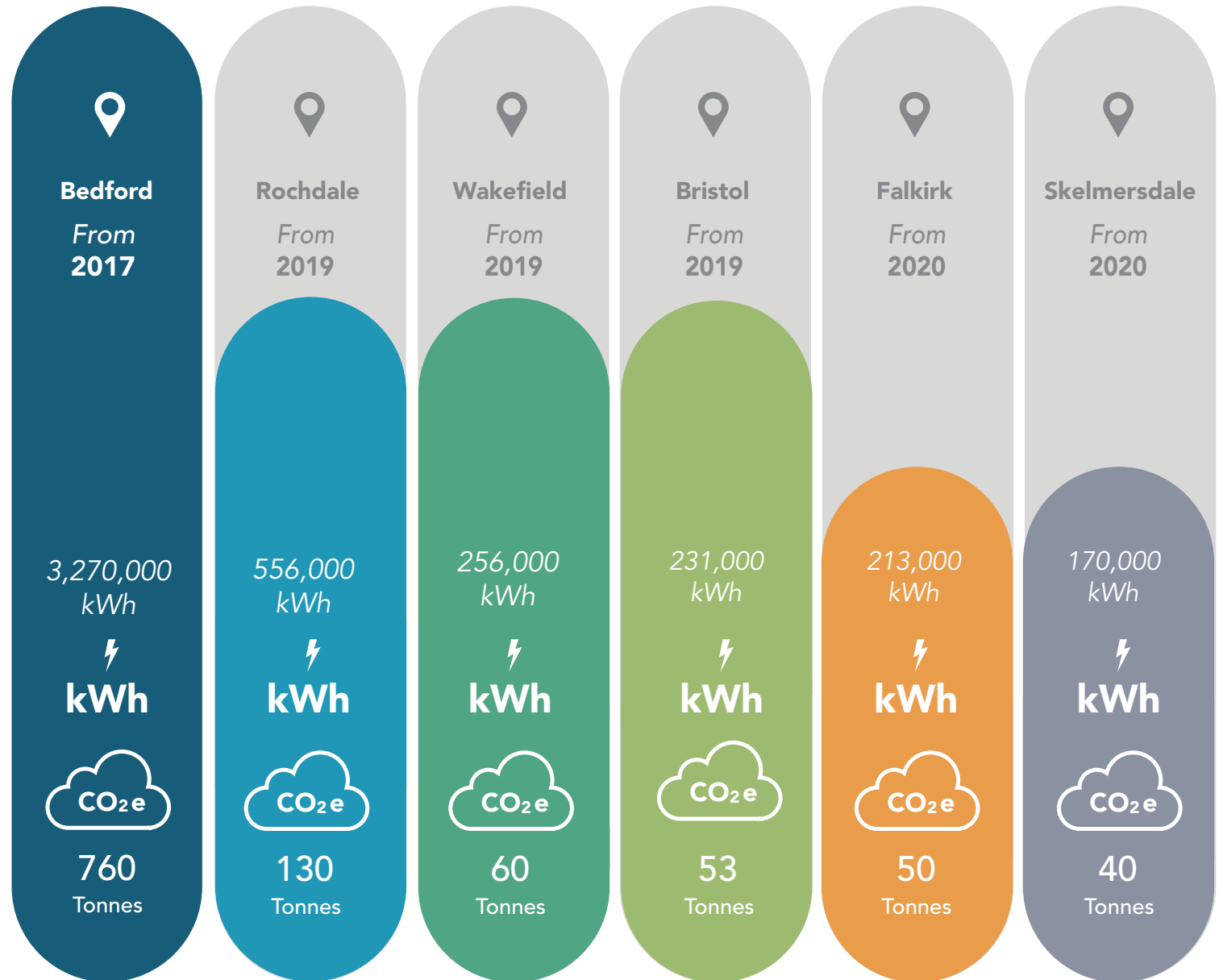
**Note:** All energy figures are based on energy data provided by City Facilities Management.

# Ethos Energy and Carbon reduction for ASDA

Total Savings:

  
**4,696,000**  
kWh

  
**1,093**  
tonnes CO<sub>2</sub>e



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## The Star Refrigeration Group

