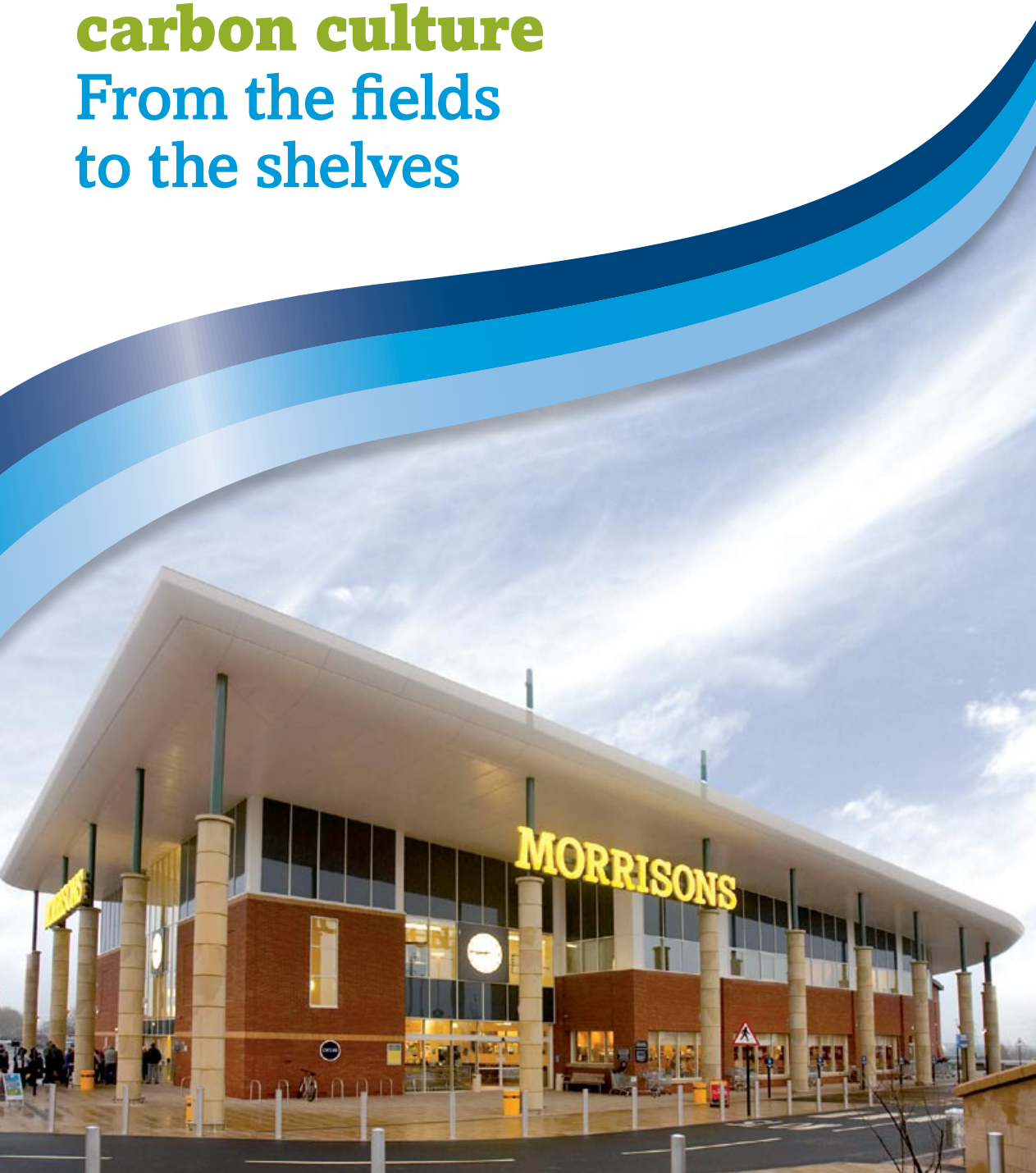
CARBON TRUST

Making business sense of climate change

Building a low carbon culture

From the fields to the shelves



£100m

spent on refrigeration efficiencies over the last three years

240,000

tonnes of CO_2 saved across all operations

130,000

staff trained as part of energy awareness programme

Key measures

Since 2005 Morrisons has:

- Installed meters to monitor energy use at its stores and production sites
- Centralised lighting controls at its stores
- Retrofitted combined heat and power (CHP) systems in 30 stores
- Introduced heat reclaim systems
- Fitted variable speed drives to chillers at its production sites
- Reduced transport emissions through logistics efficiencies
- Won a National Training Award for its energy staff awareness training programme
- Become the first supermarket to achieve the Carbon Trust Standard.

“The work we have done on carbon management is truly company wide. I believe we have found a way to make carbon reduction part of how we think and what we do everyday”

Neal Austin
Logistics Director, Morrisons

Company background

From humble beginnings in 1899, when founder William Morrison opened a market stall in Bradford, Morrisons has grown to be the UK's fourth largest food retailer, with over 10 million customers every week, as well as the fifth biggest food producer in the UK.

Bradford remains the hub of Morrisons and is home to its head offices. The company has increased its presence in the south of the country since acquiring Safeway in 2004. Since then it has gone from strength to strength, being voted retailer of the year by Retail Week in 2008 and 2009.

As well as 425 stores, many with petrol stations, the company has 12 distribution centres, a transport fleet and 13 production sites across the UK – comprising three bakeries, three abattoirs, six fruit and vegetable packhouses and one food preparation factory.

The company's efforts to improve its environmental performance and reduce emissions were recognised in 2008, when it became the first supermarket to receive the Carbon Trust Standard. Awarded to organisations that measure, manage and reduce their carbon footprint, the Standard provides an objective benchmark against which to assess success in addressing climate change impact.

Morrisons was awarded the Standard based on the broadness of its carbon management work, and success in exceeding its targets. The evaluation process singled out its training and awareness work as a particular highlight.

Morrisons was the third placed overall company in the FTSE CDP Carbon Strategy Index and leading food retailer.

425

Morrisons stores currently nationwide

+ 12 distribution centres

+ 13 production sites

"Carbon management is now at the very heart of our operations, and the Carbon Trust Standard acknowledges the progress we have made in this area"

Paul Boreham
Group Energy Manager, Morrisons

Business focus

As the only major food retailer with in-house manufacturing and processing facilities, Morrisons has a higher direct carbon footprint than its main competitors – but also far more control over it.

When it started work with the Carbon Trust in 2005, the annual carbon footprint of Morrisons was just under 1.5 million tonnes of CO_2 (tCO_2).

Being resource efficient, reducing costs and cutting carbon have been the main drivers for the company. With significant investment in carbon management, it has saved more than 240,000 tonnes of carbon dioxide equivalent (tCO_2e) between 2005 and 2009, despite significant growth.

Work to reduce emissions has also been a key part of its wider corporate social responsibility programme. This has also reduced waste and water use, and focused on sustainable and responsible sourcing.

A new commitment

More recently, the Carbon Reduction Commitment (CRC) Energy Efficiency Scheme has provided an added incentive to take action.

Companies falling within the CRC will have to pay to cover each tonne of carbon they emit, so there will be a direct incentive to reduce energy use. Every year, a league table of participants will be published, with positions in the table determined by how much organisations have reduced their emissions by that year. The revenue generated from the sale of the carbon allowances will then be given back to participants according to their position in the CRC league table – the higher the position, the higher the payback.

By taking early action and achieving the Carbon Trust Standard, Morrisons will be higher up the league table in the first year. This means it will receive a greater share of the revenue raised from the sale of carbon allowances.

Carbon Reduction Commitment

The Carbon Reduction Commitment (CRC) Energy Efficiency Scheme is an emissions trading scheme aimed at reducing carbon emissions in large non-energy intensive organisations by 1.2 million tonnes of carbon per year by 2020.

It will be a mandatory scheme, targeting emissions currently not included in the EU Emissions Trading Scheme or Climate Change Agreements, and will apply to organisations using more than 6,000 megawatt hours (MWh) of electricity per year.

Read more about the CRC at **www.carbontrust.co.uk**

Defining a carbon strategy

Under the guidance of Group Energy Manager Paul Boreham – and with the support of the Carbon Trust – Morrisons has taken an exemplary approach to carbon management.

"The Carbon Trust helped us develop an overall carbon management strategy, and determine the direction we needed to move in. That initial advice was invaluable, and the team continues to provide vital support by verifying figures and plans as we roll projects out," explains Paul.

In-depth surveys focusing on specific areas such as automatic metering, have also helped build the business case for new projects.

Underpinning all the other work has been a sustained and highly successful training programme, designed to develop a more energy aware culture and instill better habits among staff.

Spotlight on… Training and awareness

Central to all its carbon management work, the training and awareness programme at Morrisons, Switching on to Switching off, has won the company a NationalTraining Award.

The initial programme was cascaded throughout the organisation in 2007, using a 'train the trainer' approach. Managers were trained before passing that learning on to their own teams, meaning Morrisons was able to train the vast majority of its staff in just three months.

As well as highlighting best practices, the programme demonstrated more explicitly how staff could make a difference – making the link between something as simple as turning off lights and mitigating the effects of climate change.

The programme has now developed into a 'Cut the Carbon' campaign, and continues to educate new employees during induction. Colleagues are then supported by carbon champions at all sites.

Technical approach

Work on carbon management at Morrisons has focused on all areas of its business. It is implementing over 100 projects – ranging from improving refrigeration at stores and production sites, through to using state-of-the-art software that optimises routes and vehicle loading for its distribution.

Supermarket savings

Stores offered the greatest opportunity for emission savings, and this is where most of the work has taken place. And Morrisons has seen the fruits of its labours in this area: overall emissions from stores were more than 195,000 tonnes lower in 2008 than they were in 2005.

Always look in your fridges

The biggest savings have come from the work around refrigeration. Across its estate Morrisons has invested almost £100 million in improving refrigeration, and expects to make significant savings in energy costs each year as a result.

Although Morrisons avoids using air conditioning except where absolutely necessary, it still needs refrigeration to store and display chilled and frozen produce. To minimise the amount of energy needed to chill open-fronted display cabinets, insulating blinds automatically drop down at night to reduce heat gains.

Another simple change has been to switch the circulating fans in the fridges from alternating current (AC) to direct current (DC). The speed of DC fans can be easily and precisely controlled with inexpensive local circuits, so they only run at the minimum speed needed to maintain the desired temperature.

Real Zero

The Carbon Trust's Real Zero workshops are one-day training courses for refrigeration maintenance staff who service supermarkets' refrigeration units.

The aim is to train businesses on ways to reduce carbon emissions, improve the efficiency of refrigeration systems, and save on energy spend.

Visit our website to register for the next course.
www.carbontrust.co.uk/events

Running a fan continuously, and adjusting the speed as needed, will use much less energy than turning a fixed speed AC fan on and off. What's more, a small reduction in speed brings a larger reduction in power. For example, reducing a fan's speed by 20% should halve the power requirement to run that fan.

Although the difference in any one store is quite small, across the whole estate this change has made a significant difference.

Training has played its part here as well. Morrisons provides training not only for its own refrigeration technicians but for contractors' fitters as well – a very enlightened approach, and one that won the company an award at the 2009 Cooling Industry Awards.

Moving forward, all the engineers who work on fridges will attend the regular Carbon Trust Real Zero workshops.

"Instilling good habits among staff has been key to our success. Simple things like getting people to close doors and prevent energy escaping can make a big difference"

Paul Hooper
Services Manager

“Increasing refrigeration efficiency in stores has had a major impact on emissions reduction”

Colin Coe
Refrigeration Manager

Cutting the refrigerant losses

In addition to these savings, the company has enjoyed a lot of success improving refrigeration coolant efficiency.

It has gone beyond merely detecting and fixing leaks, and tried to establish why losses occur, then use that information to improve maintenance and procurement. A £2 million, state-of-the-art refrigeration leak detection system is helping spot and eliminate any wastage, while the company has invested a further £1 million to monitor energy use in its refrigeration systems. By the end of 2010 it will have installed refrigeration optimisation equipment in 100 stores, which should save 5% of each store’s energy consumption.

Traditionally made up of fluorocarbons (carbon/fluorine compounds) refrigerants pose a far greater threat to the climate than the CO_2 emitted as a by-product of energy use.

In an effort to achieve world-class carbon performance, Morrisons is trying alternative refrigerants, such as CO_2. This gives better thermal efficiency and has much lower environmental impact in the event of leakage. Morrisons believes it is the market leader in this area, using proportionally more CO_2 refrigerants in its stores than any of its competitors.

The results of this work have been impressive, with 2008 refrigerant emissions 120,000 tonnes lower than those from 2005.

The company is also using its CO_2 systems when training refrigeration engineers for the future.

Keep track of what you use

To help measure energy, Morrisons has installed electricity submeters and gas meters across its estate.

Adding private meters significantly improves energy monitoring. Primarily they improve the management of technologies with a consistent and predictable pattern of energy use – such as lighting or air conditioning – by helping identify any anomalies. But it’s also useful to monitor areas with more erratic energy demands, to help predict and manage future demand.

Morrisons continuously monitors its meters, so any wasteful behaviour can be detected and challenged. Poor practice detected in this way includes boilers inadvertently left on during the summer and bakery ovens preheated for too long. In one instance the meters revealed that lighting had been installed wrongly, which meant it was running continuously and could not be turned off.

“The meters have proved invaluable,” says Paul Boreham, Group Energy Manager. “They have shown up where processes are not being followed – or where people aren’t awareof them – and are helping us target and address these problems much more effectively.”

Some stores see a payback of just six months after installing submeters, with savings of up to 170 tonnes of CO_2 each year.

Where appropriate, information from meters is used as the basis for other projects. In the case of pre-heating the ovens, advice on best practice was then built into targeted training for bakery staff.

Don’t leave the lights on all night

After a Carbon Trust survey exploring building controls at its stores, Morrisons introduced automatic lighting controls, which have proved very effective.

Previously lights had been left on all the time, even when the store was empty, whereas now main store lights, illuminated signs and security lighting are all on centrally-controlled timers. In retail areas, for example, lighting comes on 15 minutes before the store opens and is then dropped to one-third of normal levels while staff are cleaning and stacking shelves at the end of the day.

Changes to the lighting controls have now been rolled out across 292 stores, with sizeable cost and carbon savings at each store as a result.

170 tonnes

annual reduction in emissions per store from metering

Turn your waste heat into useful heat

Elsewhere, the introduction of a 150 kilowatt (kW) CHP system at Thornbury proved successful, and can now be seen at other stores as well.

This consists of an engine-driven generator whose waste heat can be recovered and converted into electricity. In effect it can be thought of as a heating boiler which gives free electricity as a by-product. The heat generated is then used to help heat the store, and raise the temperature of water used within it.

Most sites don't have a high enough heat requirement to make CHP a practical solution, because the generator would be quite small and wouldn't generate enough electricity. However, at sites where there is a continuous demand for heat, and the need for a larger generator, CHP is a viable option.

Morrisons has 30 stores with sufficient continuous demand for heat, and CHP has been rolled out across these.

Heat produced by Thornbury's central chiller plant is also being put to good use. Rooftop condensers disperse heat extracted from the plant. This heat is normally lost but a heat exchanger installed by the company's engineers now recovers some of it and uses it in the store's hot water system. Heat from the plant preheats incoming cold water from 10°C to 40°C and a gas-fired water heater takes it up to 60°C.

This addition has proved so effective that Morrisons has been able to dispense with one of the store's two gas-fired water heaters, which will be replicated in 40 further stores.

Efficiencies on the production line

There has also been a lot of work at production sites. Supplying all Morrisons stores, the company's Farmers Boy factory in Bradford employs 1,500 people packaging bacon and cheese and manufacturing sausages, pies, and fresh and cooked meat products. Together, these operations consume 40GWh – a figure that Morrisons is working hard to reduce.

Most production areas at the site need to be maintained at 12°C or 14°C, with meat processing carried out at 2°C. Add large cold stores at -25°C and it is not surprising that there is a continuous substantial demand for cooling. To improve the efficiency of the central chiller plant, Morrisons is converting two 300kW chillers to variable speed operation. This saves electricity by matching the output to the load, and avoids wasting energy by having chillers on full power for only a part load.

During working hours the factory's compressed air system consumes 28 cubic metres per minute. By using compressors of three different sizes, and an automatic control system known as 'sequence control', Morrisons is ensuring that this is delivered at the lowest possible energy cost.

When a fixed speed air compressor is used, it will often be left at full speed as it is loaded and unloaded. This means that when it's empty it may still use up to 40% of the electricity it would use when running a full load. The advantage of using sequence control is that the compressors can be run in combinations that match the demand for air – so they are either running at near full capacity or turned off if not needed.

Keep an eye on the weather

Over 50 gas, water, steam and electricity submeters have been installed at the site, to give a better picture of how energy is used – and where it can be reduced. Data is collected continuously by the building energy management system and exported for analysis against production volumes and the prevailing weather.

The weather is an important factor on sites such as this, because it's usually the ambient temperature that dictates how much energy is needed to heat or cool large spaces.

Sequence control

Using sequence control for air compressors can help make sure that they are working efficiently, and can often be a more economical solution than retrofitting variable speed drives.

Air is supplied into a receiver, which acts as a buffer store, and can also help give greater control. The ultimate refinement is to have one small variable speed machine to modulate the output, which means compressors either run fully loaded or not at all.

The sequence control principle can be applied anywhere where banks of similar equipment serve a common load – such as boilers, chillers and cooling towers.

Future plans

Morrisons has now set a new target for the business to reduce total carbon emissions by 30% by 2020. This simple, yet extremely challenging move exceeds the UK target to reduce emissions. Morrisons has already achieved impressive carbon savings and this sets the standard for the future.

Building a sustainable future

While rolling out the most successful pilot projects across its existing estate, the company is also turning its attention to new stores. Morrisons is working with the Carbon Trust to identify the most suitable and energy efficient solutions for its new sites.

Embedded carbon levels should be low, as the current store design uses primarily stone and brick. What's more, stores are built to have a 15–20 year lifespan, and many of the materials used are recyclable.

So the company is placing greater emphasis on operational carbon – such as heating and lighting – and focusing more on what equipment to install. High efficiency equipment will save carbon and pay for itself many times over during the life of the building.

Looking for renewable supplies

An initial target for Morrisons was to have 10% of its energy from renewable sources by 2010, and it commissioned a feasibility study from the Carbon Trust in 2007 to assess how and where it could use renewables.

Although the main focus has been elsewhere, the company is already using solar power at its stores in Kidderminster and Gibraltar as well as wind turbines at its distribution site at Sittingbourne in Kent.

Waste not, want not

Morrisons is also exploring the introduction of anaerobic digestion to its waste management strategy.

This process, known as waste-to-energy, will break down food waste and other biodegradable material to produce methane (the main constituent of natural gas). This can offset demand for traditional fossil fuels and Morrisons believes it could save up to 15,000tCO_2 per year.

> "We have laid the groundwork by improving the efficiency of our existing sites. Now we are exploring new low and zero-carbon designs for our new stores, distribution facilities and manufacturing sites"

Terry Hartwell
Group Property Director, Morrisons

Further information

The Carbon Trust provides a range of tools, services and information to help you implement energy and carbon saving measures, no matter what your level of experience.

Carbon footprint calculator – Our online calculator will help you calculate your organisation's carbon emissions.

www.carbontrust.co.uk/carboncalculator

Interest-free loans – Energy Efficiency Loans from the Carbon Trust are a cost-effective way to replace or upgrade your existing equipment with a more energy efficient version. See if you qualify.

www.carbontrust.co.uk/loans

Carbon surveys – We provide surveys to organisations with annual energy bills of more than £50,000. Our carbon experts will visit your premises to identify energy saving opportunities and offer practical advice on how to achieve them.

www.carbontrust.co.uk/surveys

Action plans – Create action plans to implement carbon and energy saving measures.

www.carbontrust.co.uk/apt

Case studies – Our case studies show that it's often easier and less expensive than you might think to bring about real change.

www.carbontrust.co.uk/casestudies

Events and workshops – The Carbon Trust offers a variety of events and workshops ranging from introductions to our services, to technical energy efficiency training, most of which are free.

www.carbontrust.co.uk/events

Publications – We have a library of free publications detailing energy saving techniques for a range of sectors and technologies.

www.carbontrust.co.uk/publications

Need further help?

Call our Customer Centre on 0800 085 2005
Our Customer Centre provides free advice on what your organisation can do to save energy and save money. Our team handles questions ranging from straightforward requests for information, to in-depth technical queries about particular technologies.

The Carbon Trust is a not-for-profit company with the mission to accelerate the move to a low carbon economy. We provide specialist support to business and the public sector to help cut carbon emissions, save energy and commercialise low carbon technologies. By stimulating low carbon action we contribute to key UK goals of lower carbon emissions, the development of low carbon businesses, increased energy security and associated jobs.

We help to cut carbon emissions now by:

- providing specialist advice and finance to help organisations cut carbon
- setting standards for carbon reduction.

We reduce potential future carbon emissions by:

- opening markets for low carbon technologies
- leading industry collaborations to commercialise technologies
- investing in early-stage low carbon companies.

www.carbontrust.co.uk

0800 085 2005

ACT ON CO_2 is the Government's initiative to help individuals understand and reduce their carbon footprint. Visit http://actonco2.direct.gov.uk for more information.

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