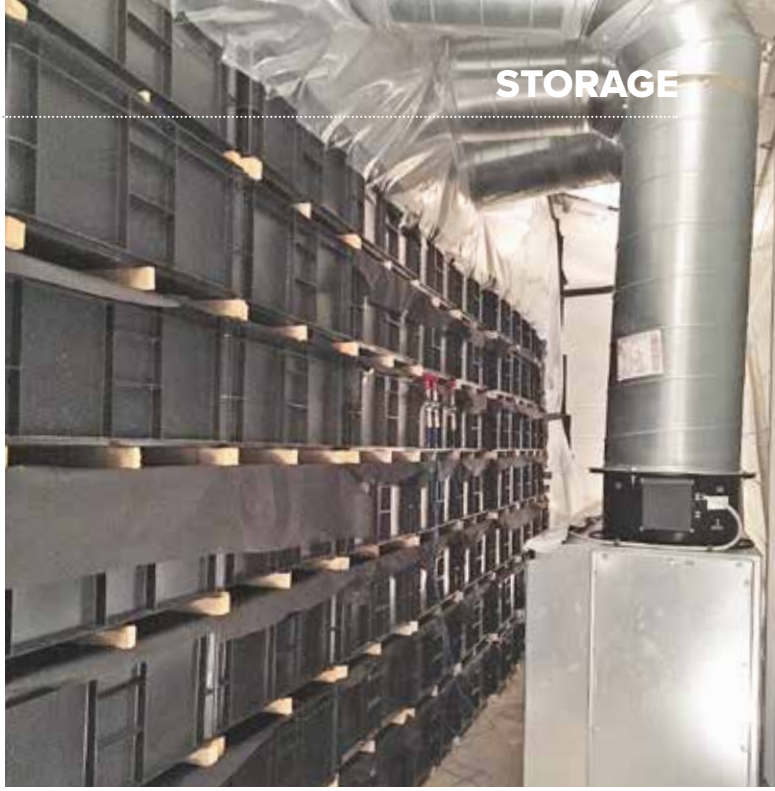

Big savings from a small outlay

Relatively limited expenditure can greatly improve the efficiency and running costs of potato box stores, the results of a major industry trial have confirmed.

The two-year project has identified a number of ways in which owners of both existing and new stores can improve their performance by either retro-fitting a range of features to improve the even-ness of airflow throughout the store, or installing them as original equipment.

'Box stores still account for over half of all UK storage so the results are highly significant,' says Adrian Cunnington, AHDB's head of crop storage research at Sutton Bridge in Lincolnshire.

The trial was 'industry led' with 70% of the £800,000 funding coming from Innovate UK. The primary industrial partner was Crop Systems Ltd, a leading store designer and developer.

Other partners included AHDB, Branston Ltd, Stored Crop Conservation, FEC Energy, The Technology Research Centre and CIPC manufacturer Aceto Agrochemical Corporation Ltd. Scientific validation of the findings was provided by AHDB and Cranfield University.

The project was run in a specially built ⅓ scale model store at Sutton Bridge Crop Storage Research (SBCSR) and in commercial facilities, including units operated by Branston. The work represented possibly the most detailed monitoring of airflow ever completed in a potato store, says Mr Cunnington.

'We took measurements at every slot in the face of the box store at both ends, so on a stack that was 10 boxes wide and eight boxes high that was a total of 160 airflow monitors,' he recounts.

'In standard form we found that nearly 75% of the air produced by the fans to dry and cool the crop wasn't going through the boxes but was disappearing everywhere else.

'There was massive inefficiency in such systems so we started to examine how we could improve things by installing plenum walls and testing the use of side and top sheets. These measures improved airflow dramatically – by as much as factor of three.

'Nearly all potatoes produced for the fresh market are stored in boxes and a significant proportion of the crop is held in long term storage,' he added.

Prior to this latest project, AHDB and FEC Energy had carried out a trial that indicated huge differences in the efficiency with which energy was being used in potato stores.

'That started to ring alarm bells because we were finding running costs of £4/tonne in the best stores but £12/tonne in the worst,' Mr Cunnington recalls. 'We began to examine the causes of those differences and there are a number of things which came into play.'

The project highlighted one key difference between bulk and box stores, explains Ray Andrews, managing director of lead partner Crop Systems Ltd. 'Bulk stores with under-floor ducts work well because the air literally has nowhere else to go but through the crop. In box stores the air comes out of ducts above the crop and we have much less control over where it goes. We found some instances where boxes at the far end of the store saw virtually no air movement at all.'

Following tests in the model store at Sutton Bridge the project went on to evaluate the use of a plenum wall at the fan end of a commercial facility. Side curtains were also added.

'Achieving good airflow right across the store is crucial to getting heat out of the crop and keeping potatoes in best condition,' Mr Andrews explains. 'It also helps ensure that refrigeration works efficiently and with less need for de-frosting, which has a dramatic effect on running costs.

'It is also essential for the consistent distribution of CIPC. If airflow isn't good

Dual purpose facility: When researchers at Sutton Bridge were looking for a scaled-down store to host the airflow project the answer was staring them in the face. The marquee (below) used for open days and seminars such as the storage event in June hosted jointly with Agritech East, was quickly converted, fans were installed and plastic crates took the place of full-size pallet boxes.

then distribution will be inefficient and uneven. In such instances store operators might be tempted to raise the application rate to try and improve the coverage in areas with poorer airflow, which might risk exceeding application limits. And if airflow is poor there is a risk you might still fail to control sprouting in the far corners of the store.'

Adrian Cunnington says the airflow project partners are now keen to translate the findings into more 'case study' work in commercially run stores to complete the research.

'We need more data on running costs, and we need to collect this both before and after any changes to the store equipment have been made so we can measure how these ideas work in practice.'

The project is already said to be producing benefits for Branston, which has used the research to steer improvements to stores run by the company itself and by farmers who supply its packhouses.

Agronomy director David Nelson observes that the variability of temperatures and CIPC distribution in box stores have been issues for the whole industry for years. Branston was keen to find solutions to these problems which is why the company hosted some of the commercial trials in its own stores.

'We were keen to see how we could achieve uniformity of airflow and CIPC coverage while avoiding the hot/cold spots that can have a negative impact on crop quality.

'We aim to store potatoes as warm as possible (around 4ºC), but we also need to ensure that temperature is consistent right across the store to prevent the potatoes exceeding the base temperature for sprouting.

'If we cannot achieve that consistently we may need to run fridges at a lower temperature or for longer periods to compensate. Both of those options raise storage costs.'

Branston has already seen significant improvements from installing a plenum wall to prevent air being short-circuited around the fan and to ensure that more ventilation passes through boxes.

'We did consider using curtains but felt they would not be as air-tight as a solid plenum face which could be installed in pretty well any store with floor mounted fridges.'

The upgrade at Branston has enabled the company to store crops for longer and use CIPC more effectively, reducing the need for other sprout suppressants.

Storage advice updated

The latest data on airflow, tuber respiration and sprout suppression is included in the 3rd edition of SBCSR's *Potato Store Managers' Guide*. Author Adrian Cunnington points out that since it was first published 17 years ago store managers have been facing increased pressure on management of energy costs, reduction of supply chain waste and the introduction of sustainability programmes. They are also working with new varieties and there is a greater emphasis on health and safety.

'We have included a new disease identification section as well as updating best practice guidance on condensation control, storage temperatures and pull down rates,' says Mr Cunnington. 'Ultimately, efficient store management is an integrated part of running a successful potato business.

'The guide contains links to our storage cost calculator and AHDB's benchmarking tool, Farmbench, to allow store managers a firm grip on how the decisions they make in store affect the bottom line – and allow them deliver a quality crop to their customers.'

SBCSR's *Potato Store Managers' Guide* will be released in print this autumn but is available now as a download. **potatoes.ahdb.org.uk/storemanagersguide**

Simple solutions produced a marked improvement in the performance of the experimental store. Note the airflow figures and standard deviation for the unmodified store (left) compared with those recorded after the installation of a plenum (right).