



ENERGY News

for the horticultural industry

New project investigates energy efficient cooling system



One of the consequences of Climate Change is that ambient temperatures are expected to increase – with some predictions suggesting that annual temperature across the UK will go up by between 2 and 3.5°C. These increased temperatures coupled with the demand for higher quality produce, longer shelf-life and extended production seasons are likely to push existing refrigerated produce packing & storage facilities beyond their capacity. Increased ambient temperatures also mean that the energy consumption associated with produce cooling is set to increase – which is more bad news as growers strive to reduce the 'carbon footprint' of their operations.

With this in mind a new project jointly funded by Defra, HDC (CP57) and the British Potato Council is to investigate how an innovative refrigeration system can help to save energy and ensure that optimum produce storage conditions are maintained. Ground source cooling uses the natural temperature of the earth as a heat sink to accept the heat rejected during the cooling process. This approach is similar to that used by ground source heat pumps – a technology that is finding increasing applications in domestic and commercial heating systems.

Conventional refrigeration systems use ambient air to accept the heat removed from the produce. One of the problems with this approach is that the warmer the ambient air, the more difficult it is to reject

heat and the more inefficient the process becomes. This is where ground source cooling comes into its own as the constant earth temperature can more readily accept the removed heat and ensure that the efficiency remains within acceptable limits.

The project will take place at A Pearson & Sons tomato nursery in Cheshire and will involve the installation of a ground source system to cool their existing packhouse and produce storage facilities. If successful however, the technology can be applied to other crops including potatoes.

The system is currently being installed and its performance will be monitored throughout the 2008 production season (March to October). Performance and savings will then be compared with conventional systems so that the viability of the technique can be determined.

Phil Pearson of A Pearson & Sons commented *"We are delighted to be hosting this project especially as it fits so well with the work we are already doing to reduce the carbon footprint of our business. Because we supply tomatoes to the major multiples we have to be dedicated to producing quality products with minimised emissions. This technology fits well with these objectives so we await the results with interest"*.

Overall management of this project is being carried out by Warwick HRI as part of the Climate Change Innovation Network.

For more information about this project contact Ruth Finlay on 01732 848383 or ruth.finlay@hdc.org.uk.



Energy price update

Prices for annual gas contracts to start in Oct 2008 ended the year at 52.9p/th, over 30% higher than at the beginning of the year. Increased demand brought about by colder weather and difficulties at the Rough storage facility kept the day-ahead price at over 50p/th early in 2008. Support for gas prices is coming from oil markets where US crude oil prices have reached over \$100/barrel for the first time.

Prices for annual electricity contracts to start in Apr 2008 ended the year at £52.20/MWh. This is just under 50% higher than at the start of 2007. The first few days of 2008 saw electricity prices responding to a higher gas market. These trends indicate that, under current market conditions, energy prices are likely to remain high during 2008.

Will ducted air systems revolutionise UK greenhouse heating & ventilation?



Study reveals that small-scale wind could increase CO₂

Micro-wind turbines installed on buildings in built-up towns could create more CO₂ than they actually save, according to a new study by the Building Research Establishment Trust. Results from the study published late last year show this is a result of lower winds and turbulence in urban areas.

In Manchester and Portsmouth the majority of the different options studied for siting turbines produced a CO₂ impact that could never be paid back.

The likely output of a micro-wind installation on a pitched roof house in a large city was estimated at less than 150kWh a year; 2% of average domestic energy consumption. But in a windy location such as Wick, the output was estimated at around 3,000kWh a year - about 40% of energy use - with the carbon payback less than a year in most cases.

Biodiesel CHP engines to be trialled

The first UK demonstration project of a new generation of biodiesel-fuelled combined heat and power engine has been launched at the new and renewable energy centre in Blyth. Combined heat and power generates electricity and uses the waste energy from the engine for heating.

The research and development programme will evaluate the economics and ecology of the engines and develop them so they will be ready for commercial sale in the UK and Europe hopefully in the next three years.

The first phase of a four year industry-led project investigating how ducted air heating systems might change the way we heat and ventilate greenhouses in the UK is now complete. As a result a ducted air system has been designed and installed in a commercial tomato production greenhouse in Humberside.

The project - PC 278 - is a direct outcome of a previous HDC study that looked into the role of sealed greenhouse technologies in the UK. Whilst this earlier study - PC 256 - came to the conclusion that the potential for sealed greenhouses in the UK was limited, it identified that the ducted air systems used in the Dutch sealed greenhouse designs had potential for energy saving and improved crop performance.

It is now possible to distribute warm air along a duct more evenly.

What is a ducted air system?

Some growers will have fond memories of the times when ducting connected to warm air heaters was a common sight on many nurseries. Whilst these systems were common several decades ago, they fell out of favour because the temperature uniformity was poor and crop quality fell below expectations. Also, there was a problem of where to put the ducting. Put it in the greenhouse roof and it reduced the light transmission. Put it on the floor and it took up room that could be used for production. In the end air heating was replaced by the now common pipe rail heating systems.

Despite the problems, it has been continually recognised that air systems have desirable features including fast response time and the ability to create good air movement. For example, Bernard Bailey of Silsoe Research Institute highlighted the advantages of such systems again in the early 1990's but discounted them on the grounds that there was no room to accommodate the ducts.

However times move on and the advent of new greenhouse systems such as hanging gutters and benching means that ducts can now be fitted in. Also it is now possible to distribute warm air along a duct more evenly. This now means that ducted air is now a practical option which offers the following benefits:

- Enhanced air movement which will give more uniform temperature, humidity and CO₂ distribution.
- Faster heating system response times which will save energy and allow sudden changes in greenhouse conditions to be easily corrected.
- The ability to use lower heating water temperatures. This improves heating system efficiency and expands the opportunities to use waste heat.

Phase 1 - system design

Before a system could be designed and installed a suitable site to host the project had to be selected. Several sites were considered, and in the end a 10,000m² greenhouse block at Mill Nurseries, Keyingham, East Yorkshire was chosen. This site grows tomatoes and the test greenhouse represents a 'state of the art' facility typical of those found in the UK. The greenhouse is also equipped with hanging gutters so the new ducting system could be fitted under the crop.

All of the heating for the test greenhouse could have been supplied with a ducted air system.

Tomatoes were chosen because the crop responses can be easily quantified. Yield changes are being measured throughout the project and the incidence of pests and diseases monitored.

The layout of the equipment installed for testing at Mill Nurseries is very similar to that used by the Dutch in their sealed greenhouses. However, the differences lie in how heating and cooling energy is sourced and delivered to the greenhouse.



The Dutch systems use underground aquifers for long-term energy storage. Therefore the Mill Nurseries' installation is using heat from their existing boiler and CHP with heating water temperatures being limited to a maximum of 50°C to simulate the use of low grade or waste heat. Also, the Dutch rely on the aquifer to provide cooling energy in the summer. Again this is not viable in the UK so the only cooling provided is from outside air.

All of the heating for the test greenhouse could have been supplied with a ducted air system - but this would have needed very large heat exchangers and fans. So, because the test greenhouse already had pipe heating, it was decided that this should be kept to supply some of the heating needs. This approach allowed sensibly sized fans and heat exchangers to be used and keep capital costs under control. Also, the existing heating rail system could be retained to run work platforms and picking trolleys.

Equipment suppliers

Extensive discussions took place with many potential suppliers. In the end a solution provided by Priva was selected because it met the design requirements and provided the best technical and economic solution.

Priva's equipment is based around their new Optimser units that were launched by the company at the Hortifair Exhibition in Amsterdam last October.

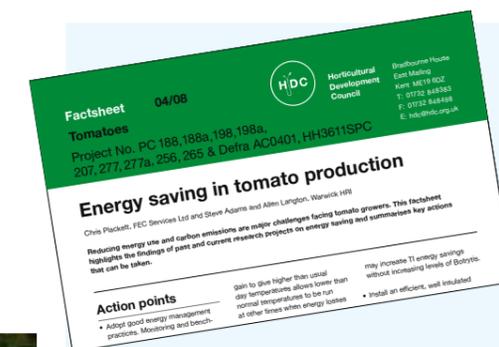
18 Optimser units have been installed in the 10,000m² test greenhouse. These units have a combined heating capacity of 450kW (45W/m²) and an airflow of 108,000m³/hr. This gives an air change rate of twice/hour.

Control of the air system is done by the nursery's existing Priva Integro computer and all control modifications have been provided by Priva UK.

A separate heating circuit has also been provided to feed the air system's heat exchangers. This has been designed and installed by Cambridge HOK Ltd.

The installation was completed in January so the project team and staff at Mill Nurseries are now learning how best to use the new equipment and grow a crop in greenhouse environment that is somewhat different from the norm.

For more details about the project contact Tim Pratt at FEC Services on 024 7669 6512. For copies of the project report PC 256 contact HDC.



New tomato energy factsheet published

Growers striving to make energy savings can now call on a new HDC factsheet for help. Energy Saving in Tomato Production brings together the results and information from a range of sources - including many completed HDC projects on energy saving for tomatoes - into a single factsheet. In addition new developments are considered so that growers have information on the future of energy efficient tomato production in the UK.

Written by Chris Plackett of FEC Services, Steve Adams and Allen Langton of Warwick HRI, the factsheet covers a host of topics including basic energy management, thermal screens, temperature integration, humidity control and CO₂ enrichment.

Although focussing on tomatoes, the factsheet will also be of interest to growers of other crops - particularly cucumbers and peppers. If you would like a copy contact HDC now.

Workshop will investigate green technologies for UK greenhouses

A one day event entitled 'Greening the Greenhouse' will be held at The Living Rainforest near Newbury on April 2nd 2008.

Speakers from Holland, USA and the UK will explore how greenhouses in the future can be built and operated to achieve carbon neutral production.

Further details of the seminar programme will be forwarded to HDC members when they are available. Alternatively contact

Lisa Mather at The Living Rainforest on 01635 202444 ext. 10 or email lisam@livingrainforest.org.

GrowSave helps turn energy saving theory into practice

Our new technology transfer project GrowSave kicked off last September and has already attracted the interest and participation of a key group of HDC members.

Jointly funded by HDC and Carbon Trust, GrowSave is designed to give participants access to expert help and advice on how to make energy savings in greenhouses. "The concept is just like looking over the shoulder of an expert as he operates a greenhouse in the most energy efficient way" comments HDC Communications Manager Jenny Lang.

GrowSave has already worked with one case study nursery - leading stem chrysanthemum grower Donaldsons Nurseries of Chichester - to demonstrate how savings could be made through better energy management and the use of temperature integration controls. The project has now moved on to look at the use of thermal screens by working with tomato growers R & L Holt Ltd of Evesham.



"The GrowSave website is a unique information resource" comments Tim Pratt of GrowSave project managers FEC Services. "This includes data such as climate control settings, graphs of the resulting greenhouse climate and energy consumption information".

If you haven't yet joined GrowSave then it isn't too late. Join now by logging on to the website www.growsave.co.uk and you will be able to access the project information and data.



SSE announces increased reward for exported solar energy

Scottish and Southern Energy plc (SSE) has developed a new tariff for householders and small businesses which export power to the electricity network generated via solar photovoltaic (pv) panels installed on their premises.

Under the new pricing structure, SSE will combine the price it pays for the Renewable Obligation Certificates (ROC) associated with solar power and the price it pays for the power itself. It will also install export meters, act as the ROC agent and seek ROC accreditation for customers free of charge. The package will be called 'solar energyplus'.

The new price will be 18 pence per kilowatt hour of power exported. This means that a householder or small business generating 1,500kWh of power a year (just under half the average household's electricity consumption) will earn around £135 a year if it exports 50% of the total power generated. For customers who export the majority of their generation, SSE believes this will be the best export tariff in the market.

Climate change agreements to be extended to 2017

As part of last November's pre-budget statement the Chancellor of the Exchequer announced that Climate Change Agreements (CCA's) will be extended to 2017.

CCA's are the underlying energy saving agreements between industry bodies and Government which form the basis of Climate Change Levy (CCL) discount. The current agreements are set to end in 2010.

This is good news for horticulture as it indicates that its current CCL discount agreement is set to be extended for a further 7 years. Government is now consulting with industry groups to decide the format for the new agreements.

The first part of the consultation process has started and it is looking at how CCA's might be simplified to lessen the administrative burden on participating companies. In addition, the relationship between CCA's and other Climate Change instruments such as the European Emissions Trading Scheme and the forthcoming Carbon Reduction Commitment are being explored. The consultation documents are available to download from the Defra website. Copies have also been forwarded to the NFU who will be responding on behalf of the horticultural industry.



Horticultural Development Council
Bradbourne House
East Malling
Kent ME19 6DZ
T: 01732 848383
F: 01732 848498
E: hdc@hdc.org.uk

Written by FEC Services Ltd

fec services
Stoneleigh Park
Kenilworth
Warwickshire CV8 2LS
Tel: 024 7669 6512
Fax: 024 7669 6360
www.fecservices.co.uk