Food Refrigeration & Process Engineering Research Centre

THE GRIMSBY INSTITUTE of Further & Higher Education

Carbon Vision - cutting carbon emissions in food processing

A multi-disciplinary project, funded by the Engineering and Physical Sciences Research Council and the Economic and Social Research Council as part of the larger Carbon Vision research programme.

Partners

University of Bath School of Management, Centre for Action Research in Professional Practice

frperc at the University of Bristol

Manchester Business School

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EPSRC

ESRC

Industrial companies involved in the project are : Unilever, Northern Foods, Hygrade Foods, Baxi Technology and CompAir.

Background

It is becoming increasingly clear that the world will experience devastating effects from climate change if we don't reduce our carbon dioxide emissions to a safe level. The UK government aims to reduce carbon use by 60 percent by 2050.

Even excluding the energy that goes into agriculture and into cooking in the home, and excluding the energy involved in moving food around the world, the food industry accounts for 12 percent of energy use in industry in the UK at present (DTI figures, 2001).

Much of this energy is spent on heating and cooling foods during preparation.

This £800,000 research project brings together some of the UK's leading academics and industrialists to help reduce the amount of climate-changing carbon dioxide released by the food industry.

Project information

The project will focus in particular on food industries where high and low temperature cycles are common.

Since cooking, refrigeration or chilling and air compressor systems are the major energy consumer in food industries, large amounts of energy savings could be achieved.

One route to achieving large reductions in emissions is combining heating and cooling using air cycle refrigeration. Air cycle refrigeration has so far only found widespread application in aircraft cabin cooling and train air conditioning. Air cycle technologies have been developed for many years by frperc and applied to retail display cabinets, food cooling and freezing and building air conditioning. Although air cycle systems have a low coefficient of performance when used solely for refrigeration, they can provide high temperature heat (300°C) and extremely cold air (below -100°C) without the efficiency penalty experienced by vapour compression systems. They therefore have the potential to provide heating and cooling systems that save energy.

A second approach to be investigated is combining refrigeration, heating and electricity generation. This single process, known as trigeneration, could convert up to 90% of the energy contained in the primary fuel into a usable energy with a huge reduction in carbon dioxide emissions. Trigeneration is an excellent example of a 'stuck technology' - one that offers major savings in money and energy, and so can offer major benefits in climate change - but that is hardly used at present. It is extremely efficient: one source of fuel provides electricity, heating, and cooling. Energy efficiency can therefore be massively improved. But trigeneration is hardly used at present.

A third strategy also being investigated is a business strategy rather than a technological innovation. In the service company approach external companies supply heating, cooling and compressed air as services, rather than simply selling equipment for these purposes.

The project will use action research strategies to explore systematically how such 'stalled' solutions can be used not only at the local level of a plant, but how they can be rolled out more widely as part of an overall business strategy and into industrial sector and national policy levels. Action research is a form of applied common sense, but with academic rigour as well. The researchers try something, see what happens, then make sense of it - perhaps by looking at wider research, sometimes by reflecting together or with customers or other stakeholders. They then try again and repeat the process. By understanding what stops something from changing and by trying to change it, researchers can understand how to remove blockages. Action research is thought to be relevant to Carbon Vision because it is very practical. The research will be undertaken in real factories with real products and real managers who are trying to make real changes that will benefit both their shareholders and - in the process - make a genuine difference in combating climate change.

More information about air cycle technology can be found on the frperc air cycle research topic page.

Contacts

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