Food Refrigeration & Process Engineering Research Centre

THE GRIMSBY INSTITUTE of Further & Higher Education

Air cycle: Development of integrated, rapid heating and cooling systems for the food industry (Project AFM 224)

Funded under the defra LINK programme

Partners

FRPERC at the University of Bristol

Air Products

Avana Bakeries

Campden and Chorleywood Food Research Association (CCFRA)

CCC Consultants

Chris Jessop Energy Consulting

Corac

Earthcare Products

Geest

Honeywell Normalair Garrett Limited

Hygrade Foods

Masterfoods

Munters

Northern Foods

Background

The rapid and continuing expansion of the chilled and frozen food industry has resulted in an increasing range of products that are cooked and immediately chilled or frozen during production. All the signs are that due to life-style changes the market for foods to be reheated or consumed cold without any further cooking will increase .

In very few cases are the cooking and refrigeration processes linked or even carried out in the same vessel. Until now it has been difficult to link the processes because the heat generated by direct expansion refrigeration systems (the most common form of refrigeration employed in the food industry) is not at a high enough temperature to be useful in cooking.

Project information

An air cycle refrigeration system can generate heat at temperatures above 200°C and produce cold air below -100°C. The use of air as a refrigerant is based on the principle that when a gas expands isentropically from a given temperature, its final temperature at the new pressure is lower. The resulting cold gas, in this case air, can then be used as a refrigerant, either directly in an open system or indirectly by means of a heat exchanger in a closed system. Hot air from the compressor can be used via a heat exchanger for cooking, steam generation or other heating applications. When utilised for both cooking and cooling a very energy efficient, more environmentally friendly system can be produced.

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

The aims of this project are to:

Develop and demonstrate the use of air cycle with impingement heat transfer to produce a totally integrated process for food heating followed by immediate rapid refrigeration.

Demonstrate a combined hot water generation/rapid freezing system based on air cycle.

Prove to potential users and system suppliers that air cycle heating/cooling systems have considerable commercial potential for food manufacturing applications.

Contacts

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