



Opportunities and Applications for Hydrocarbons in the Refrigeration Sector

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Sustainable Development & Regulation
Directorate
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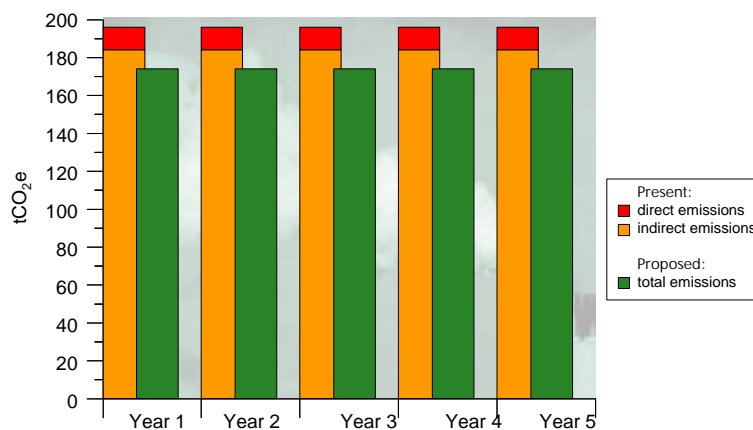
Firstly, I would like to thank Helen Huxtable for organising this discussion with you today.

1. Hydrocarbons in brief

P.J. van der Weyde of Philadelphia first used hydrocarbon refrigerants in 1866; please remember that this is not new technology!

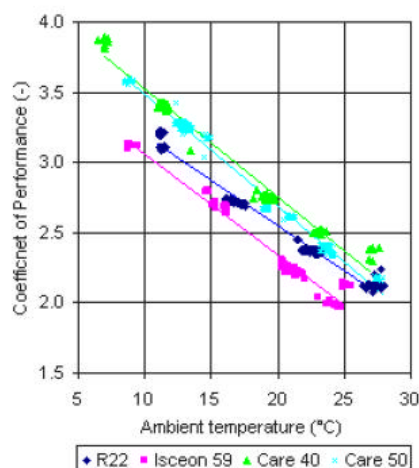
The greatest success of hydrocarbons has been the application of R600a to domestic refrigerators. Since 1992, more than 300 million fridges using hydrocarbons have been produced worldwide. Hydrocarbon technology had proved to be safe, less noisy and more energy-efficient than HFCs.

The improved energy efficiency of hydrocarbon refrigerants has been demonstrated in worldwide independent tests and trials. An international study into the energy and environmental performance of supermarket refrigeration concluded that the use of natural refrigerants in conjunction with optimised design could achieve reductions in electricity consumption of 20% over conventional direct expansion (DX) systems and reductions in Total Equivalent Warming Impact (TEWI) of 36% over conventional DX systems¹.



The following performance comparisons illustrate the improvement in system coefficient of performance achievable using hydrocarbons:

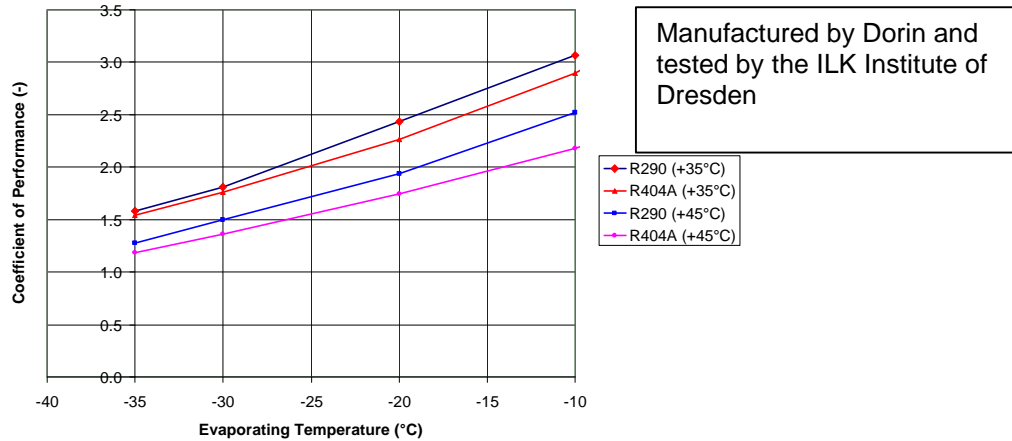
Comparison 1



Manufactured by Bitzer and tested by the Building Research Establishment in Watford.

¹ Annex 22 - Compression Systems with Natural Working Fluids - Final Report & Guidelines for Design and Operation

Comparison 2



The excellent performance of hydrocarbons refrigerants can be attributed to the following parameters:

- Lower compression ratio (due to higher suction pressures and lower discharge pressures at specific operating temperatures)
- Improved heat transfer in heat exchangers (as a result of more favourable fluid thermal and transport properties)
- Reduced system pressure losses (from lower refrigerant density and viscosity)².

2. Earthcare in brief

Established in 1997 to provide natural cooling solutions

The first to use hydrocarbons in split systems, and we went on to develop our own range

We were also the first to supply hydrocarbon chillers

And we recently supplied a 650KW application

We've developed ground source heat pumps

And Water-Cooled Integral Refrigeration Cabinets

When faced with the problem of replacing R410a for which there is no single component natural substitute we developed and patented three low GWP refrigerant blends

And with the EU F-Gas Directive commencing HFC phase out in 2011, our prognosis is better than ever. So why do we need help?

3. Why we need help

Apart from the domestic sector, the uptake of hydrocarbon refrigerants has been disappointingly slow. Only Unilever has made any substantive progress with over 366,000 new ice cream cabinets using hydrocarbon refrigerants. The biggest refrigerant user in the UK is the NHS and despite a UK government policy since 2000 to avoid HFCs, the NHS still actively specifies HFCs and most other departments have made no attempt to implement the policy.

² www.care-refrigerants.co.uk-CARE Technical File-Design Resources--Performance Test Data

Our biggest problem is the manipulation of trade standards for commercial ends. Until the advent of the Pressure Equipment Directive (PED), there were many suppliers of hydrocarbon refrigerant heat pumps in the EU. Paradoxically, given that the PED was supposed to encourage the free trade in pressure vessels by eradicating protectionist measures by individual member states, the PED has been perverted by the F gas lobby to prevent the CE marking of hermetic compressors containing more than 150 grams of hydrocarbon refrigerant within the EU.

The fact that these restrictions have nothing to do with safety is best demonstrated by this picture showing a combined heat and power (CHP) gas compressor unit using hermetic scroll compressors to compress mains gas, i.e. methane, prior to combustion in a turbine set. If the compressor manufacturer is prepared to PED and CE mark these compressors for use with hydrocarbons in CHP applications, where combustion occurs at the end of the process and the upstream volumes of flammable gas are virtually unlimited, then why not for refrigeration, air conditioning and heat pumps, unless for protectionist reasons?



Earthcare now source hydrocarbon refrigerant heat pumps in China where we can get PED compliant compressors and CE marked hydrocarbon refrigerant heat pumps. The great irony is that CE marking, originally introduced to protect EU manufacturing jobs, is now accelerating the loss of manufacturing jobs in the EU because the F gas lobby has been allowed to manipulate trade standards in an attempt to boost the short term profitability of their industry.

The European Commission has declined to investigate what is in effect a cartel operating to the detriment of both the market and the environment, and also reneged on a commitment made under the EU Environment Directorate Climate Change Program priority measures for F gas abatement to provide funding for the research and promotion of F gas alternatives.

This raises concerns regarding the implementation of the F gas regulation and the upcoming review in 2011. The Regulation includes a commitment to the "Promotion of Alternatives", but is likely to be ignored in the same way as the ECCP commitment.

By way of contrast, the Kyoto Protocol CDM executive board has paid out \$4.7 billion USD to ODS manufacturers in return for capital expenditure of only \$100 million USD for HFC23 abatement! A massive subsidy paid by taxpayers in industrial countries to support the continuing manufacture of ODSs.

4 Conclusions

The Government announcement regarding an 80% cut in greenhouse gas emissions is going to impact significantly on the refrigeration, air conditioning and heat pump sector. The halocarbon using sectors will be unable to make a proportionate contribution from leakage reduction alone. We will therefore have to address both energy efficiency and GWP, and given that any success in leakage reduction will mean that refrigerants will stay banked for longer, the 2011 F gas review is not too soon to start to consider emissions from the refrigerant bank in 2050. As a starting point it would be helpful if DEFRA and BERR persuaded the UK Government to implement its HFC policy and stop using HFCs in government buildings and on high profile projects such as the London Underground and won't be used in the 2012 Olympics.

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Nicholas Cox, the Managing Director of Earthcare Products Limited, is considered a leading authority on environmentally friendly refrigeration and air conditioning. During a long career in this field, he has presented many papers on the subject. A fellow of the Institute of Sales and Marketing Management, he was awarded a graduateship of the City and Guilds of London Institute for his work on how industry could better utilise natural refrigerants and energy efficiency. He has advised both the UK government and the EU commission on environmental aspects of refrigeration and air conditioning, and he has carried out reviews and submitted written responses to proposed and pending policy documents and legislation regarding refrigerant issues.

He is at the forefront of industry developments:

In 1986, he designed, installed and commissioned a water source heat pump cooling system for the London Docklands Development Corporation.

In 1989, he developed a heat recovery refrigeration unit for cooling beer cellars.

In 1994, he was the first person in the UK to use propane as an alternative refrigerant for air conditioning systems.

In 1996, he developed and launched a new range of Very Environmentally Friendly (VEF) Chillers

In 1997, he developed the first hot & cold drinking water dispenser to use hydrocarbon refrigerants.

In 1998, using grant funding from the DETR 'Partners in Technology Scheme' he developed and launched a new range of Very Environmentally Friendly heat pump and air conditioning split systems.

In 1999, he designed, installed and commissioned the largest air conditioning thermal storage system in the UK, using ammonia and aqueous urea slurry-ice.

In 2005, he completed development of an integrated low energy refrigeration, air conditioning, and heat recovery system for supermarkets.

In 2008, he developed and patented a range of high pressure blended natural refrigerants.

Earthcare Products

Earthcare is dedicated to providing complete climate solutions to its clients. From equipment supply and consultancy through to installation and maintenance, we serve our clients from the beginning of a project to its realisation and beyond. We are the world leaders in the provision of green refrigeration and air conditioning. Our clients are drawn from both public and private spheres and include:



Heathrow Terminal 5
Horsham Arts Centre
Forensic Science Service
Transport For London
DVLA
Middlesex University
Brighton Library
DEFRA
Roche
DFT
National Trust
DEFRA
Church Of England
GSK
Local Authorities from Derby to the New Forest
Many hospital trusts including Great Ormond Street

Our history

Founded in 1997, Earthcare Products Limited is a fast growing company providing consultancy, selling, installing and servicing commercial cooling products to businesses and the public sector. The company enjoys unparalleled experience and intellectual property (IP) in its areas of operation and expertise including the practical application of natural refrigerants and is working with refrigeration and air conditioning manufacturers to commercialise the resultant opportunities.

Earthcare provides end-users with a full complement of sustainable cooling products, from small refrigerators to large custom-built building services plant. Earthcare has achieved considerable success in bringing these products to market and has now sold them into a wide range of public and private bodies, servicing the smallest to the largest possible applications. Earthcare offers a complete range of products to provide green end-users with a "one stop shop". Earthcare's principal sales are achieved in large commercial air conditioning chillers and small commercial air conditioning split systems.

Earthcare has championed the cause of NIK cooling in the United Kingdom and, in the case of hydrocarbon refrigeration, has created a market which it now dominates.

Our future

Earthcare's work is not completed yet, as global CO2 emissions are spiralling out of control and there is an urgent need to start replacing fossil fuel boilers with heat pumps. Moreover, anyone who thought that the F Gas Regulations have neutralised the HFC problem needs to think again. The formidable F Gas lobby continues to exert its malevolent influence and halocarbon emissions still account for some 13% of man made global warming. To counteract this Earthcare is campaigning for:

- The EU to provide funding for the research and promotion of F gas alternatives as committed by the EU environment directorate climate change program priority measures for F gas abatement, but never implemented.
- The EU to implement the F gas regulation commitment on the promotion of alternatives
- The EU to ensure that the F gas review considers natural refrigerants not just leakage reduction.
- The EU to recommend natural refrigerants within the eco-design directive.
- The EU to investigate how trade standards hinder the adoption of natural refrigerants.
- UNEP to stop subsidising the manufacture of ozone depleting refrigerants and to start providing carbon credits for the conversion of equipment manufacturing factories from ozone depleting refrigerants to natural refrigerants.

The changes in refrigeration technology – spurred on by legislation and environmental concern – give users an unrivalled opportunity to adopt energy efficient equipment utilising natural refrigerants. Current and proposed legislation will make it even more important to meet environmental best practice requirements. Earthcare is not yet a global player but will continue to tackle corporations head-on when they disagree with them. They believe that with vision, action and commitment the campaign for a sustainable future for our industry is winnable and that they will be on the winning side.



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