Cool Technologies:Working With Natural Refrigerants

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Working definition of “natural refrigerants”

- Refrigerants which occur naturally in the biosphere in significant abundance in a steady state
- Friendly 5: air, water, carbon dioxide, ammonia, hydrocarbons
- Are easily absorbed by nature

Topics: Report provides examples and details

Greenfreeze domestic refrigeration	Dessicant coolin	Transport cooling (under review)
SolarChill	Evaporative cooling	Foam blowing
Commercial cooling	Absorption cooling	Efficiency comparisons
Refrigerants, Naturally	Co-generation cooling	HC refrigerant producers
Consumers Goods Forum	District cooling	HC safety equipment (under review)
Companies using NR equipment	Passive cooling	Global estimates of A/C production
Manufacturers of NR equipment	Converting from R-22 to propane	Contact list of companies
Hydrocarbon & CO_2 domestic & commercial A/C	MACs & hydrocarbons (50 million cars with HCs)	
Ammonia A/C	MACs & CO_2	
Solar NR air-conditioning	MACs & HFOs	

Greenpeace Report: "Cool Technologies: Working without HFCs" : available from OEWG site

- There are many examples of companies moving ahead of governments in phasing-out HFCs.
- Natural refrigerant based technologies exist in nearly the full spectrum of applications, such as:
  - Domestic Refrigeration and Air-Conditioning
  - Commercial Refrigeration and Air-Conditioning
  - Mobile Air-Conditioning
  - Industrial Processes
  - Insulation Foam Blowing
- The efficiency of natural refrigerants is as good or better than that of fluorocarbons.

The myths from the chemical industry

The industry whose products nearly brought life on Earth to an end, whose products caused massive ozone layer depletion and global warming, propagates several myths:

-Industry has been part of the solution (like the dealer to the addict, the tobacco industry to the smoker)

-Natural refrigerants are only suitable for niche applications in small user sectors

-Fluorocarbon refrigerants are more efficient than natural refrigerants

Domino Effect

- There is a domino effect in cooling technologies.
- When one company achieves a breakthrough others soon replicate.
- Technological innovation in one sector impacts on innovations in other sectors.

Greenfreeze Revolution

- 1992-93 Greenpeace develops ‘Greenfreeze’ hydrocarbon technology for domestic refrigeration
- Greenpeace promotes Greenfreeze in Europe, China, Japan, South America
- 1997 -Greenpeace receives UNEP Ozone Award for giving Greenfreeze to the world

Greenfreeze Revolution

- Over 650 million Greenfreeze refrigerators in the world today
- 40% of global annual refrigerator production (2012)
- 95% of EU & 75% of Chinese production
- 80% of global production by 2020

Examples of Greenfreeze manufacturers

AEG	ELECTROLUX	HINDUSTAN	MATSUSHITA
ARCELIK	EMAIL	HITACHI	MEILING
AUTOSAL	FISHER PAYKEL	HUSKY DEUTSCHLAND	MIELE*
AUX	FRESTECH	VESTFROST	PANASONIC
BAUKNECHT	GENERAL ELECTRIC	INDESIT DEUTSCHLAND	QUELLE
BOSCH *	GODREJ	KELON	SAMSUNG
BRASTEMP	GORENJE DEUTSCHLAND	KOH-L-NOOR	SANYO
COLUMBIA	GRAM	KONKA	SHARP
CANDY *	HAIER	LG	WHIRLPOOL*
CONTINENTAL	HARTONO	LIEBHERR	ZANUSSI *

Countries producing Greenfreeze

Argentina	Denmark	Indonesia	New Zealand	Germany
Australia	France	Italy	Russia	Turkey
Brazil	Hungary	Japan	Swaziland	South Korea
China	India	Mexico	Sweden	USA

SolarChill Vaccine Cooler & Refrigerator Health+Environment+Development

- Hydrocarbon
- Battery free
- Solar powered
- Clean: no kerosene
- Commercialized
- GEF SolarChill Projects in Kenya, Colombia and Swaziland

SolarChill Project Partners: DTI, GIZ ProKlima,Greenpeace, PATH, UNEP, UNICEF, WHO

Refrigerants, Naturally!

Greenpeace campaign I results in initiative by Coca Cola, PepsiCo, Unilever, McDonald's & Red Bull to only buy HFC-free, point-of- sale equipment by 2015.

Confrontation yields to cooperation

- 1998 Greenpeace engages major Olympic sponsors of the 2000 Sydney Games to not use HFCs at the so called “environmental Olympics”
- Following an international public campaign by Greenpeace, Coca Cola, McDonald’s and Unilever make commitments to phase out their use of HFCs
- In 2004, Refrigerants, Naturally! is launched by the corporations, supported by Greenpeace and UNEP
- A global initiative of companies committed to combat climate change and Ozone layer depletion by substituting harmful fluorinated gases (CFCs, HCFCs and HFCs) with natural refrigerants.

RefNat accomplishments

Combined RefNat partners have over 20 million cooling units in the field and buy over 2 million units annually

- Coca Cola: 600,000 units
- Unilever: 900,000 units
- PepsiCo: 145,000 units
- RedBull: 313,000 units
- McDonald's: Developing HFC-free equipment

RefNat engages with standards and policies: e.g. supports the proposed HFC amendments to MP

Consumer Goods Forum

- Over 650 retailers, manufacturers, service providers and other stakeholders from 70 countries
- Committed to start phasing-out HFCs as of 2015
- RefNat and the CGF commitment shows that industry is capable of doing the right thing without being legislated to do so.

Examples of Supermarkets Working with Natural Refrigerants

AEON	COOP ITALY	HARRODS	REWE
ALDI SUD	COUNTDOWN	LIDL	SAINSBURY'S
ASDA	DRAKES	MARKS & SPENCER	SOBEYS
AUCHAN	EDEKA	MIGROS	TENGLEMANN
BOOTHS	EUROSPAR	MORRISONS	TESCO
CARREFOUR EUROPE	FAKTA	NETTO	WAITROSE
CONDOR	FOODLANDS	PRODEGA	WOOLWORTHS

Countries with supermarkets working with natural refrigerants

Austria	Germany	New Zealand
Australia	Global	South Africa
Brasil	Hungary	Sweden
Canada	Hong Kong	Switzerland
China	Japan	United Kingdom
Denmark	Malaysia	USA
France	Mexico	Thailand

The Report Highlights:

- 50 companies producing and/or manufacturing NR cooling equipment
- 10 manufacturers of air-conditioning equipment using NRs
- 90 commercial and public buildings using HC, CO_2 or ammonia
- 26 facilities using desiccant cooling
- 9 installations using evaporative cooling
- 67 facilities using absorption cooling systems
- 9 district cooling installations
- 157 examples commercial and public building conversions to NRs

Natural refrigerants are used to air-condition:

FACILITY	FACILITY
Supermarkets	Hospitals
Office Buildings	Homes
Banks	Universities
Department Stores	Trade Faire Buildings
Restaurants	Airports
Hotels	Government Buildings

Efficiency comparisons between natural refrigerants and HFCs

Hydrocarbons in MACs are measured to be 10- 35% more efficient than HFCs	Propane is seen as far more efficient replacement for HCFC-22 than HFCs in heat pumps.	Foster reports 15% energy savings in stand alone equipment with natural refrigerants.
CO_2 in MACs yield 25 to 40% efficiency over HFCs.	Conversions to of R-22 A/C installations to propane typically yield 15-20% efficiency gain.	Waitrose Supermarket reports 20% energy savings with hydrocarbon chilled water circuit in display cabinets.
Danish Electricity Savings Trust finds hydrocarbon appliances to be most efficient.	Unilever reports 9% energy savings with HC ice-cream freezers compared to HFC freezers	Coca Cola reports 26 to 35% energy savings with CO_2 vending machines in comparison to HFC units.
Hydrocarbons yield 5.7 % over HCFC-22 in residential AC.	McDonald's reports 19 to 32% energy savings from restaurant entirely using natural refrigerants.	Sanyo Electric reports 17% lower energy consumption with CO_2 vending machines.
HFO (HFC-1234yf) is reportedly 10% less efficient than HFC-134a in MACs while HFC-134a is typically 7 to 10% less efficient than hydrocarbons.	DeLonghi reports 5-10% higher efficiency with hydrocarbon room air-conditioners than with comparable HFC units.	PepsiCo & Red Bull report up to 45% energy savings with hydrocarbon combined with technical improvements in vending machines.

Thank you for you attention.
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For more information, please see Greenpeace report "Cool Technologies : Working Without HFCs; 2012"

Greenpeace welcomes all comments and queries.

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