



Alternative Refrigeration Backgrounder

Commitment

- *Unilever's mission is to add vitality to life. We meet everyday needs for nutrition, hygiene, and personal care with brands that help people feel good, look good and get more out of life.*

This mission, together with our established statements of values as a business - the Corporate Purpose and Code of Business Principles - explains what we stand for as a company. We believe that the long term success of our business is ultimately connected with the vitality of the communities and the environment in which we operate, and as a global company we aim to play our part in addressing global social and environmental concerns, such as nutrition and hygiene, freshwater conservation, sustainable agriculture and fisheries, packaging waste and refrigeration. Unilever is committed to contributing to sustainable development - meeting the needs of the present without compromising the ability of future generations to meet their needs.

- Unilever has been providing industry leadership by actively exploring alternatives to HFC. In 2000 we committed to stop buying new HFC cabinets by 2005, where alternatives were commercially viable and legally accepted.
- We have been, and will continue to exchange knowledge and expertise with industry technology leaders, NGOs, and regulatory agencies.

Status

1. Since 1997, Unilever has been working on **Hydrocarbon (HC)** as an environmentally preferred alternative to HydroFluoroCarbon (HFC) refrigerants. We are well ahead of our commitment made in 2000 and will have a total of 15,000 working HC cabinets in the market this year. As from early trials the equipment has shown to be safe, reliable and significantly more energy efficient than HFC.
2. Next to HC, Unilever has been working on several other alternative refrigeration technologies since 2002. These include **thermoacoustic refrigeration, solar-assisted battery powered HC cabinets**, and the development of an **ice cream delivery van with CO2 refrigerant**.
3. Unilever is consolidating its early successes with HC to ensure that they achieve the largest possible reduction in the environmental impact of their cabinets. By 2005 we estimate to have 80,000 HC cabinets on the market, and will be conducting field tests with 5 solar-assisted HC cabinets to assess the performance of solar panels.
4. Unilever replaces its cabinets on average after 8 to 10 years and estimates that most of their fleet will be HFC-free in 10 years time.

Levels of investment

- Unilever has invested over €2.5 million in HFC-free refrigeration technologies over the last four years.
- Unilever will continue to invest in innovative technologies including thermoacoustics and solar.

REFRIGERANTS, NATURALLY

Unilever's commitment to sustainable refrigeration

Unilever's business operates nearly 2 million freezers around the world and requires excellence in refrigeration as a means to remain competitive. Unilever invests considerably in internal and external expertise to work on addressing environmental concerns and believes that by demonstrating leadership in this area, it can increasingly influence its competitors and suppliers to also act on issues like this and move to alternative refrigeration.

Unilever acted early and is already ahead of its commitment by having a total of 15,000 HC working ice cream cabinets currently in the market this year, and another 80,000 HC cabinets planned for rollout in 2005.

Progress to date

Since 1995, Unilever adopted the policy of not purchasing cabinets containing (H)CFCs which have high ozone depleting potential (ODP) and high global warming potential (GWP). Also at that time, Unilever took the lead in requiring manufacturers to adopt HC as the blowing gas in the insulation foam of all new cabinets bought by the company, where legally permitted. In addition, we also introduced a policy for controlled disposal of ice cream cabinets, where disposal of all (H)CFC and HFC-containing cabinets is only allowed through approved specialist companies.

In 1997 Unilever began trials of natural hydrocarbon (HC) refrigerants for use in its cabinets, which have been used in Greenpeace's 'Greenfreeze' domestic applications since 1993. HCs have no effect on the ozone layer and make a negligible contribution to global warming.

Since 1998 further trials have been undertaken. Due to the strong expertise available at the Danish Technological Institute (DTI), a trial of 50 freezer cabinets using HC refrigerant was initiated in Denmark. Even though the focus was more on energy saving than the HC refrigerant per se, it did prove that the cabinets were technically capable of meeting all requirements of our ice cream business. The project was a collaboration between the DTI, Frisko Is, Caravell and Danfoss.

For the 2000 Sydney Olympics, Unilever undertook and announced a trial of 50 cabinets using HC refrigerant (Propane - R290). Their performance was compared with 25 of the same freezer cabinets using the conventional HFC (R404A) refrigerant. Unilever also announced that if these trials were successful and if HC freezers could become commercially viable, they would be introduced in 2005 for all new purchases where commercially viable and legally allowed.

Data monitoring units for temperature and energy consumption were fitted to all cabinets in the trial. The DTI managed the data collection and assessment during the two phases of the trial. The first phase was the exceptional usage during the Olympics. The second phase was a more normal use period in Australia. In September 2002, the DTI presented the final results as a scientific paper at the IIR Gustav Lorensen Conference on Natural Working Fluids in Guangzhou, China.

Success in Denmark and Australia opened the possibility for wider use. The trials in Denmark and Australia proved that HC refrigerant in a high performance cabinet could deliver satisfactory performance and a strong indication of energy saving possibilities and there were no performance or safety problems. The next stage was to explore, with the small portfolio of Unilever's freezer suppliers, whether the changeover to HC refrigerants could be done within existing cost frameworks.

REFRIGERANTS, NATURALLY

A further requirement was to confirm the safety aspects of the freezer cabinet operation. The independent research establishment TNO, the Netherlands Organisation for Applied Scientific Research, conducted a detailed safety assessment and confirmed that the cabinets could be operated safely for their intended industry usage. Some recommendations were made to further improve the detailed operations guidance which had already been prepared.

In July 2002 Unilever global ice cream management confirmed its decision to introduce HC refrigerants for new cabinet purchases from 2005 where legally allowed and commercially viable.

Since the technical changes the suppliers have to make, take time, it was also decided to start the introduction in a phased manner to permit the suppliers to ramp-up production of the new HC refrigerant cabinet in a manner that would avoid additional cost. This approach would also permit the necessary briefing, training and learning of the new operating procedures to be accumulated well in the early stages.

The introduction of 700 HC refrigerant cabinets in Denmark in 2003 marked the start of the global rollout.

Confirming our vision

Unilever continues to be committed to introducing new alternative refrigeration technologies as they become viable for our business. At the same time we are taking actions to significantly reduce the energy consumption of our freezing cabinets.

Today we can say that our vision of a reliable, energy-efficient, HFC-free, commercially viable refrigeration system is becoming a reality. Hydrocarbons will be Unilever's major focus in a near future, as this is where Unilever can make the most impact on reducing global warming.

We will continue to explore new alternative refrigeration technologies and are currently working **thermoacoustic** (sound wave technology – roll-out of the first prototype thermoacoustics cabinet in April this year), the development of a **CO2 delivery van** in partnership with Cold Car, and **solar-assisted battery powered HC refrigeration**. During this year's Olympics in Greece, Unilever will test five solar-assisted battery powered HC cabinets to investigate whether solar panels can be used to further reduce energy consumption.

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