



greenfreeze

by Jamie Choi

Twenty years after it was signed, the Montreal Protocol is still hailed as a beacon of how governments, industry, scientists, and activists can find common ground to avert an environmental crisis. Non-governmental organizations (NGOs) campaigned and collaborated with implementing agencies—both during formal sessions and informal corridor negotiations—to convince governments to prioritize the environment.

Greenpeace was a leading participant, advocating the earliest possible phase-out of all ozone depleting substances (ODS). But its biggest contribution to the Protocol came after its ratification, as the world waited to see which refrigerants and blowing agents would replace chlorofluorocarbons (CFCs) and halons. It opposed the chemical industry's proposal to substitute such second generation ozone-depleting and global warming substances as hydrofluorochlorocarbons (HCFCs) or global warming substances such as hydrofluorocarbons (HFCs), being convinced there was a way to avoid them by using cleaner and innovative technology.

Its pursuit of innovation led to the creation of Greenfreeze, which uses environmentally-friendly substances such as hydrocarbons as refrigerants and blowing agents. It found a partner in an East German manufacturer, Foron, which began building the first Greenfreeze prototypes in 1992, and worked behind the scenes to acquire government, scientific, and consumer endorsement for the technology. Greenfreeze was one of the first-ever NGO attempts actively to participate in technology innovation to transform an industry.

To a large extent, this has paid off. The world now has over 200 million Greenfreeze refrigerators: 27 million more are now produced each year, one third of the world's total production. Almost every domestic refrigerator now sold in Germany uses the technology. Since the first Greenfreeze refrigerators rolled out of Foron's factories, over 250 variations of the technology have been developed and most large manufacturers—including Bosch-Siemens, Electrolux, Whirlpool, Samsung, LG, Haier, and Liebherr—now use it.

But perhaps the biggest achievement was spreading Greenfreeze in China, the world's fastest growing market and its largest producer of ozone-depleting substances. Greenpeace faced enormous obstacles: technology transfer gaps, shortage of capital, and low public environmental awareness. It also lacked local campaigning experience—it did not yet have a China office—which posed cultural, language, and political challenges. But there was also a real opportunity. As a signatory to the Montreal Protocol, China was obliged to phase out CFCs by 2010 and this caused concern to manufacturers. Switching directly from CFCs to Greenfreeze made more long-term financial sense than investing in HCFCs (which had to be phased out in developing countries by 2040) and HFCs (which, while having no such deadline, still faced the danger of eventual phase-out) only to have to switch to Greenfreeze in the future. And—unlike HCFCs and HFCs, which required expensive processing and licensing—Greenfreeze technology could be purified cheaply from stocks of raw gases already widely available in China.

Greenpeace believed it was vital to align the diffusion of Greenfreeze with China's sustainable development goals, allowing a transitional economy to skip using dirty and unsustainable technologies and to move directly into cleaner innovations. Impressed by a Greenfreeze exhibition at an international conference on CFC alternatives in Beijing in 1993, Chinese officials asked Greenpeace to facilitate technology transfers and help catalyze joint ventures between Chinese and German manufacturers.

With the Chinese government's support, Greenpeace began to exert worldwide public pressure on the World Bank to grant developing countries access to the

Protocol's Multilateral Fund to finance conversion to Greenfreeze. In 1993, the World Bank's Ozone Operations Resource Group endorsed the technology as a valid replacement for CFCs in household refrigerators, paving the way for its dissemination in developing countries. In 1995, Haier (the Chinese refrigerator giant) teamed up with Liebherr (Germany's market leader) to produce the first Greenfreeze refrigerators in China. Soon Foron, Electrolux, and Bosch-Siemens had established technical cooperation or formed joint ventures with other Chinese companies. By mid-1995 three out of the four largest refrigerator manufacturing sites in China had partially converted to the technology.

By 2000, 35 per cent of all domestic refrigerators sold in China were Greenfreeze, and the technology's market share has steadily risen since, helping the country to achieve a substantial reduction of ODS and fulfill its targets. There is also wide activity within China to spread it beyond the domestic refrigeration market. Chinese universities and companies, for example, have invested large amounts of resources in recent years to explore new natural working fluids in refrigerants, such as CO₂, ammonia, water, and air. Some of the biggest multinational companies operating in China, like Unilever and Coca Cola, have already begun rolling out HFC-free commercial refrigerators or are exploring ways to do so.

The Chinese government has announced its decision to eliminate CFCs and halons by 1 July 2007, two years ahead of the deadline set for developing countries. It is expected that the 11th Five-Year plan of the Chinese National People's Congress—which for the first time sets energy conservation and environmental protection as main priorities - will help spread such natural working fluids in China. Greenfreeze has the added benefit of being more energy efficient than HCFCs and HFCs.

All this demonstrates how a combination of technical innovation and activism can work together to green markets. Yet the Greenfreeze campaign is far from over. Perhaps because so much has already been achieved, there is a growing sense of complacency among industry innovators, governments, and activists alike over the need to push for a wider distribution of the technology to combat ozone depletion and global warming. HCFCs and HFCs continue to be used in refrigerators, particularly commercial ones, throughout the world. The chemical industry has used its influence in the United States and Canada—and continues to do so—to obstruct the introduction of Greenfreeze technology, effectively limiting competition. Developing and commercializing Greenfreeze air conditioners has been extremely slow worldwide. And questions over the recovery and safe destruction of banked CFCs, and other potent ozone depleting and global warming refrigeration substances similarly contained in existing products, have yet to be addressed. Tackling these issues in developing countries like China, where a great number of first generation CFC refrigerators are being replaced by new ones, is crucial.

Recent studies by the German scientific institute *Oko-Recherche* suggest that all fluorinated gases (F-gases) combined will contribute 5.2 per cent of global warming over the next 20 years, rising to 8.6 per cent in 2050. As the window of opportunity to prevent dangerous climate change gets smaller every year, curbing CFCs, HCFCs, and HFCs will be crucial in fighting global warming, not to mention ozone destruction. If fluorinated substances are not totally phased out it will be extremely difficult to achieve the target of limiting global warming to a maximum of two degrees. We must use the 20th anniversary of the Montreal Protocol to revitalize the sense of urgency around the global phase-out of F-gases and the further diffusion of such natural refrigerant technologies as Greenfreeze. This is the only appropriate way truly to preserve the legacy of the Montreal Protocol.