Climate-friendly room air-conditioners on hydrocarbon technology and new standards for natural refrigerants in China

Background

Still today, most room air-conditioning systems worldwide (90% being manufactured in China) contain HCFC-22 as refrigerant and are the main source of ozone- and climate-damaging HCFC-emissions in the country (260 million tonnes of CO_2-equivalent emissions per year). The air-conditioning sector is a fast growing sector in China with a huge impact on the global market (the majority of the world market is produced in China). However, the predominant replacement options for HCFC-22 are ozone-friendly hydrofluorocarbons (HFCs) which are still damaging the climate. Alternative, environmental-friendly technologies are therefore urgently needed to avoid negative climate impacts. The natural refrigerant propane (R290) is ozone-friendly, has a very low climate impact and also leads to energy savings due to its specific properties. China`s industry is very much interested in introducing this new technology, but has some objections against R290 due to its flammability. Furthermore, a regulatory framework with suitable standards for this technology is also still lacking.
Future projections show that the global demand for air-conditioning will rise over the next decades, especially in developing countries. Currently about 105 million units per year are sold worldwide. More than a billion units, serviced and refilled on a yearly basis, are already installed. A technology transition to climate-friendly refrigerants in the Chinese air-conditioning market would therefore also have an important positive impact on the global situation.

Project Description

The project converted one production line of room air-conditioning systems of the Chinese manufacturer Gree Electric Appliances Inc. to use R-290 instead of HCFCs and HFCs, thereby establishing a best-practice model. Gree is the biggest manufacturer of room air-conditioners worldwide with 35 million units manufactured per year.
The project also included comprehensive training for production and service technicians; this covered the responsible and safe handling of flammable refrigerants as well as maintenance of the equipment. In cooperation with technical institutions, training material has been produced and distributed. Several workshops facilitated an exchange of experience on the conversion process, with other companies also being invited to participate.
The project was implemented by GIZ-Proklima under the International Climate Initiative of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) in cooperation with the Chinese Ministry for Environmental Protection/Foreign Economic Cooperation Office (MEP/FECO) and the Chinese Household Electrical Appliances Association (CHEAA).
The commercial production of the R-290 units has started with the official opening of the production line in July 2011. The newly designed units fully comply with European safety regulations. Two other manufacturers of room air-conditioners (Haier and TCL) are also supported in adoption of this technology through provision of core technology elements (hydrocarbon filling stations) and technical assistance.

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of the Federal Republic of Germany

An immediately linked GIZ-Proklima project was implemented in China to advise the Chinese Government and industry association on how to develop and implement a climate-friendly sector-policy, including safety standards and related norms. The consultation process has been done in close collaboration with MEP/FECO, CHEAA, and relevant industry and policy stakeholders. This project on development of technical standards for the introduction of natural refrigerants is accompanying the technology transfer and encompasses three elements: The first part of the project provides general advise on international standards on the application of natural refrigerants in room air-conditioning, the second step is the development of a draft standard, which is based on elements of regulations and standards of other countries, but also acknowledges distinct Chinese elements. Intensive consultations with industry and policy stakeholders ensure that their views are reflected in the text and that the stakeholders support the standard development. The last part of the consultation process leads to a final text for submission to the national standard commission and to an action plan on how to introduce natural refrigerants in close cooperation with MEP/FECO and CHEEA in the Chinese market.

Project Impact

Every sold unit of the new air-conditioners will permanently and sustainably reduce direct emissions of climate- and ozone-damaging HCFCs and HFCs with high global warming potential.
For a production line with a capacity of 180,000 units per year a calculated amount of 500,000 tonnes CO_2e per year will be avoided compared to currently produced R-22 units over the lifetime of the units.

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Due to the specific properties of propane and a new system design, the new technology is also about 15% more energy-efficient, which reduces indirect emissions of greenhouse gases and saves electricity costs for the consumer.
Through the technical assistance and safety training provided by the project, an innovative technology was introduced to the world market. Other air-conditioning manufacturers in China and elsewhere are following suit and replicate the results of the project. This will lead to a wider diffusion of the hydrocarbon technology, also because a large part of the Chinese AC production is for export.

Title Pilot production of climate-friendly room air conditioners and related standards in China
Country People's Republic of China
Sector AC industry
Objective Pilot conversion of room AC production in China from halogenated to natural refrigerants
Target Group Chinese manufacturer Gree Electic Appliances Inc., other manufacturers of air conditioners in China and in partner countries, the Chinese Household Electrical Appliances Association (CHEAA); Chinese Refrigeration and Air Conditioning Association (CRAA); technical institutes in China; technical committees of international environmental agreements
Project Executing Organization BMU (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
Implementing Partner Organization GIZ; Chinese Ministry of Environmental Protection/Foreign Economic Cooperation Office (MEP/FECO); Chinese Household Electrical Appliances Association (CHEAA)
Project Approval October 2008
Project Duration Until October 2011
Project Budget EUR 3,466,456
Funds The project is funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety within the framework of the International Climate Initiative based on a decision of the German Federal Parliament.
Impact on the Ozone Layer and Climate Protection
One production line will produce 180,000 HCFC-free units per year. Direct emissions of 500,000 tonnes CO_2e will be prevented during the life cycle of the units produced during one year.
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