



Conversion of Supermarket Refrigeration Systems from F-Gases to Natural Refrigerants

Background

Facing a shortage of energy supply in South Africa, prices for electricity are increasing. The country is therefore looking for possibilities to manage energy demand. Supermarkets, which are an important sector of the economy, need large amounts of electricity, of which most is used in their refrigeration and air-conditioning systems. It is therefore essential to explore options to increase their energy efficiency. For the same reasons, supermarkets in Europe are changing their freezers and refrigeration equipment from fluorinated gases to natural refrigerants with favourable thermodynamic properties, and considerable energy saving potential. So called cascade systems operating with the climate- and ozone-friendly natural refrigerants ammonia and CO₂ are currently considered state-of-the-art in supermarket refrigeration.

Project Description

Currently, all supermarket refrigeration systems in Southern Africa operate on fluorinated refrigerants with high ozone-depleting and/or global warming potentials. Modern, environmentally friendlier technology based on natural refrigerants is still completely unknown there and is seen with some concern. Most equipment owners, refrigeration engineers and service technicians have been reluctant to discuss these technologies due to potential safety issues.

Pick n Pay is one of the largest supermarket chains in Southern Africa. Due to increasing energy costs, Pick n Pay decided to explore these new refrigeration technologies. They readily agreed to technical and financial assistance to convert the refrigeration and air-conditioning systems in two supermarket stores in climatically different zones of South Africa, namely in Johannesburg and in Cape Town.

The new technology is a cascade system with ammonia as the primary system located in a machine room off the sales area and a glycol-water solution for distribution inside the store. The secondary CO₂-cascade provides the cooling for the low temperature applications. The state-of-the-art system components come from Europe and Australia, but are supplied through local South African refrigeration companies. This ensures that the technology can spread more easily once its advantages are proven.

Investment costs for the new systems are still relatively high compared to the standard cooling technology in South Africa. Significant energy savings can offset this partially and will contribute to an overall economic benefit.

It is an integral part of the project to train the supermarket's service technicians in the professional maintenance and servicing of the new equipment to ensure optimal performance and safe handling of the equipment and to maximise energy efficiency.

The two stores were opened in December 2009 during the summer season in the southern hemisphere and are now fully operational.

On behalf of



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety

of the Federal Republic of Germany

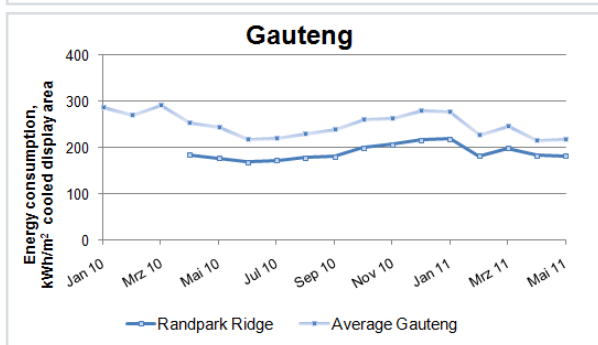
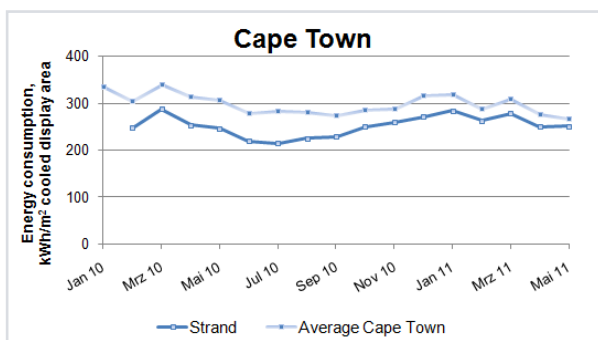


Project Impact

The use of natural refrigerants and improved energy-efficiency of the new equipment permanently and sustainably avoids greenhouse gas emissions associated with the current technology. Direct emissions due to leakage of the refrigerant HCFC-22 (up to 80%) in the old refrigeration plants amounted to approx. 2,000 tonnes CO₂e for both stores per year. In addition, decreased energy consumption will significantly reduce the company's electricity expenses and thereby contribute to an overall improvement in profitability. After start-up, energy consumption data from both stores was collected and compared to conventional stores. After more than one year of monitoring, energy savings of 19-26% are demonstrated.

The findings of the project will encourage other supermarket chains in the Southern African region to implement natural refrigerant based technologies. The South African supermarket association is supporting the dissemination of the technology. One major supermarket chain has already started to convert their cooling equipment to CO₂-technology (MAKRO SA). The supermarket chain Pick n Pay will continue to invest in natural refrigerant based technology in the near future and has already converted an additional store on its own costs to the new technology.

Further information/Media interest: The German television Deutsche Welle (DW-TV) has produced a short film about this project, available on their website: www.dw-world.de or on the Proklima website.



Energy efficiency comparison between average store and converted store

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Title Conversion of supermarket refrigeration systems from F-gases to natural refrigerants
Country South Africa
Sector Commercial refrigeration/retail sector
Objective Introduction of ozone- and climate-friendly state-of-the-art refrigeration technology into Southern Africa
Target Group Supermarkets in Southern Africa; suppliers of commercial refrigeration equipment; service technicians
Project Executing Organization BMU (German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety)
Implementing Partner Organization Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH; South African Department of Environmental Affairs and Tourism; National Ozone Office; Designated National Authority; Pick n Pay (South African supermarket chain)
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Project Budget EUR 1,607,545

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 Ozone Layer and Climate Protection
Direct emissions of 2,000 tonnes CO₂e per year are sustainably and permanently eliminated through replacement of HCFC-22 with natural refrigerants. In addition, there are significant energy savings through installation of more energy-efficient natural refrigerant based equipment: After monitoring for more than a year, savings of 19-26% compared to conventional stores are demonstrated.
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