On behalf of:

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REPUBLIC OF SOUTH AFRICA

Mitigating emissions in the transport refrigeration sector in South Africa

Introducing innovative logistics and supply structures in the South African transport refrigeration sector to mitigate emissions

The challenge

South Africa's economy depends largely on agriculture and trade (retail) – two sectors in which transport plays a vital role. The transport and distribution of refrigerated goods is an important part of the greenhouse gas emission balance of cold chains. It is estimated that under a business-as-usual scenario, emissions in the transport refrigeration sector will increase from the current two million tons of CO_2eq*, to above five million tons CO_2eq by 2020 in South Africa.

There are about 9 000 trucks and trailers in the refrigerated transport sector in South Africa. In terms of their direct greenhouse gas emissions, each truck contains refrigerants, mainly the hydrofluorocarbon blend R404a, which has a global-warming potential (GWP) of 3 922 and to a lesser extent the hydroflourocarbon 134a (HFC-134a), which has a GWP of 1 430 times that of CO_2. Furthermore, the refrigeration unit and truck engine consume fuel and therefore create indirect emissions in the form of CO_2. These indirect emissions contribute less than 50% in smaller trucks, but up to 75% in trailers.

In 1987, 197 countries, including South Africa, ratified the Montreal Protocol on Substances that Deplete the Ozone Layer. By doing so, they committed to phase out the use of chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) – two substances with high ozone-depleting potential which, in the past, were commonly used in the refrigeration industry. Nowadays, HFCs are the most commonly used refrigerants in cooled transport processes in South Africa. Although these gases have no ozone-depleting potential, they can still be damaging to the environment because of their predominantly high GWP.

In order to mitigate the high level of emissions from refrigerated trucks and trailers, the type of refrigerant used needs to be reconsidered and energy-efficiency improvements have to be made. However, this poses some challenges: the refrigerated transport sector lacks the technical information and know-how to make these changes. Solutions to these challenges are not readily available and there are only a couple of transport refrigeration units in the world that are currently running on alternative natural refrigerants. In terms of energy-efficiency improvements, the insulation of the bodies is the most important starting point. However, South Africa does not have a testing facility to measure thermal efficiency, which makes it impossible to assess the actual performance of trucks and trailers.

Project name	Emission mitigation in transport refrigeration sector through the introduction of innovative logistics and supply structures in South Africa
Commisioned by	German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB)
Project region	South Africa
Partner	Department of Environmental Affairs (DEA) Department of Trade and Industry (DTI)
Duration	June 2012 until October 2015

CO_2eq: global-warming potential of a greenhouse gas in relation to the effect CO_2 would have over a set period of time

Left: A refrigerated multi-compartment truck

Right: Participants brainstorming at a workshop on refrigerated transport, held in November 2013

Photos: © GIZ

Left: A refrigerated transport body

Right: Industry representatives at a workshop on refrigerated transport, November 2013

Our approach

With South Africa's obligation to phase out the use of HCFCs in the foam industry and its commitment to reduce greenhouse gas emissions as expressed in the National Climate Change Response Policy White Paper of 2011, there is an opportunity to reorganise the old supply infrastructure. The project aims to contribute to the climate-friendly development of the transport refrigeration sector in South Africa through two main interventions: changing to natural refrigerants, such as hydrocarbons or carbon dioxide, with less global-warming potential, and reducing the energy consumption of the cooling and transportation process. The latter can be accomplished by:

- increasing the energy efficiency of the refrigeration system (using less energy to provide the same amount of cooling);
- increasing the insulation capacity of the vehicle bodies to reduce the cooling capacity required to reach and maintain specific temperatures; and
- optimising operational procedures such as loading practices.

The project further supports the South African government to integrate the transport refrigeration sector into their national mitigation strategy. The project will be implemented in two phases:

- In phase one, the sector will be analysed in close cooperation with relevant stakeholders in the refrigeration industry. The most promising measures and interventions to reduce greenhouse gas emissions will be formulated and discussed with the partners.
- During phase two, pilot measures will be implemented.

Results achieved so far

After engaging with relevant stakeholders in the refrigeration industry, the sector analysis was completed and pilot measures were recommended. Two workshops were held in November 2013 and March 2014.

Thereafter a steering committee was established in April 2014 to take the lead on the project. This committee comprises officials from South African Government departments and industry representatives. From the steering committee two separate working groups were formed to investigate the following topics in more detail:

1. Establishing a test chamber in South Africa

   Several countries have been using thermal test chambers for many years to verify the thermal efficiency of refrigerating units and the insulation capacity of bodies. This working group supports the process to establish a test chamber in South Africa.

2. Improving the body design of trucks and trailers

   This working group will work towards supporting manufacturers in improving their products so they can eventually meet the requirements of future national standards, which will be tested in the hall.

In terms of refrigerants in use, a prototype working with a hydrocarbon refrigerant will be developed in cooperation with the South African refrigeration industry. To this end, the project team has already entered into discussions with a local manufacturer of refrigeration units. Additionally, an extension of a UK field trial with CO_2-units with an international refrigeration unit supplier has been initiated.

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