




## Climate-friendly cooling in German supermarkets?

When shopping, many people highly appreciate sustainable food production and eco-friendly packaging. However, very few are conscious of climate effects from cooling of the goods.

In supermarkets, most cooling shelves and refrigerators run on climate damaging refrigerants. We call them F-gases, among which the best-known refrigerant is R404A. Its effect on the climate is 4 000 times higher than the one of CO<sub>2</sub>. Only in Germany, the annual leakage of the refrigerant R404A into the environment damages our climate as much as emissions of 1.8 million cars!

Nevertheless, it is possible to avoid this impact. Natural climate-friendly refrigerants can be used as an alternative. They are already on the market. We only have to use them.



climate-friendly  
refrigerants

climate-damaging  
refrigerants

## Introduction

In its first questionnaire on the use of refrigerants the German environmental organization Deutsche Umwelthilfe (DUH) asked the biggest food retailers in Germany about the refrigerants used and whether the companies are already making use of climate friendly alternatives. Besides, the DUH asked them about the implementation or planned implementation of energy efficiency measures in their systems. In total, 13 companies answered, seven of them filled the questionnaire extensively.



*Nowadays, customers can buy a lot of healthy and environmentally friendly manufactured products in the supermarket, but most of the supermarkets are far away to cool environmentally friendly.*

The aim of the survey was drawing general attention to the very large use of fluorinated gases (F-gases), among others in systems for cooling and air-conditioning<sup>1</sup>. In Germany, besides the air-condition systems of cars, industrial cooling causes most emissions of fluorinated gases. Especially the central cooling systems of the food retailing industry in Germany<sup>2</sup> are climate-damaging. The chemical refrigerant R404A with the greenhouse factor 3 922 in comparison to CO<sub>2</sub> is in large use. On average, every year 11% of this refrigerant escape into our climate because of leakages in the systems.

<sup>1</sup> *Approx. 2/3 of the total use of F-gases is related to the area of refrigerants.*

<sup>2</sup> *Approx. 3/4 of the total amount of F-gases is related to central cooling systems (mainly in the food retailing industry).*

## The use of natural refrigerants in supermarkets and discounters – taking the example of the food retailing industry

After the ban of the ozonosphere-damaging CFC, in the food retailing industry predominantly so called F-gases were used for cooling.

Today, natural refrigerants increasingly are catching on. Nearly all of the retailers who answered the DUH survey stress the importance of natural refrigerants in the future. Especially “discounters” more and more rely on natural refrigerants for the deep-freezing. In this field, the percentage of natural refrigerants is already exceeding the rate of climate-damaging refrigerants.

The use of F-gases-free cooling technologies has a double protecting effect on the climate. On the one hand, natural refrigerants have a low greenhouse factor. On the other hand, the systems run more efficiently and need less power. As a result, investment costs amortize quickly because of lower operating costs. Thus, a changeover is ecologically worthwhile and economically efficient at the same time.

Nevertheless, the results of the survey reveal that the way to an extensive conversion to the use of natural refrigerants is still very long and needs a clear input for the future. In this context, the ambitious redesign of the F-gas regulation with EU-wide application is highly important. Also on a national level it is possible to stimulate the reduction of F-gases and the switch to natural refrigerants, e.g. by means of an optimization of the disposal and the recovery of F-gases or by a refundable deposit on them.

## Revision of the F-gas regulation

Recently in Brussels, negotiations on the future of the F-gases are going on. A new version of the applicable F-gas regulation shall bindingly determine the date from which each of the numerous substances will be prohibited. The decisive criteria for this question is the fact whether and to what extent climate-friendly, energy-efficient and economically acceptable alternatives are available.

The DUH survey clearly demonstrates that in the food retailing industry alternatives for the cooling are already at our disposal. Even more: they are already in use. This applies with no limitations for new systems and for cooling as well as for deep-freezing. This is



why the use of the climate-damaging R404A<sup>3</sup> should be prohibited for new systems not later than beginning from 2020. A clear signal like that will push the further development and optimization of the systems running with natural refrigerants for these, as well as for other applications.

Concerning the existing systems, the project of the new regulation provides for allowing exclusively reprocessed R404A for the refilling, beginning from 2017. This so called “service ban” on the one hand restricts the new production of R404A and on the other hand underlines that these systems shall not be in use for a long time any more. At the same time, it increases the incentive to reduce the loss rates of 11% on average by suitable means. The service ban speeds up the switch to natural refrigerants but gives the user enough time

to perform this conversion. For the implementation, we need a functioning reprocessing system as well as high standards for the service devices and the affected stuff.



The customer mostly doesn't know which refrigerant is used.

<sup>3</sup> In 2011 the percentage of new systems damaging the climate by using the refrigerant R404A was 75% in large Supermarkets and 55% in smaller stores and discounters (source: German federal environment agency Umweltbundesamt (UBA)).

## ALDI NORD (approx. 2,428 branch stores, 35 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Shelves</b>
<b>F-gases</b> 27,6% R134a (greenhouse factor 1,430) 69% R404A (greenhouse factor 3,922) Approx. 1% R410A (greenhouse factor 2,088) 1,4% others	not applicable or not existing
<b>Natural refrigerants</b> 1% CO <sub>2</sub> (greenhouse factor 1)	
<b>Cabinets</b>	<b>Cabinets</b>
<b>F-gases</b> 51% R404A (greenhouse factor 3,922)	<b>F-gases</b> 45% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b> 49% Propane (greenhouse factor 3)	<b>Natural refrigerants</b> 55% Propane (greenhouse factor 3)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>F-gases</b> 7% R134a (greenhouse factor 1,430) 70% R404A (greenhouse factor 3,922) 23% others	<b>F-gases</b> 100% R404A (greenhouse factor 3,922)
We noticed	
» Energy efficiency measures such as optimized night roller blinds, energy-saving compressors and fans, comprehensive measuring and control devices	
» High amount of F-gases in the cooling shelves	
» No doors at the cooling shelves	
» No use of natural refrigerants in the logistics centres	
Planned investments	
» Decision on the use of natural refrigerants in combined heat and power systems not taken yet	



## ALDI SÜD (approx. 1,816 branch stores; 31 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Cabinets</b>
<b>F-gases</b> 20,7% R134a (greenhouse factor 1,430) 69% R404A (greenhouse factor 3,922) 0,1% others	<b>F-gases</b> 21% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b> 10,1% CO <sub>2</sub> (greenhouse factor 1)	<b>Natural refrigerants</b> 79% Propane (greenhouse factor 3)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>F-gases</b> 0,9% R134a (greenhouse factor 1,430) 1,5% R404A (greenhouse factor 3,922)	<b>F-gases</b> 0,9% R134a (greenhouse factor 1,430) 1,5% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b> 97,6% Ammonia (greenhouse factor 0)	<b>Natural refrigerants</b> 97,6% Ammonia (greenhouse factor 0)
We noticed	
<ul style="list-style-type: none"> <li>» Energy efficiency measures such as LED lights in new systems, optimized night roller blinds, energy-saving compressors and fans, comprehensive measuring and control devices</li> <li>» 4 from 5 cabinets (approx. 32,000) operating with natural refrigerants</li> <li>» Since 2010 all combined heat and power systems (full cooling / deep-freezing of a branch store) armed with CO<sub>2</sub> (recent inventory 180)</li> </ul>	
<ul style="list-style-type: none"> <li>» No doors at the cooling systems</li> </ul>	
Planned investments	
<ul style="list-style-type: none"> <li>» Until 2017: no cabinets with F-gases shall be used any more</li> <li>» New systems completely free of F-gases</li> </ul>	



## Kaisers Tengelmann (approx. 513 branch stores; 4 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Shelves + cabinets</b>
<b>F-gases</b> 10% R134a (greenhouse factor 1,430) 65% R404A (greenhouse factor 3,922) 25% others	<b>F-gases</b> 10% R134a (greenhouse factor 1,430) 65% R404A (greenhouse factor 3,922) 15% others
	<b>Natural refrigerants</b> 10% CO <sub>2</sub> (greenhouse factor 1)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Natural refrigerants</b> predominantly Ammonia	<b>Natural refrigerants</b> predominantly Ammonia
We noticed	
<ul style="list-style-type: none"> <li>» Use of LED lights at every 2<sup>nd</sup> cabinet</li> <li>» 20% of the existing systems are combined heat and power systems. Standard for new installations</li> </ul>	
<ul style="list-style-type: none"> <li>» Sticking to F-gas refrigerants for the usual cooling</li> </ul>	
Planned investments	
<ul style="list-style-type: none"> <li>» Reduction of the leakage of refrigerants minor to less than 10%</li> </ul>	



## Kaufland (approx. 630 branch stores, 6 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves + cabinets</b>	<b>Shelves + cabinets</b>
<b>F-gases</b>	<b>F-gases</b>
6% R134a (greenhouse factor 1,430) 93% R404A (greenhouse factor 3,922)	93% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b>	<b>Natural refrigerants</b>
1% CO <sub>2</sub> (greenhouse factor 1)	7% CO <sub>2</sub> (greenhouse factor 1)
Use of refrigerants in the logistics centres	
<b>Natural refrigerants</b>	
predominantly NH <sub>3</sub> (Ammonia) (greenhouse factor 0)	
We noticed	
<ul style="list-style-type: none"> <li>» Increasing rate of CO<sub>2</sub> for deep-freezing (CO<sub>2</sub> is standard for new systems)</li> <li>» 100% night coverings at all cooling shelves</li> <li>» LED lights are standard for all new cooling systems since spring 2013</li> <li>» Very high rate of the climate-damaging refrigerant R404A used for the cooling in the stores</li> </ul>	
Planned investments	
<ul style="list-style-type: none"> <li>» 100% sliding and revolving doors for the deep-freezing until end of 2013</li> </ul>	



## Lekkerland (supplier of 61,400 kiosks, specialized tobacco shops, petrol station shops, beverage stores, department stores, food stores, baking stores, canteens and convenience stores, 15 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Shelves</b>
<b>F-gases</b>	not applicable or not existing
5% R134a (greenhouse factor 1,430) 95% R404A (greenhouse factor 3,922)	
<b>Cabinets</b>	<b>Cabinets</b>
<b>F-gases</b>	<b>F-gases</b>
28% R134a (greenhouse factor 1,430) 1% others	15% R404A (greenhouse factor 3,922) 1% others
<b>Natural refrigerants</b>	<b>Natural refrigerants</b>
71% Isobutane (greenhouse factor 3)	66% Isobutane (greenhouse factor 3) 18% Propane (greenhouse factor 3)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>F-gases</b>	<b>F-gases</b>
13% HFO	2% R404A (greenhouse factor 3,922) 6% HFO
<b>Natural refrigerants</b>	<b>Natural refrigerants</b>
87% Ammonia (greenhouse factor 0)	92% CO <sub>2</sub> (greenhouse factor 1)
We noticed	
<ul style="list-style-type: none"> <li>» High rate of natural refrigerants at all applications</li> </ul>	
Planned investments	
<ul style="list-style-type: none"> <li>» No further information</li> </ul>	



## LIDL (approx. 3,300 branch stores, > 30 distribution centres/logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Shelves</b>
<b>F-gases</b> 2-3% R134a (greenhouse factor 1,430) 90-93% R404A (greenhouse factor 3,922)	not applicable or not existing
<b>Natural refrigerants</b> 3-5% Propane (greenhouse factor 3)	
<b>Cabinets</b>	<b>Cabinets</b>
<b>F-gases</b> 30-40% R404A (greenhouse factor 3,922)	<b>F-gases</b> 30-40% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b> 60-70% Propane (greenhouse factor 3)	<b>Natural refrigerants</b> 60-70% Propane (greenhouse factor 3)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>F-gases</b> 70% R404A (greenhouse factor 3,922)	<b>F-gases</b> 70% R404A (greenhouse factor 3,922)
<b>Natural refrigerants</b> 30% CO <sub>2</sub> +Propane (greenhouse factor 1+3)	<b>Natural refrigerants</b> 30% CO <sub>2</sub> +Propane (greenhouse factor 1+3)
We noticed	
<b>+</b>	<ul style="list-style-type: none"> <li>» 2/3 of all cabinets already operating with natural refrigerants</li> <li>» New generation of branch managers (approx. 150) and nearly all of the new branch stores demanding high standards of energy efficiency and climate protection</li> <li>» Since 2011 all new cabinets armed with LED lights</li> </ul>
<b>-</b>	<ul style="list-style-type: none"> <li>» No doors at the cooling systems</li> <li>» High rate of the climate-damaging R404A in the cooling shelves of the branch stores and logistics centres</li> </ul>
Planned investments	
» Beginning from 2014: implementation of LED lights in the cooling shelves	

## Netto Supermarkt GmbH (345 branch stores; 2 logistics centres)

Use of refrigerants in the stores	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>Shelves</b>	<b>Shelves</b>
<b>F-gases</b> 95% R134a (greenhouse factor 1,430) 5% R404A (greenhouse factor 3,922)	not applicable or not existing
<b>Cabinets</b>	<b>Cabinets</b>
<b>F-gases</b> 98% R134a (greenhouse factor 1,430) 2% R404A (greenhouse factor 3,922)	<b>F-gases</b> 2% R22 (greenhouse factor 1,810, damaging the ozonosphere) 98% R404A (greenhouse factor 3,922)
Use of refrigerants in the logistics centres	
<b>Cooling</b>	<b>Deep-freezing</b>
<b>F-gases</b> 100% R134a (greenhouse factor 1,430)	<b>F-gases</b> 50% R404A (greenhouse factor 3,922)
	<b>Natural refrigerants</b> 50% CO <sub>2</sub> (greenhouse factor 1)
We noticed	
<b>+</b>	<ul style="list-style-type: none"> <li>» 95% of the cooling systems are recovering a part of the thermal energy for the heating of the branch store</li> <li>» Low rate of leakages: less than 6%</li> </ul>
<b>-</b>	<ul style="list-style-type: none"> <li>» No use of natural refrigerants in the cooling systems of the branch stores</li> </ul>
Planned investments	
» No information	

## Others (What we noticed concerning other food retailers – the following retailers did answer, but did not fill in the questionnaire.)

<b>tegut...</b>	+
» Since 2010 in all new branch store buildings and in the case of complete renovations installing only integrated CO <sub>2</sub> -systems (recently at 20 branch stores)	
<b>Handelshof</b>	+
» There are night coverings in all cooling systems	
» New cooling systems armed with LED lights	
<b>Metro Group</b>	+
» Cooling systems in new buildings and in the case of basic renovations shifted to natural refrigerants by default	
» The natural refrigerant ammonia is used in all warehouse locations (14)	
<b>Alnatura</b>	+
» All cooling systems armed with energy saving doors	
<b>REWE Group</b>	+
» New acquisition of 15,000 cabinets operating with natural refrigerants	
» Cooling shelves for self service meat goods completely glazed; in new buildings and in the case of renovations successive upgrading of the cooling shelves for dairy products as well (700 stores until now)	
<b>Edeka</b>	+
» In new buildings and in the case of upgrading the cooling systems natural refrigerants used nearly exclusively	
<b>All retailers</b>	-
» No information on the quantities of the used refrigerants	

## Outlook to the future and recommendations

The phasing out of the use of climate-damaging F-gases is possible and necessary. For this, we have to take the right decisions now:

- » on EU-level we need clear signs for the conversion: a prohibition of refrigerants with a greenhouse factor of 2 500 and higher beginning from 2017 as well as a prohibition of new systems running with these substances beginning from 2020
- » In addition, clear rules for the use of recycled substances for existing systems are necessary. This means that existing systems may be refilled with newly produced substances only until 2017. Beginning from 2017 only, recycled F-gases can be used.

The food trading should strengthen its efforts in the conversion to natural refrigerants and its investments in efficient technologies. International companies have already declared their support for a binding phasing out of the use of F-gases. A transparent policy and a clear program would support the efforts of the business in sustainability.



*Source greenhouse factors: IPCC Fourth Assessment Report-2007. Pictures credits: title: composition of pictures of Robert Kneschke/fotolia.de and adisa/fotolia.de; p.2: contrastwerkstatt/fotolia.de; p.3: adisa/fotolia.de*

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