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Umwelt Bundes Amt
Für Mensch und Umwelt

Natural refrigerant for mobile air conditioning systems

Carbon dioxide as refrigerant lowers greenhouse gas emissions

It is now widely acknowledged that the synthetic refrigerants contained in mobile air conditioning systems are doing damage to our climate. In June, experts at two international congresses in the USA will once again discuss alternatives to the harmful refrigerants now used in air conditioning systems. In the opinion of the Federal Environment Agency, the most climate-friendly solution is to replace synthetic refrigerants such as R134a with the natural refrigerant carbon dioxide (R744). "To effectively relieve the burden on the earth's atmosphere will take more than a European or mere German solution that adopts carbon dioxide. It is time for global action", intoned UBA President Prof. Dr. Andreas Troge. UBA is showing its support of this climate-friendly technology by equipping a car with an R744 air conditioning unit, which will demonstrate the practicability of this innovation.

There are already 400 million motor vehicles equipped with air conditioning systems worldwide. According to climate experts' estimates, this number will rise to nearly one billion by the year 2015, at which time the Intergovernmental Panel on Climate Change (IPCC) forecasts that the refrigerants in these air conditioning systems alone will emit at least 270 million tonnes of CO_2 equivalents into the atmosphere and further accelerate global warming. The refrigerant used to date in mobile air conditioning systems is the fluorinated greenhouse gas tetrafluoroethane, which has a high Global Warming Potential (GWP) and is known commercially as R134a. Researchers and engineers have been working on alternatives to fluorinated refrigerants since the early 1990s. In the meantime they have happened upon a natural refrigerant which has been known for more than 100 years, namely carbon dioxide (R744). R744 is 1,300 times less harmful to the climate than R134a, has good cooling performance, is non-toxic, and already available worldwide at a reasonable price as it can be captured directly from the air.

Some controversy persists in the international debate about the energy consumption of carbon dioxide-based mobile air conditioning systems, which is supposedly higher than in R134a units. However, experienced development engineers working on carbon dioxide systems have proof of lower consumption. The UBA will carry out independent measurements to prove that R744

air conditioning systems can also provide an energy advantage. The Agency expects initial results in Autumn 2008.
The US Society of Automobile Engineers (SAE) is hosting the ninth Alternate Refrigerant near Phoenix (USA) from 10-12 June 2008. This year's United States Environmental Protection Agency's congress on mobile air conditioning will also take place on 13 June 2008 in Phoenix. Participating experts will discuss alternatives to the refrigerant R 134a while considering R744 and other synthetic refrigerants with low Global Warming Potential.
In Europe the eventual abandonment of fluorinated refrigerants with high Global Warming Potential is scheduled. As per EU Directive 2006/40/EC, after 1 January 2011 manufacturers may only sell new type passenger cars if the air conditioning system contains a refrigerant that is significantly less damaging to the climate than R 134a. The new refrigerant may only have a GWP of up to 150 times that of the same mass of carbon dioxide.
German automobile manufacturers already made the decision in Autumn 2007 to switch to carbon dioxide as the refrigerant in mobile air conditioning in new car types. On account of the necessary changes in production process, German automobile manufacturers and their suppliers are intensively stepping up efforts to make mass production possible by 2011. A universal switch to R744 would achieve several goals at once: automobile manufacturers would dispose of a long-term, sustainable and uniform technological solution that would also dramatically reduce the share for which motor vehicles are responsible for global warming. Thanks to the technical specifics of an R744 system-- and unlike the synthetic refrigerant alternatives also in question- there is no risk that, in the event of a leak, the system would be refilled with a refrigerant with high Global Warming Potential.

EU Directive 2006/40/EC relating to emissions of fluorinated greenhouse gases from air conditioning systems in motor vehicles can be accessed on the Internet at:
http://www.umweltbundesamt.de/produkte/dokumente/RI_2006_40_17_05_06.pdf

English version :
http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:161:0012:0018:EN:PDF

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