



ACEA Automobile Industry Overview of Alternative Refrigerants

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Legislation on New Refrigerants

Legislation in Europe:

- Legal act, prepared by the Commission, is adopted by the European Parliament and the Council (Directive 2006/40/EC) by May 2006
- Elements:
 - Leakage reduction for R134a from 2008
 - Ban of refrigerants with $GWP_{100} > 150$:
 - 2011 for new types
 - 2017 for new vehicles
 - Legal basis is article 95 of the EU treaty
(= total harmonization over 27 EU member-states, no national differences allowed)



ACEA Position on New Refrigerants

Position towards the European legislation:

- ACEA accepted and supported the ban of R134a and leakage reduction.
- ACEA claimed during the consultations of Dir. 2006/40/EC for the years 2012/2018, because the timeline 2011 was extremely challenging. OEMs repeatedly have made clear the complexity and for this the criticality of the timeline. Nevertheless ACEA members are committed to realize the phase-out of R134a according to the timeline of the directive.
- ACEA never put a joint decision of its member companies pro or against any refrigerant. GWP 150 was and is seen as fair compromise between the targets of the regulation and keeping options for different applications. Different applications might see specific advantages for different solutions. A regulation explicitly or implicitly prescribing one refrigerant has been rejected.
- ACEA requested support from EC to come to a harmonized regulation at least across the major markets. Inside Europe a regulation following Art. 95 (harmonization across Europe) was and is essential.
- ACEA supported and collaborated with DG ENTR successfully to work out the technical requirements for leakage control of R134a, which is adopted through the CATP (Committee for Adaptation to Technical Progress) (Regulation 706/2007) by June 2007



ACEA Position on New Refrigerants

Status of the EU-regulation today:

- The political decision concerning the ban of R134a was made at a time of uncertainty concerning the feasibility for substitution. There are still substantial challenges concerning the usage of R744, which might not be solvable. On the other side there is an increasing number of alternate refrigerants coming up as potential substitutes of R134a.
- Tests concerning usability of new alternatives need time. Timeline for R744 as well as for alternatives is critical.
- Current activities of pressure groups to force industry into using R744 or other alternatives are counterproductive.

=>For this ACEA-members started and are involved in their own evaluation processes as only reliable source for a decision. As long there are no validated alternatives, ACEA-members will not give up their existing option of choice (R152a, R744).

- The regulation following Art. 95 (harmonization across Europe) was and is essential. Direct or indirect pressure from national administrations trying to exceed Directive 2006/40/EC in favour of one specific refrigerant would be irregular.
- ACEA welcomes the clarification of Commissioner Mr. Verheugen, who stated, timeline and target are set, but not the solution, as long as it is below the threshold of GWP 150.



ACEA Position on New Refrigerants

The Threshold is GWP 150:

- GWP 150 brings the most significant contribution to direct emission reduction.
- The step from GWP 1410 to 127 (at present the worst GWP among the alternatives) brings absolutely 91% or more than 5% reduction in greenhouse emissions of a complete vehicle, if the assumed 85 g/year of the leakage-study by J.Schwarz were realistic. But ACEA-measurements showed an in-operation leakage of only 10 g/year and not 52 g/year like predicted by J.Schwarz.
- Further leverages like
Leakage-control in operation (i.e. Regulation EC 842/2007, SAE J2727)
Leakage-control and skill in service and recycling (i.e. Regulation EC 842/2007)
EOL-recovery
Ban of Do-It-Yourself-Solutions
can reduce emissions from refrigerants to a negligible level.
- ACEA welcomes the limit of GWP 150 as an important and enormous, but also in relation to other emissions, satisfactory step. For this ACEA expects this threshold as a durable value.



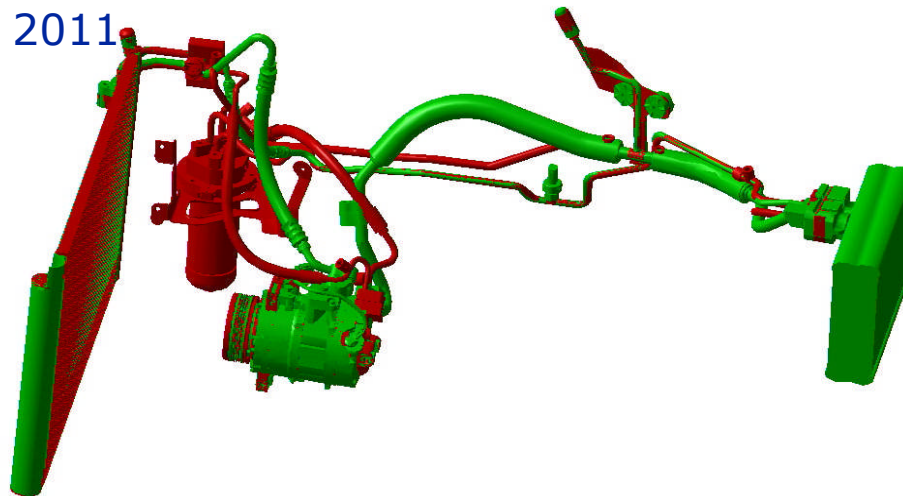
ACEA Position on New Refrigerants

Reasons for investigating alternatives i.e. to R744:

- Still open critical technical issues:
 - Safety
 - Durability of components
 - Space for additional components / Compatibility to R134a in its layout
 - Noise level
 - Dual evaporator systems / battery cooling for hybrid vehicles
 - Servicing in all markets
 - Wide range in performance and efficiency, in specific with small vehicles
 - Technical expertise of OEMs and suppliers
- =>
- Maturity critical for 2011

Red:
R744

GREEN:
134a



BMW R744
Fleettest
Example



ACEA Position on New Refrigerants

Reasons for investigating alternatives i.e. to R744, continued:

- Global usability questionable:
 - no final and complete approval in US.
 - sensitivity to hot climates.
 - servicing in emerging markets.
- =>
- Two systems inside and outside Europe require improved compatibility

For these reasons any system that is more compatible and can be based on robust experience grown with deploying actual system technology is attractive.

It is responsive and necessary to further investigate additional solutions with the potential of global usability, that can bring additional benefit to environment.



ACEA Position on New Refrigerants

Further evaluation process:

- Unless there are found showstoppers for all new alternatives, the evaluation process of the refrigerant candidates will last until end 2007 (see specific presentations).
- Existing options will not be abandoned until an alternative is validated.
- Activities in car projects foresee provisions for the new candidates and the existing option of choice until a decision.
- For different applications ACEA-members may choose different solutions and inside their companies several solutions in the sense of Directive 2006/40/EC.



ACEA Position on New Refrigerants

Frequently asked questions:

- Do you intend to use a non-natural refrigerant or the natural refrigerant ?*

This decision is still under evaluation. ACEA-members are committed to protect the environment by limiting the GHG-emissions from MACs. But "Natural" or "Non-Natural" imply an inadequate qualification. The only valid qualification is the lowest LCCP on a global scope. For this OEMs await the outcome of the validation.

- On what timescale do you expect to deploy the new refrigerant ?*

From ACEA-members not before 2011.

- What testing of alternative refrigerants have you done including efficiency, toxicity, ODP, indirect GWP and are you prepared to make the data publicly available?*

Evaluation is under way and covers all questioned parameters. The information is shared in many public events like SAE AARS, VDA Wintermeeting ..which are available to all participants.



Summary

- ACEA is committed to the dates, as laid down in the regulation
- ACEA members have to invest by themselves into the ongoing evaluation process of alternate refrigerants, what is the proper choice for them individually. Decisions will be put during autumn 2007.
- During this evaluation at least one of the existing options is kept as fall-back option.
- ACEA sees public pressure towards R744 in Europe. For ACEA it is not effective if national administrations and NGOs focus on one particular technology. Focus should be on technology-independent performance requirements, leaving the choice on the technology to the OEMs.
- For US ACEA urges approval of R744, R152a and new alternatives for use in all states.