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**Position of the German Automobile Industry regarding
Vehicle Climate Control
Use of Environment-Friendly Refrigerants**

Safety, environment, economy, and customer focus are the predominant goals of the automobile industry with regard to production and products. Balancing these conflicting goals presents major challenges.

Continually increasing demands in customer comfort have resulted in optimised interior climate control systems. They not only provide improved occupant comfort, but also contribute to improved driving safety, because driver attention can be better maintained.

The German automotive industry is continuously striving to improve mobile air conditioning systems to minimise their environmental impact.

1. Already in July `92, long before legally mandated, the German automotive industry committed itself to phase out the ozone depleting CFC (R12) in mobile air conditioning systems. As a substitute to this chlorine-containing refrigerant, the German automotive industry introduced the chlorine-free HFC (R134a). Preventing ozone layer depletion had at that time highest priority in the environmental policy (Montreal Protocol). Furthermore, the refrigerant R134a has a 6-fold smaller global warming impact compared to R12 used at that time.

Simultaneously, the refrigerant losses of mobile air conditioning systems were substantially reduced. Nevertheless, the improvement of tightness of the systems remains a constant challenge for the automotive industry to reduce refrigerant loss.

The use of fully halogenated CFC's in the foaming process of insulation panels for commercial vehicles with cold-storage facilities was also phased out and suitable substitutes are now in use.

2. In the current environmental policy discussions regarding mobile air conditioning systems, climate protection has attained highest priority status. In Kyoto, in 1997, a resolution was made to significantly reduce the most relevant greenhouse gas emissions. Refrigerant HFC - 134a, which is a partly fluorinated hydrocarbon, is used in today's air conditioning systems. R134a belongs to the so-called "Kyoto gases" and is therefore directly affected by these reductions. For this reason, the German automotive industry is investigating alternatives to reduce emissions of potential greenhouse gases.

Currently, the natural and non-flammable R 744 (CO₂) and the (synthetic and flammable) R 152a are being discussed as potential alternatives:

Refrigerant R744:

Clear advantages speak for R744 as a possible future refrigerant and replacement for R134a. The greenhouse potential of CO₂ (GWP=1) is 1300 times lower than that of R134a. With CO₂ mobile air conditioning systems one can attain comfortable compartment climate conditions in a shorter period of time. It is a suitable agent for auxiliary heating devices functioning as a heat pump system, thereby using components of the mobile air conditioning system as the supplemental heating system, while at the same time the system shows higher energy efficiency.

Despite the fact that research has been conducted since the early 1990's, further development work is required and initially higher system costs will be inherent due to more severe technical requirements. A harmonised and standardised safety concept to handle potential, but unlikely CO₂ accumulation in the passenger compartment is currently being developed.

Refrigerant R152a:

The global warming potential of R152a is by a factor 140 higher than that of R 744. In contrast to R134a and R744, R152a is a flammable gas. Its combustion products are highly toxic. A potential cost advantage of R 152a systems may be (over-)compensated when safety measures have to be taken during production, maintenance or operation. In addition, R 152a is also a HFC and will most likely be subjected to the limitations targeted by the legislative with regard to Kyoto gases.

From the perspective of German automobile manufacturers the development activities for the refrigerant HFC-152a are at a very early stage. The development and introduction of such a system will therefore require a longer development time.

3. Conclusion

The German automotive industries will continue to contribute to environmentally acceptable air conditioning systems in motor vehicles. Thereby, a holistic approach over the entire life cycle has been taken into consideration. Should the need for a substitute for R134a arise, we will carefully choose an appropriate refrigerant. At this point, R744 serves as a possible alternative to R134a. The introduction of new systems, however, can be expected towards the end of the decade and only for completely new vehicle models. Because of open technical questions, a significant development effort remains. The aim is to make a harmonised approach among the automobile manufacturers worldwide.