THE ALLIANCE FOR CO_2 SOLUTIONS

turning the problem into the solution

the issues

Today, the chemical HFC-134a is used in car air conditioning, and is making global warming worse. That is why it is being phased out, starting from 2011, in the EU with more countries expected to follow.

Several alternatives exist to replace this refrigerant. None are perfect. However, CO_2 Technology appears as the most sustainable and cost-effective solution, with a potential to reduce total car emissions by 10% alone.

CO_2 Technology is the best insurance policy worldwide against future climate change legislation, as the refrigerant CO_2 will not need to be phased out.

The decision for the next generation car air conditioning refrigerant hinges upon 3 key issues.
Namely, which refrigerant is;

1. **More environmentally friendly ?**

   CO_2 systems cause less emissions and less fuel consumption than current systems and new chemical substances.

2. **More technically ready ?**

   CO_2 systems have been fully tested successfully, unlike most of the chemical substances.

3. **More cost-efficient ?**

   Over the life cycle CO_2 systems can bring about more cost savings than the alternatives. Thanks to fuel savings and cheaper servicing, an initial higher investment (i.e. 20€ per unit for car manufacturers) can easily be recovered.

How does CO_2 Technology work?

Today CO_2 is released as an industrial waste product directly to the atmosphere. By cleaning and re-using it for cooling and heating a car, i.e. recycling it, this CO_2 can become environmentally neutral.

By contrast, competing chemical alternatives have to be manufactured from scratch with all accompanying environmental burdens.

- **CO_2 - Release or Re-use?**

CO_2 can either be directly released to the atmosphere, contributing to global warming, or recycled for refrigeration, thus becoming environmentally neutral.

The risks of the proposed new chemical refrigerant

A new chemical refrigerant proposed by DuPont and Honeywell, HFO-1234yf, presents a large number of unsolved issues: its long-term effects are unknown, it leads to lower efficiency, and it will create incentives to extend the lifespan of highly polluting R-134a.

Moreover, it is flammable.

Concretely, these are the main risks:

1) Unknown effects: The impact of HFO-1234yf on the environment is insufficiently known. The influence of the decomposition product Trifluoroacetic acid, CF3C(O)OH or TFA (a herbicide), on biodiversity is not understood. As a result, the long-term consequences for the environment are uncertain. Furthermore, it is not clear whether the substance is toxic, as independent testing has not yet been carried out. The fact that certain refrigerants were creating the Ozone Hole, and later contributing to Global Warming, was discovered only years after these refrigerants were on the market.

2) Poor efficiency: The substance has lower efficiency than R-134a and therefore leads to higher indirect CO2 emissions. This was proved during the extensive tests carried out by Japanese car manufacturers, as well as by General Motors, across entire vehicle fleets. Implementing HFO-1234yf in new cars would decrease the efficiency of MAC systems by about 5-7% compared to today's standards. This will increase a vehicle's overall fuel consumption by 7%. As a result, greenhouse gas emissions will increase instead of decreasing.

3) Retrograde step: It is claimed that HFO-1234yf facilitates the industry transition to new MAC systems. In reality, it will do the opposite. HFCR-134a costs approximately 5 €/ kg, whilst it is expected that HFO-1234yf will cost 50€/KG, ten times more. Consequently, after the first charge of refrigerant HFO-1234yf has been expended, consumers are highly likely to refill their MACs with R-134a as a cost saving measure. The prohibitively high cost of HFO-1234yf will prove to be an even greater impediment in developing countries where the car market is exponentially growing. HFO-1234yf has a global warming potential (GWP) of 4, whilst R-134a has a GWP of 1430. The use of HFC-134a will be uneccessarily prolonged by the introduction of HFO-1234yf into the global market, therefore undermining the ultimate goal of reducing greenhouse gas emissions.

4) Flammability: As independent tests have shown, in case of a front-end accident, systems using HFO-1234yf would significantly increase the risk of fire in the passenger cabin. This new refrigerant hence reduces today's safety level of MAC systems, as it puts human life at risk. Additional safety measures would thus be necessary to mitigate this risk. This would have a negative impact on the system's efficiency, while increasing its costs at the same time.

How flammable is it?

After tests simulating front-end accidents, this is what would happen [1]:

Image gallery:

[1] The rupture of certain lines and components, as a result from such type of accidents, leads to the release of a mixture of refrigerant and oil into the engine compartment. This in combination with oil circulating in the system leads to the release of a flammable mixture of refrigerant and oil onto hot engine parts, which can then easily ignite. More information on: www.r744.com/article.view.php?Id=375