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> [R744 - up to 40% less emissions in hot climates](#)

R744 Technology outperforms current Mobile Air Conditioning systems in terms of costs, energy efficiency, safety, and environmental performance, according to the latest study by the leading research institute SINTEF.

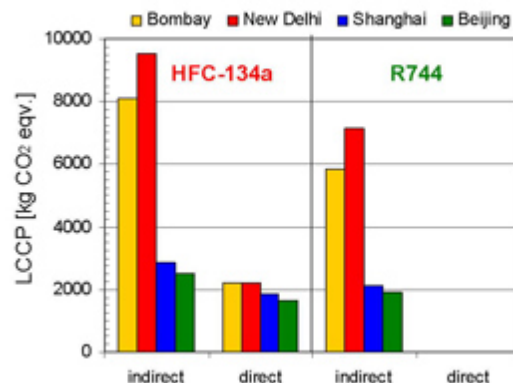
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Realistic estimations and tests for Asian and European climates show that R744 Mobile Air Conditioning (MAC) not only leads to fuel savings of up to 28% in hot climates when compared to current HFC-134a cooling systems, but also offers additional future reduction potential due to its rapidly evolving system improvements.

These are only two main findings by Petter Neksa and Armin Hafner, senior scientists at SINTEF, who compiled test results from leading companies (Visteon, Behr, ixetic etc.) and own research data to prove the global use of R744 being the most efficient and long term viable option for the automotive industry.

Based on the Life Cycle Climate Performance (LCCP) with reference to the New European Driving Cycle (NEDC) comparing MAC systems' total contribution to global warming in a "cradle to grave" approach, the study highlights several benefits of R744 MAC concerning environmental performance, costs and future potential.

Environment



Recent tests have shown that an average vehicle in Bombay, India, when equipped with an HFC-134a MAC, emits 10 metric tons of Green House Gases CO₂ equivalents during its lifetime. A vehicle equipped with R744 MAC can reduce these total GHG emissions by 40%. The same tests in Shanghai, China, have pointed even to a GHG reduction of at least 50% (from 4.5 metric tons). These results come along with fuel savings of 28% and 25% respectively.

Tests in Europe confirmed the Asian results with fuel savings for a vehicle operating in Athens, Greece, ranging up to 26%, and in Frankfurt, Germany, up to 21%. Overall, a R744 MAC system would reduce the GHG emissions by 50% in Southern Europe and by 70% in Northern regions.

Armin Hafner, Research Scientist at SINTEF's Energy Research division, summarizes: "R744 is an environmentally safe option worldwide. As an example, using R744 MAC in only 1 million cars in New Delhi, India, could already save 58,000 m³ of petrol and 300,000 metric tons of greenhouse gases (GHG) each year."

Costs & Comfort

One of the last hurdles for a global introduction of R744 MAC should no longer be a major concern, as the cost of completely new R744 systems can be easily recovered by fuel savings and superior performance. As an example, initial costs for implementing R744 MAC are estimated to be less than € 30. This cost is offset by annual savings of 50 € (58 liter of saved petrol; New Delhi conditions), SINTEF concludes. Moreover, the refrigerant cost is only about 50€cents per kilo and the servicing of R744 systems will be more cost-efficient since recovery of the low global warming refrigerant is unnecessary making sophisticated refrigerant handling equipment oblivious.

A future use of R744 systems operating both in heating and cooling mode will further reduce costs while at the same time providing additional comfort and safety for the driver.




Flexibility & Future potential

Due to its potential to use the R744 cooling circuit in reverse also for heating the car, R744 MAC systems offer highest flexibility regarding future developments of heat pumping units. Additional systems improvements (i.e. ejectors or expanders) are expected, with most of the global component and MAC system manufacturers having already invested in the use of CO₂ Technology and being ready for serial production.

Background

SINTEF - the Foundation for Scientific and Industrial Research at the Norwegian Institute of Technology - is the largest independent research organisation in Scandinavia. Its research team on natural refrigerants took part in the "rediscovery" of CO₂ as a natural refrigerant in the late 80's. Nowadays, its work focuses on developing of CO₂ technology for vehicle cooling systems, commercial refrigeration, and heat pumps.

More information:

- > [More information on SINTEF in our Engineering Services section](#)
-  [ixetic: "R744 Compressor for Compact Cars and Hybrid Technology" \(2.6 MB\)](#)
-  [OBRIST Engineering: "R744 system efficiency improvements..." \(569 KB\)](#)
-  [Visteon: "Improved Efficiency for Small Cars with R744" \(1.4 MB\)](#)
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