



European Commission

Enterprise and Industry
Directorate-General

European strategy on MAC generated GHG emissions

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MAC & GHG emissions

➤ **Direct greenhouse gas (GHG) emissions:**

Typical refrigerants have very high greenhouse warming potential (GWP)
Release of refrigerant during operation, maintenance end of life

➤ **Indirect greenhouse gas (GHG) emissions:**

MAC operation leads to significantly increased fuel consumption/CO₂ emissions of the vehicle

MAC: direct GHG emissions

MAC Directive 2006/40/EC:

- Greenhouse warming potential (GWP) of passenger car refrigerants $< 150 \times \text{GWP}(\text{CO}_2)$
 - As of 1 January 2011 for all new types of vehicles approved
 - As of 1 January 2017 for all new vehicles registered
- Various provisions on handling of refrigerant (training etc.)

NB: Today's standard refrigerant R-134a has a GWP of about $1430 \times \text{GWP}(\text{CO}_2)$

MAC: indirect GHG emissions

- Operation of MACs leads to substantial, additional fuel consumption/CO₂ emissions
- Technically there is a great potential for improvement at small costs, “low hanging fruits”
- Commission Communication of February 2007 on the integrated approach for reducing automotive CO₂ emissions identifies MAC as target of regulation

MAC: indirect GHG emissions

- Type approval test procedure for MAC energy efficiency in vehicle developed by TUG/TNO with stakeholders on behalf of Commission (test with MAC on/off on chassis dyno)
- Test can be performed in “normal” test lab without special facilities (heating, humidification, solar lamps,..) => low costs
- Potential for virtual testing (numerical simulation) of defined test procedure in the future
- Pilot test phase ongoing, to be finished in 3rd quarter 2012
- MAC test procedure drafting & regulatory amendments in early 2013
- Should be applied to Euro 6 vehicles, MAC CO₂ emissions to be recorded in certificate of conformity (CoC)

MAC: indirect GHG emissions

MAC CO₂ emissions in CoC. So what. And then?

- Consumer awareness => incentive for improving MAC energy efficiency. Sufficient?
- Specific limit values for MAC energy efficiency? Probably not in the near future...
- Include MAC CO₂ emissions in value for overall CO₂ emissions of the vehicle for the purposes of CO₂ fleet limits. Possible after revision of automotive CO₂ Regulation 443/2009/EC

Political decision is necessary, discussion to be started by end 2012



Thank you!

Thank you for your attention!

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