

Indirect Part of MAC LCCP

Method of calculating Indirect Part applying:

- Fuel over consumption measurements
- Example: Frankfurt

Armin.Hafner@sintef.no

2007-04-16

Methodology

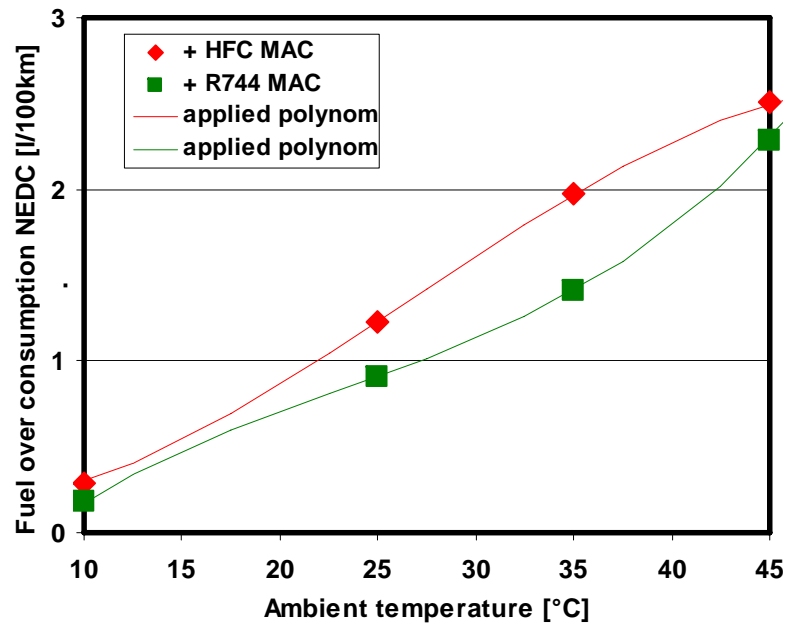
- Measure fuel over consumption due to AC
 - at various ambient temperatures
 - at certain driving cycle(s)
 - at equal comfort / capacity
- Apply measured data
 - to calculate regional (country) emissions
 - to calculate regional fuel consumption

Measured vehicle data

Table 4.1 Vehicle (Toyota Yaris) fuel consumption for NEDC, Wieschollek, F & Heckt, R. (2007)

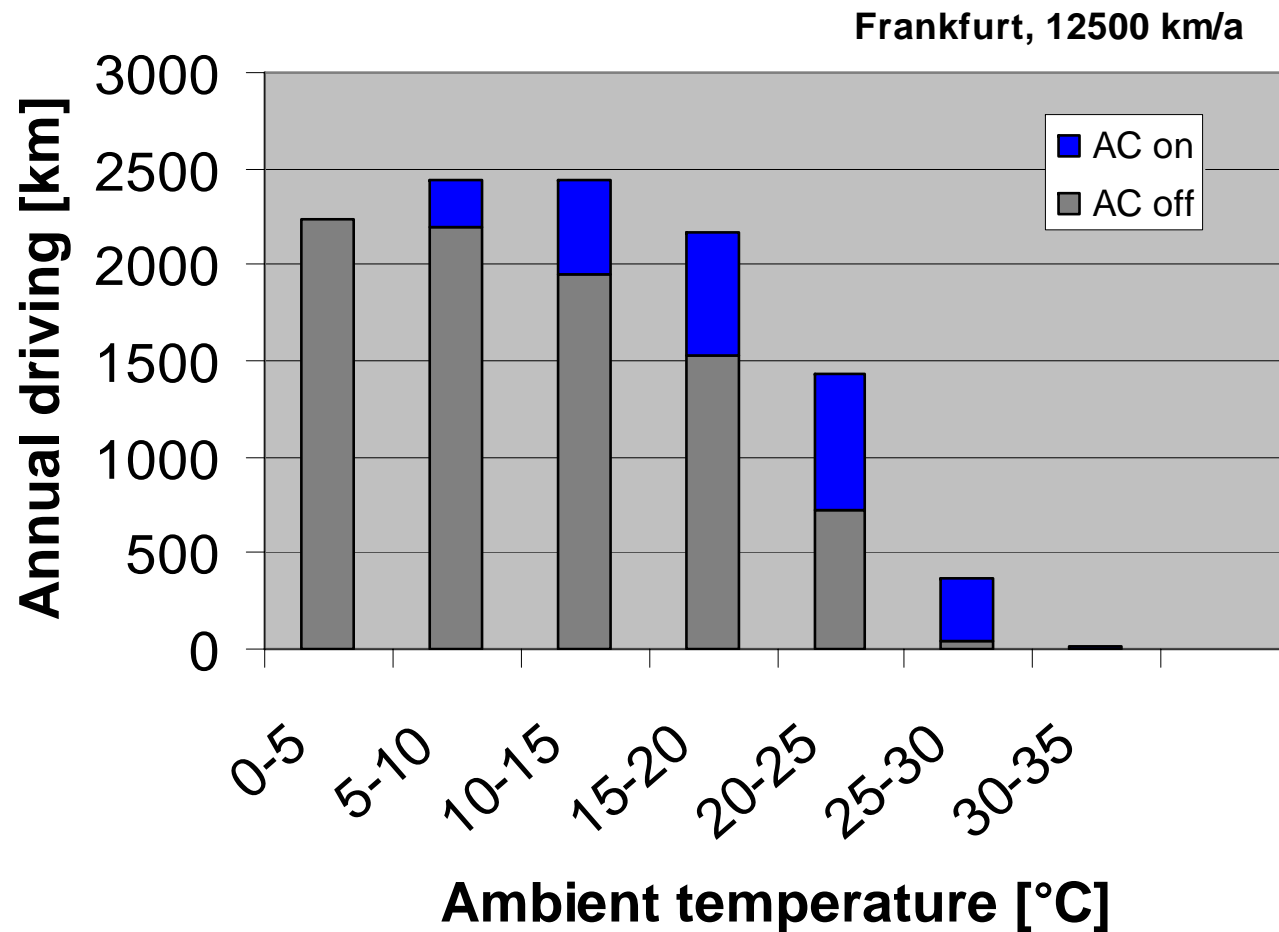
	NEDC@10°C	NEDC@25°C	NEDC@35°C	NEDC@45°C
no MAC	5,4	5,42	5,41	5,38
HFC-134a MAC	5,69	6,65	7,38	7,89
R744 MAC	5,58	6,33	6,82	7,67

http://www.r744.com/news/files/Visteon_vda_wintermeeting2007.pdf



Fuel over consumption as a function of ambient temperature during a NEDC

Annual driving



The higher the ambient temperature the higher the AC-on rate during driving

Fuel consumption to CO₂ emission factor

2.698 [kg CO₂/liter of gasoline]

(applying GaBi LCA software,
included emission during fuel production).

Result: Frankfurt

