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**ACEA contributions to
The Conditions under which an
Auxiliary Control Device is Allowed**

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Abstract

Section 6.1.2.4 of Annex I to Directive 2001/27/EC specifies the conditions under which an auxiliary control device cannot normally operate. These conditions are intended to correspond to the normal temperature and altitude conditions under which commercial vehicles normally operate in the EU and will be subject to review by the Commission.

ACEA, in cooperation with the Aristotele University in Tessalonniki, has carried out an analysis of the data available on the temperature/altitude distribution across the EU as a contribution to this review.

The domain corresponding to “normal engine operating condition” was defined using the following criterion: more than 90% of the vehicle kilometres within the EU would be driven within the 3 given conditions of minimum ambient temperature, maximum ambient temperature and maximum altitude.

This study highlights that:

- 30°C maximum ambient temperature and 1000m. maximum altitude as specified in Section 6.1.2.4, meet the above criterion with a substantial margin,
- the minimum ambient temperature, above which the vehicle can be considered to operate under normal ambient conditions, should be lowered to 2°C (presently 10°C).

Continuous operations at such low ambient temperatures create difficulties to some technologies, as for example sulphuric acid in cooled EGR systems, and thus may jeopardise the chances for these technologies to be marketed. Furthermore the behaviour of after-treatment systems at such low temperature is not completely known.

Taking into account the lead-time needed for a greater availability of Sulphur free fuels and the improvement of the EGR and after-treatment technologies, the European manufacturers suggest to proceed in a 2 stage approach, starting with a minimum temperature value of 6°C in EURO4 and introducing the final value of 2°C in EURO 5.

	EURO3	EURO4	EURO5
Altitude	<1000m	<1000m	<1000m
Temperature	10-30	6-30	2-30



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EU veh.km / temperature / altitude distribution

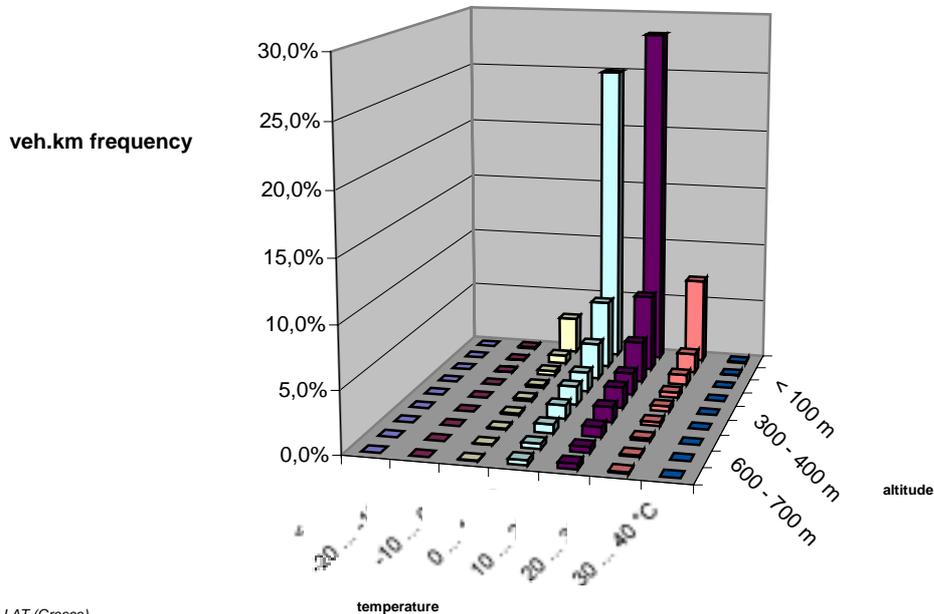


chart developed on data originating from LAT (Greece)

Background

Sections 6.1.2.2 to 6.1.2.4 of Annex I to Directive 2001/27/EC, which amends Directive 88/77/EEC on Heavy-Duty Engine emissions, contain provisions allowing an auxiliary control device to be installed on an engine or on a vehicle, provided inter alia that this device operates outside the following conditions:

- an ambient temperature within the range 283-303 K (10-30 °C);
- an altitude not exceeding 1,000 metres (or equivalent atmospheric pressure of 90 kPa).

A footnote to these provisions requests the Commission to further evaluate these ambient conditions.

ACEA considers important to have reliable technical requisites early enough to enable the final design of the EURO4 engines. It is also the position of the ACEA HD-manufacturers that a European directive should refer to those ambient operating conditions that can be scientifically demonstrated as normal from a global European perspective.

On this basis, ACEA initiated a study that intends to be a constructive contribution to the further evaluation requested by the above mentioned footnote. This study was carried out by the Aristoteles University in Thessaloniki.



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Determination of normal operating conditions for the EU

All the EU 15 countries have been divided into administrative regions according to the Nomenclature of Territorial Units for Statistics (NUTS). The Scandinavian countries and Spain have been further sub-divided in order to take into account the differences between the Northern and Southern regions of these countries.

Altitude

Data on elevation of various cities and towns have been taken from the web site <http://www.calle.com/world/index.html>.

A normal distribution of the elevation on a regional basis is assumed. The elevation of the capital of each region is assumed as the mean value of the distribution and a deviation of 20% of this value is the standard deviation of the distribution.

Temperature

The average daily maximum and minimum temperatures in each of the 18 regions have been assessed using data from the web site <http://www.weatherbase.com>. The average values over each region are then calculated for each month.

A normal distribution of the temperatures on a monthly basis is assumed. The average temperature is the mean value of the distribution and the mean daily maximum and minimum temperatures are equal to two standard deviations from the mean value.

Driven distances

The total vehicle kilometres (veh-km) of the Heavy Duty Vehicles (HDV) for each country are divided into the three driving modes (urban, rural, highway) and the four HDV categories (3,5-7,5 t, 7,5-16 t, 16-32 t, >32 t), which derive from the COPERT Gross Vehicle Weight (GVW)-dependent classification.

The veh-km share of each HDV-GVW class is then calculated. Statistics on the annual vehicle kilometres driven by each HDV class are taken from TRENDS for the reference year 1995. The class division has only been used to perform a day/night sensitivity study that proved not to be relevant enough, probably due to a lack of sufficiently precise data on the driven distances.

A monthly uniform distribution is assumed for classifying the vehicle kilometres into the individual months.

European distributions

On the basis of the driven vehicle kilometres per region and per altitude class or per temperature class, an average weighted EU frequency is calculated per altitude class or per temperature class.

Figure 2 hereunder represents the cumulative EU frequency of driven kilometres vehicle per temperature class



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Technical comments

The interpretation of this chart is the following:

- less than 1% (3% in day time) of the vehicle kilometres are driven at temperature above 25°C.
- about 10% (7% in day time) of the vehicle kilometres are driven at temperatures below 2°C.

This leads to the conclusion that the minimum value should be 2°C, if applying the above selection criterion.

From a technical point of view, the engine manufacturers see a potential problem with proposing this new low temperature requirement of 2 °C.

This temperature is under the limit where sulfuric acid condensation in the EGR system can occur. The experience from the US engines meeting the US02 Consent Decree requirements has indeed shown that in reality, such corrosive condensation n(acid) may occurs. To overcome these difficulties, a sulphur free fuel, together with technology improvements of the EGR system are needed.

Therefore, the European manufacturers propose an intermediate stage of 6 °C (for EURO4).

