Automotive LPG - Autogas
a competitive alternative fuel for improved air quality

A RECENT STUDY DEMONSTRATES THAT REPLACING DIESEL OR PETROL WITH LPG CAN BE DONE AT A COMPETITIVE COST WITH A BENEFICIAL IMPACT ON AIR QUALITY WHILST FURTHER REDUCING THE GREENHOUSE-EFFECT

- Forthcoming EURO 4 and EURO 5 emission limits, as well as the introduction of cleaner conventional fuels, will significantly improve the level of regulated pollutants from vehicles in the next few years, but their introduction will still take some time.

- Thus, in specific locations such as urban centres where air quality issues can be an immediate concern, **Autogas is a solution**, that contributes to improving local emissions. Autogas offers **similar benefits to other gaseous fuel options such as CNG and is already widely available on the market today through an extensive retail network**.

- LPG, furthermore, improves **supply security** and meets the EU 20/20 challenge, meaning 20% of the European motor fuel market will be alternative fuels in 2020. LPG originates either from crude oil refining or through extraction from natural gas processing (the latter representing 60% of current LPG supply).

- Recent test results of the **European Emission Test Program (EETP)** have confirmed the air quality benefits of Autogas vehicles. The results give a clear indication of the positive environmental impact of Autogas as an available, alternative fuel with a promising future.

THE POSITIVE RESULTS OF THE EETP STRENGTHEN 3 KEY ELEMENTS OF THE AEGPL'S ARGUMENTS AND PROPOSALS:

- **Promotion of Autogas in applications where it can contribute to improve air quality, particularly in urban areas.**

- **Support for more R&D by car and equipment manufacturers to further improving the performance of Autogas vehicles.**

- **With respect to EU legislation, AEGPL request to take into account the following:**

  - Maintaining special Autogas rates in the context of excise duties with a significant differential with conventional fuel rates,
  - Explicitly including Autogas in the definition of "alternative fuel" as defined by the EU,
  - Explicitly including LPG in EU R&D programmes.

This document is issued by the European Association of Liquefied Petroleum Gas Suppliers (AEGPL)

AEGPL represents 23 national LPG federations in Europe. Other members are the LPG pan-European distributors and corporations with an extensive interest in LPG in Europe from a production, transport, distribution or application point of view.

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THE EUROPEAN EMISSION TEST PROGRAMME (EETP): REPLACING CONVENTIONAL FUELS WITH AUTOGAS HAS A MARKED POSITIVE EFFECT ON URBAN AIR QUALITY AND GREENHOUSE-EFFECT

JOINT INITIATIVE BY PUBLIC AUTHORITIES AND INDUSTRY

The EETP programme was supported by a representative part of industry and public authorities, giving it the necessary credibility.

AEGPL and its members – some of whom participated in the EETP – strongly supported the initiative and fully subscribe to its results.

EETP PARTNERS:

- ADEME (French Environmental Agency)
- BP
- CFBP (French LPG association)
- ENERGY SAVING TRUST
- LPGA (UK LPG association)
- Shell
- SHV Gas
- TOTALGAZ
- VROM (Dutch Environmental ministry)
- VVG (Dutch LPG association)

RELIABLE, HIGH QUALITY LABORATORIES AND METHODS

TESTING IN 4 INDEPENDENT, WELL KNOWN LABORATORIES

- IFP (France)
- Millbrook Proving Ground (UK)
- RWTÜV (Germany)
- TNO (Netherlands)

REAL-LIFE TESTING: 30 VEHICLES CURRENTLY ON THE MARKET

- Representative of car manufacturers' range of products
- Cars currently available on the European market
- Cars complying with current emission regulations (Euro 3)
- Cars with mileages ranging between 5.000 and 25.000 km

MEASURED EMISSIONS

- Regulated pollutant emissions: NOx, CO, HC, particulates
- Unregulated pollutant emissions: oxygenated products, BTX, PAH, NO_2 and particulate mass
- CO_2

TRIPLET METHOD =

- 10 models tested in triplicate with petrol, diesel and LPG fuel but with all other variables held constant
- All testing methods are recognised and highly reliable
- To guarantee consistency in results, 3 vehicles involved in the program were "cross-tested" as control vehicles in the laboratories

New European Driving Cycle (NEDC) – cold start

- Urban mode
- Extra-urban mode

New European Driving Cycle (NEDC) – warm start

Common Artemis Driving Cycle (CADC)

- 40 minutes of urban, rural and motorway driving
- best reflects European driving conditions overall

In this document we generally refer to the NEDC testing results (if available) since this is the EU approved testing method. If CADC does not lead to similar results, we refer to both testing methods (NEDC and CADC).

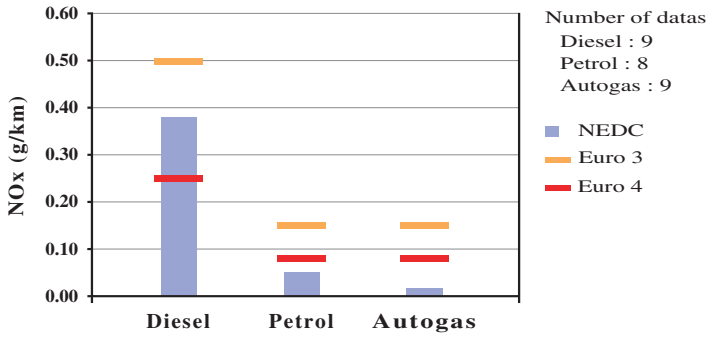
EXCELLENT RESULTS FOR HIGHEST PRIORITY POLLUTANT EMISSIONS; R&D COULD IMPROVE FURTHER

The orange and red barriers in the graphs below refer respectively to **EURO 3** and **EURO 4** emission limits. EURO 3 is applicable to new passenger cars as of 1 January 2000 and as of 1 January 2001 for all passenger cars. EURO 4 is compulsory only as of 1 January 2005 except for light commercial vehicles over 1305 kg for which the deadline is 1 January 2006.

► NOx EMISSIONS: 96% LOWER THAN DIESEL, 68% LOWER THAN PETROL

As a consequence of its intrinsic characteristics, NOx emissions from Autogas vehicles are the lowest.

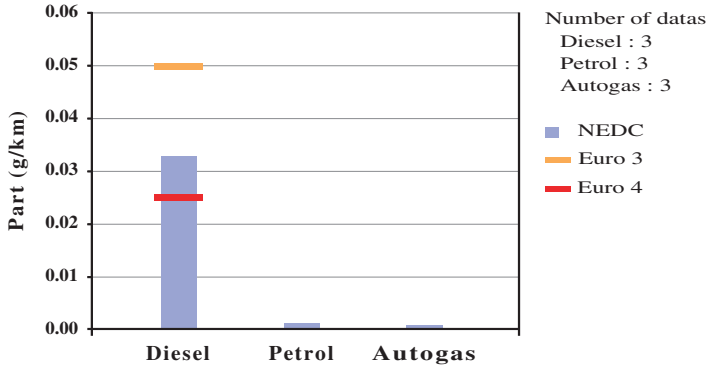
They are 96% lower than those of diesel and 68% lower than those of petrol.



► PARTICULATE MASS EMISSIONS LOWEST FOR AUTOGAS

At present, particulate mass emissions are only regulated for diesel vehicles. Testing results clearly show that particulate mass emissions are the lowest for Autogas vehicles.

Particulate filters for diesel vehicles (DFP) could bring down particulate mass emissions. Filter installation, however, is currently only done on new cars. This comes with an installation cost as well as a maintenance cost to keep the filter working properly.

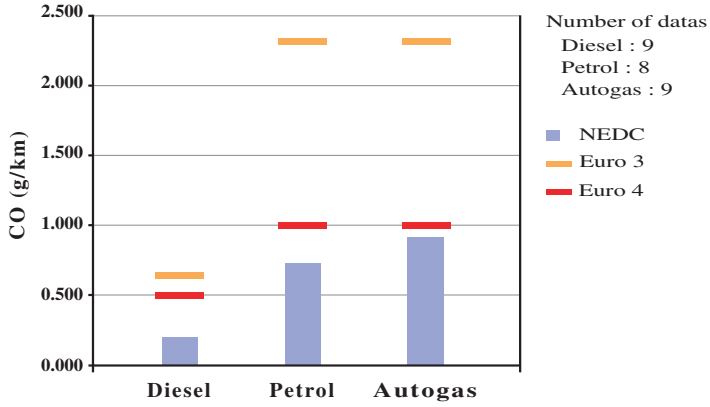


► CO EMISSIONS: BELOW EURO 3 AND EURO 4 - R&D COULD IMPROVE FURTHER

Autogas CO emissions are below EURO 3 and EURO 4 limits, but higher than those of petrol and diesel.

Please note that CO limits are currently deemed low enough.

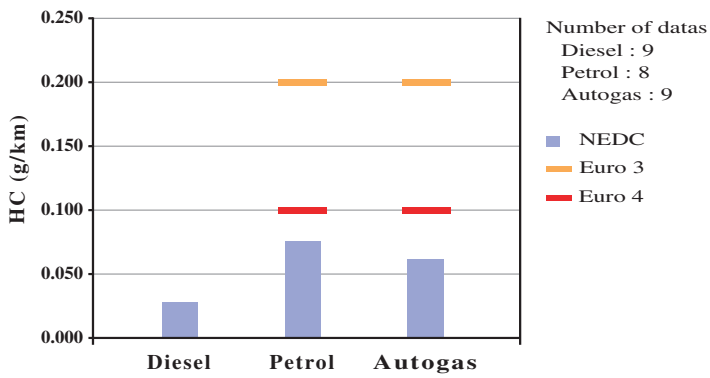
The EURO 5 scenario does not include a further reduction of CO emission limits.



► ALMOST NON DETECTABLE HC EMISSIONS

Results show that the HC emissions of diesel vehicles are the lowest. Emissions for petrol and Autogas vehicles are within each other's range.

All measured HC emissions are however close to the reliability limit of the measurement method.

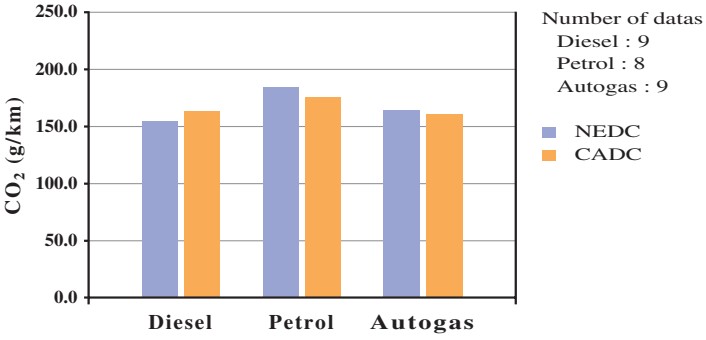


CO_2: POTENTIAL FOR OPTIMIZATION

NEDC testing results show that Autogas vehicles emit less CO_2 than petrol vehicles and more than diesel vehicles according to NEDC testing.

Testing in some real-life conditions (CADC cycle) puts Autogas almost at the same level as diesel and are equivalent if the well-to-wheel analysis is taken into account.

Further R&D by car and equipment manufacturers can further improve Autogas vehicles' results.



AUTOGAS: VERY POSITIVE RESULTS FOR CURRENTLY UNREGULATED POLLUTANT EMISSIONS

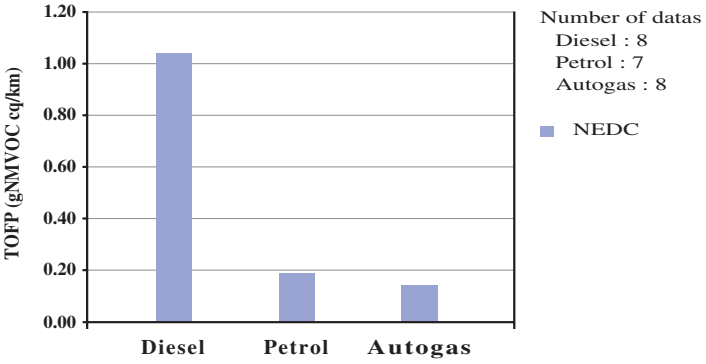
- **Aldehydes** emissions in Autogas vehicles are significantly less than in diesel vehicles and slightly less than in petrol vehicles.
- **For Poly Aromatic Hydrocarbons,** current testing methods appear to indicate that emission levels for Autogas are lower than for petrol and diesel.
- **Benzene, Toluene & Xylenes** (BTX) levels are low for both Autogas and diesel and higher for petrol.
- **Particulate size :** as far as solid particles are concerned (above 0.040 µm), Autogas and petrol emissions are 100 to 1000 times lower than those of diesel.

GOOD AUTOGAS RESULTS FOR ESSENTIAL FACTORS OZONE FORMATION, ACIDIFICATION AND GLOBAL WARMING

OZONE FORMATION

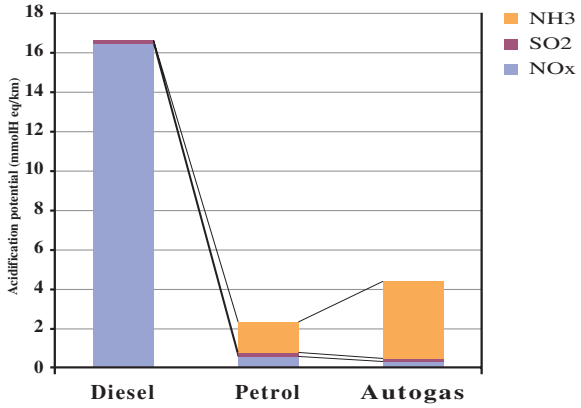
The EETP employed 2 main indicators currently used to evaluate changes in the ozone level, at a **local level** (Photochemical Ozone Creation Potentials) and a more regional level (Tropospheric Ozone Forming Potentials).

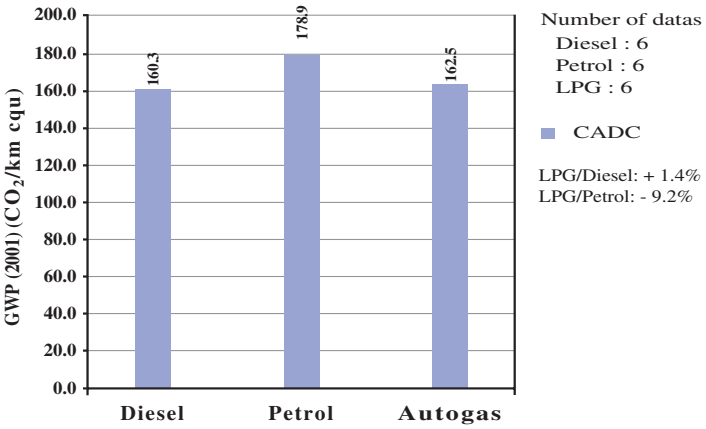
On a **regional level** (TOFP), the results for LPG came out best and were considerably lower than the results for diesel vehicles. If NOx emissions are ignored, results are practically the opposite.



ACIDIFICATION AND GLOBAL WARMING

The acidification potential (left graph, CADC) is **significantly lower for** petrol and LPG vehicles than for diesel vehicles due to their low NOx emissions. For global warming potential (right graph, CADC), Autogas vehicles rank between petrol and diesel, roughly equivalent to those of diesel.





SYNOPTIC TABLE OF EETP RESULTS

Substance/ fuel	Diesel	Petrol	LPG	Remarks
NOx	☹	😐	☺	Autogas is 96% lower than diesel and 68% lower than petrol
Particulate mass	☹	☺	☺	Autogas even slightly lower than petrol
HC	☺	☹	😐	Close to detection limit
CO	☺	😐	☹	Optimized engine calibration/design can give better results for Autogas
CO_2	😐	☹	😐	Autogas has no disadvantage compared to diesel and further R&D could further improve results
Unregulated pollutant emissions	☹	☹	☺	Aldehydes, Poly Aromatic Hydrocarbons, BTX and the number of small sized particulates
Ozone formation	☹	😐	☺	Good effects on regional level; opposite for local level (NOX not taken into account)
Global warming	☺	☹	☺	Strongly linked to CO_2 emissions
Acidification	☹	☺	☺	Only NH_3 higher for Autogas

AUTOMOTIVE LPG, THE MOST WIDELY USED ALTERNATIVE MOTOR FUEL BUT… IN NEED OF SUPPORT FOR FURTHER DEVELOPMENT

The European Association of Liquefied Petroleum Gas Suppliers (AEGPL) warmly welcomes the results of the EETP. These results support the association and its members in their efforts to actively promote Autogas. The EETP shows that Autogas offers a valuable alternative fuel for diesel and petrol given its beneficial impact on environment.

AUTOGAS

Approximately 13.500 refueling sites and their number can quite easily be increased with industry support.

On a yearly basis approximately 20 million tons of LPG is sold in Europe: 80% for domestic/industrial use and 20 % for Autogas.

- easy to handle, available at a competitive price
- clean product extracted from natural gas processing & oil refining
- the most widely used alternative fuel powering over 9 million vehicles worldwide in over 38 countries

Autogas currently has a market share of approximately 2% in relation to other fuels. Autogas is expected to reach 5% share of the European motorfuel market by 2010.

AEGPL SUPPORTS THE EU POLICY ON ALTERNATIVE FUELS, BUT WOULD LIKE TO PRESENT SOME SUGGESTIONS IN THE FORM OF A 3 LEVEL ACTION PLAN

1. EU LEGISLATIVE ACTIONS

► **Maintaining special rates for Autogas in relation to excise duties**

Annex II of Directive 2003/96/EC of 27 October 2003 restructuring the Community framework for the taxation of energy products and electricity allows for exemptions & special rates for LPG. This Directive foresees a periodical review of the exemptions. **Directive 2004/74** evaluates these temporary exemptions and allows them to be maintained.

AEGPL strongly requests that future reviews should maintain the exemptions since Autogas needs continued support for its promulgation as an alternative fuel.

► **Systematically including Autogas in the EU definition of "alternative fuels"**

Furthermore AEGPL would like to see Autogas given the position it deserves in the **Contact Group on alternative motor fuels**. The European Commission should emphasize (in its interim report dated 26 March 2003 for example), the potential of Autogas as an alternative fuel and its need for further technological development.

► **Autogas should systematically be part of all EU R&D programmes related to fuels**

Autogas has a high potential for development given the large availability of LPG.

AEGPL requests the EU Commission to underscore the potential of Autogas in, amongst others, its Communication **"Towards a thematic strategy on the urban environment"** and any legislation that could potentially follow.

2. PUBLIC AUTHORITIES' ACTIONS

AEGPL requests public authorities to:

► **promote the use of Autogas in applications where it can contribute to improving air quality, particularly in urban areas**. LPG cars and fuel are easy to find, easy to operate, their costs are competitive and they are available today!

► **support the development and promulgation of Autogas in society.**

Autogas is currently the only available and operational alternative fuel that can significantly, and with immediate effect, reduce the pollutant emissions of the cars currently in use. This advantage is especially important to improve air quality in big cities, where the impact of pollutant emissions is the highest.

3. INDUSTRY ACTIONS

► AEGPL is willing to undertake **further research for the development of Autogas**. It appeals to the EU to strongly invite car and equipment manufacturers to also invest in R&D.

► Currently, the industry is working hard on the possibility of using Autogas as an ignitor fuel (rather than petrol) and thus further reduce pollutant emissions. Further research is needed to develop this technology and AEGPL explicitly asks industry and the EU to support such a development.

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