

Last but not least, it should not be overlooked that more “political” measures can help reduce emissions: any 3 km/h increase in the average commercial speeds (e.g. through systematic priority) allows pollutant emissions to be halved.

THE UITP RECOMMENDS :

- that in general the choice between an investment in clean diesel buses or in CNG buses should only be made after a comprehensive economical and ecological balance has been carried out.

and in particular :

- Operators should invest in EURO III or even EURO IV compliant vehicles, which means the use of desulphurised diesel, particle filters and NOx filters.
- Authorities should allot tax rebates on desulphurised diesel and stimulate widespread distribution.
- Oil producers should market and distribute desulphurised diesel with the same conditions as diesel
- Information about the background of the fuel choice is necessary to support the use.
- In approving vehicles, a unit to quantify pollution should be adopted that more closely reflects reality, such as g/km representing the practise of daily life.

Some other important steps to influence fuel consumption and pollution:

- Operators need to improve staff training to achieve a more environmentally-friendly driving style
- Authorities should adopt traffic management and demand management measures such as buslanes, priority at crossings etc.

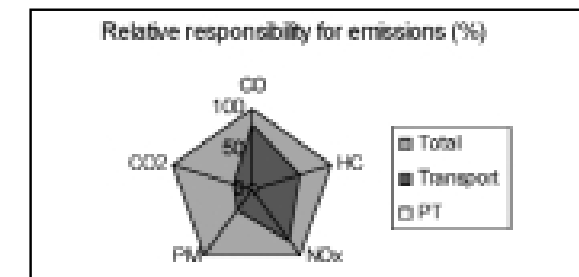
For future developments towards a real sustainable public transport:

- Industry and operators need to work together in the developments and promotion of hybrid vehicles and the use of hydrogen.

Ecology and Economy: the fuel choice debate

Public transport is often thought to cause high levels of pollution, but it is actually responsible for very little. This is due to its low energy consumption per passenger kilometre (3 times less than the car) and above all because of the limited number of vehicles concerned.

Nevertheless companies in this sector accept their responsibilities. In the long term, electric traction will become commonplace in innovative forms (e.g. hybrid, fuel cell and induction) because it is quiet, comfortable and environmentally friendly.



Until there is sufficient availability of electric modes of road transport, there is no way of avoiding the political and strategic issues of fuel choice and engine types required to meet increasingly strict legislation.

Evolution of max. limits for regulated emissions (expressed in g/kWh)					
	EURO I (1993) ¹	EURO II (1996) ¹	EURO III (2000)	EURO IV (2005*)	EURO V (2008*)
Carbon monoxide (CO)	4.5	3	2.1	1.5	1.5
unburned hydro-carbons (HC)	1.1	0.95	0.66	0.46	0.46
Nitrogen oxides (NOx)	8	7.2	5	3.5	2
Particulate (PM)	0.36	0.14	0.1	0.02	0.02

¹ equivalent values for a 13-mode cycle

* forecasts

There are many different fuel types. However, experience shows that many of them cannot be considered because of intrinsic or extrinsic disadvantages, either economical, ecological or health-related in nature.

These are liquefied natural gas, various alcohols and “biofuels. In the short and medium term, there are three reasonable options for use in large-scale transportation: diesel, compressed natural gas, liquid petroleum gas.

Diesel

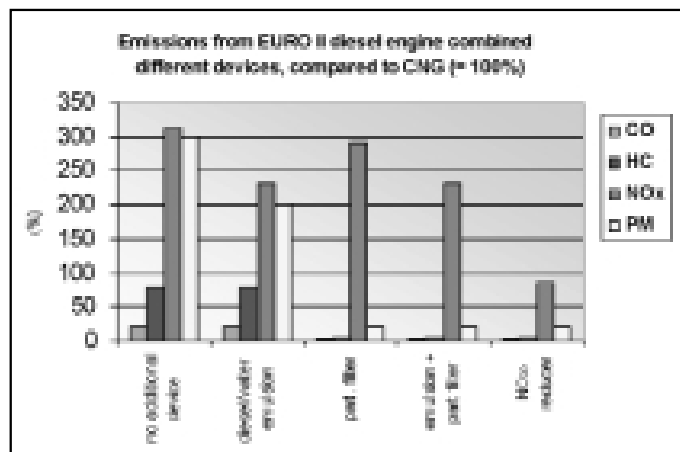
The diesel engine is a high-yield energy transformer that is tried and trusted, reliable, compact and economical. Its ecological performance is constantly being improved thanks to new engine types, sophisticated refining techniques (desulphurisation, diesel/water emulsions) as well as techniques for emission after-treatment (particle filters – CRT – and NOx reducers – SCRT). These measures will enable diesel to conform to the future EURO V standard.

Compressed natural gas - CNG

Natural gas is very environmentally friendly. It already meets the V standard except for unburned hydrocarbons. Using gas also offers indisputable geopolitical advantages. However the consumption and CO2 emissions from natural gas-powered vehicles are higher than for diesel. Despite improvements, operational results from a number of European cities suggest reliability levels and capacities below diesel vehicles. What is more, CNG vehicles cost an extra 25% to purchase, before taking into account the high fixed-infrastructure costs (e.g. filling stations, safety etc.), and they are more expensive to maintain.

Liquid petroleum gas - LPG

LPG, produced from refining petroleum, is a little less environmentally friendly than natural gas for vehicles. However, choosing this fuel can be justified in view of the astounding quantities of LPG simply wasted by being burnt off at the refinery. Aside from a few operation constraints such as LPG ban from any underground infrastructure, several networks are completely satisfied with their experience. However several countries are reluctant to approve this type of fuel for safety reasons. These vehicles are also 10% more expensive than diesels and require start-up investment as well.



How to ensure a balance between costs and environmental concerns?

From the operators’ perspective of achieving the best compromise possible between ecological and financial requirements, the qualitative advantages of gas over modern diesel have become so small that it is increasingly difficult to justify the extra expense of gas.

Operating costs are difficult to calculate because of differences in tax systems and varying levels of subsidy. However the advantage of gas in terms of price is offset to a large extent by its high consumption. When reduced reliability and additional maintenance costs are added to

this, it is still a fact that diesel buses cost less to operate, but this fact is hard to quantify.

Then there are the equipment costs to consider, based on the assumption that the slow fill method is not compatible with operating a large fleet of natural gas-powered vehicles.

The debate is no longer centred on diesel versus CNG, but on the best allocation of resources to obtain a clean fleet. Indeed the diesel option has the advantage that we can fit existing buses with a system for the post-processing of emission gases, quickly making an entire fleet more environmentally friendly without waiting for the end of amortisation periods for older vehicles.

Public health

Looking solely at the issue of public health, buses play an extremely small role in urban pollution. More importantly, recent scientific discoveries indicate that the toxicity of particles is linked more to their size than to their number and mass – the smaller they are, the more carcinogenic their impact. Particles appear to be practically absent in gas but this is only because their size is below detection levels. They are consequently especially harmful for human health, and the argument that emissions from gas engines are harmless must therefore be firmly refuted. On the contrary, particle filters used with diesel are demonstrated to be particularly effective for the “nano-particulate” range.

The greenhouse effect

Experts concur that the number one issue to be resolved this century is that of carbon dioxide (CO2). The release of CO2 into the atmosphere occurs whenever fossil fuel is burned and contributes to the greenhouse effect and global warming. Thus thermal engine vehicles are responsible for 22% of all CO2 emissions in the 15 EU member states, with only 5% generated by buses and coaches. This transport mode is thus clearly not a priority target in strategies to combat greenhouse gas.

On the other hand, excessive fuel consumption by gas-powered vehicles compared with diesel vehicles has an unfavourable impact on CO2 levels.

In the long term there is no doubt that hydrogen will be the widespread fuel, both for thermal and electrochemical (fuel cell) traction.

Diesel has had a bad press, with political decision-makers often encouraging investment in alternative fuels, particularly in gas. However, the marginal advantages of gas in the issue of global pollution generated by transport make it hard to justify the additional fixed and ongoing costs. This is all the more true since lower cost alternatives of more or less the same quality already exist and since it is possible to convert old equipment.

Nevertheless, gas (in competition with diesel-electric hybrid drivelines) is perfectly suited for particularly sensitive zones, complementing other measures such as a ban on cars, or in specific energy and economic contexts where its use is more justified.

For the same money, an operator can:

- either purchase 50 gas-powered buses with the relevant equipment
- or buy 50 new diesel buses and filter-cleaning equipment, and retrofit 245 old buses to make them EURO V compliant.

For now, however, diesel oil would appear to be the best compromise between:

- economical constraints (investments, but also continuity of existing infrastructures)
- and ecological performance