Green fleets

*As reducing national carbon emissons is fast becoming the latest political 'hot potato', **Alan Whitehead MP** asks: 'Can we decarbonise our freight fleet?'*

Goods vehicles and buses contribute about 20% of all vehicle CO_2 emissions, which in turn account for around 25% of overall UK CO_2 emissions. This percentage will rise over the next few years because of a combination of absolute emission increases as road transport grows, and relative falls in emissions in other sectors. It is the energy-using sector making least progress in emissions, and certainly if the overall target of a 60% reduction in CO_2 from a 1990 baseline is to be achieved by 2050, then transport overall, and freight transport in particular, will have to provide a steeply improving contribution to emission reduction: at present the whole transport sector threatens to be a drag anchor on whatever improvements in emissions are achieved from industry and domestic use.

It was fashionable a little while ago to suggest that major inroads into the freight CO_2 'footprint' could be made by transferring freight from road to rail, or even to water. After all, CO_2 emissions per km/tonne of freight hauled by rail are under a quarter of those hauled by road, and rail is, in turn, several times more profligate in emissions per km than water.

However, even if all the freight slots on all railway lines were utilised, it would merely stabilise the growth of road freight, and not appreciably lessen it over the foreseeable future. Freight should of course, where appropriate, go by rail, or even if possible via short-sea shipping – but perhaps as a driver to deal with future traffic congestion and the problems that 'just-in-time' logistics bring to the demands of freight on roads, rather than because modal switches of these kinds will seriously dent freight emissions.

Road-hauled freight will be the overwhelmingly logistical mode for the remotely foreseeable future, and so it is imperative to make vehicles as efficient and low carbon emitting as possible. There has been good progress on this by means of voluntary agreement with the vehicle manufacturing industry, and through government projects such as the 'powering future vehicles' strategy. By 2008, vehicle emission efficiency will have improved by 25% or more from a 1995 baseline.

But rather like road to rail proposals, this is a strategy that ameliorates rather than makes permanent inroads into vehicle emissions, since the overall growth of vehicle use catches up on the gains at an eventual faster rate than technological changes can reduce them. Indeed – using the 1995 baseline once again – gains in vehicle efficiency have been all but wiped out by the increase in vehicle numbers and use over the period. It is suggested that by 2020, there could be scope for further fuel efficiency using conventional fuels and engines, or through adopting hybrid electric/fuel technology on a more widespread basis, for both commercial and domestic vehicles. That again, though, runs just a little faster against the encroaching pattern of vehicle numbers. Better use of logistics, such as 'backfilling' freight journeys, can also make a contribution and is important, but the conclusion remains the same: vehicle and logistical efficiency runs hard to stay in the same place.

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A more radical way forward would be represented by the effective 'decarbonisation' of the fuel used by freight. Some marginally lower carbon options, such as the use of compressed natural gas, and liquid petroleum gas have been introduced in some vehicles, working on the assumption that fuelling from a dedicated pump in a depot would provide enough fuel load for scheduled logistics. Both technologies require conversion of engines rather than entirely new powertrains, but the principle of dedicated fuel sources in depots could be important if the most radical 'decarbonisation' fuel technology – hydrogen fuel cells – were to be adopted. Hydrogen, or hydrogen hybrid, vehicles may become viable on the market by about 2020, but even if they do, they will face considerable problems with fuel supply not only in terms of outlets, but also on the basis of fuel transport. Hydrogen is 12 times more bulky to transport than diesel, for example, and if the 'hydrogen highway' is eventually to become a reality, a system of delivery pipelines would probably have to be introduced.

The most promising way forward, therefore, rests with fuel additives which could in the longer term develop into fully renewable fuelled systems, but in the shorter term can be placed into the existing tanks of vehicles already on the road without conversion of the engine, and certainly without the new engine that would be required for running solely on renewable fuel.

Ethanol as an additive to petrol and biodiesel as a diesel complement are the two candidates. The Government has recently announced the implementation of a Renewable Transport Fuel Obligation, to come into force by 2008. Fuel suppliers will be required by the obligation to introduce, in graduated steps from an initial 3%, a 5% of renewable additive in all fuel by 2010. At this level of obligation, there will be no problem with the tolerance of additives by existing vehicles. All new vehicle engines are warranted for operation with up to 5% ethanol or biodiesel, and in reality (as is shown by warranties for identical engines elsewhere than the UK), the unmodified operating tolerance for ethanol in petrol engines is nearer 10%, and as will be discussed, higher for diesel engines.

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Placing such fuel additives into engines in this way produces a step change in emission reduction. It is true, of course, that 'renewable' fuel is not entirely renewable in the sense of being wholly without carbon emissions, unlike hydrogen. Even hydrogen is in effect a 'carrier' fuel in that it needs to be produced by the use of other forms of energy. If that energy source is itself renewable (solar electricity used for electrolysis of water, for example) then the hydrogen engine, producing as it does only water vapour as an emission, will be 100% carbon free. More likely early hydrogen technologies may form hydrogen 'on board' from mineral fuel, which produces no saving at all, or from oil or gas conversion, which only works if the resulting CO_2 is captured at source and sequestered.

Fuel additives, however, come from renewable sources. Ethanol can be derived from traditional crops such as wheat or sugar beet, and more advanced technologies can produce it from the breakdown of lignose fibres, opening up the prospect of widespread production of vehicle fuel from woody plant residues – effectively producing fuel from waste. Biodiesel arises from a reaction between vegetable oil derived from crops such as oilseed rape, and methanol, which creates methyl esters similar in composition to mineral diesel fuel. Since energy crops such as these have captured carbon in their growth, their use as fuel, in principle, simply completes the carbon cycle. Carbon dioxide is, however, emitted during the production of the fuel, and it is estimated that overall, there is a 60% saving in emissions rather than 100% after all processing has been completed. Even so, a 5% addition of biofuel to the tank means an instant saving of 3% in emissions. Should ethanol or biodiesel as a sole fuel for vehicles with compatible engines become widespread, as has already happened in Brazil, for example, then the step change saving would be very considerable.

As far as biodiesel as an additive is concerned, however, that is not the end of the story. Modern engines can work well with up to 30% biodiesel. Depot-based fuelling can easily blend biodiesel and mineral diesel up to this percentage, and it may be that a renewable fuel obligation increases the amount of biodiesel in fuel over the next few years. The myths about the degree to which the countryside would have to be covered with energy crops persist, but an additive level of up to 30% could be supplied from within the UK without undue distortion of land use. On the positive side, renewable fuel production will introduce substantial new employment and income to rural economies.

An issue for freight managers, however, will lie in comparative cost. Currently, renewable fuels are substantially more expensive to produce than mineral fuels. In the medium term, volume production and technological innovation will establish a relatively stable or reducing cost of producing biofuels and will compare increasingly favourably with a likely continuing price rise in mineral fuel as demand increases against supply. In the short term, however, it is a concern and, prior to the introduction of the renewable fuel obligation, the Government has reflected this with a reduced rate of duty (20p cut on duty for biodiesel from 2002, and on bioethanol from 2005). It is important that this cut in duty works over the transition period to a fully working obligation and, ideally, that incentives are available to encourage fleet managers to fuel vehicles renewably beyond the obligation.

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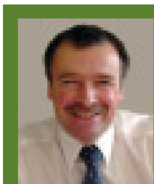

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