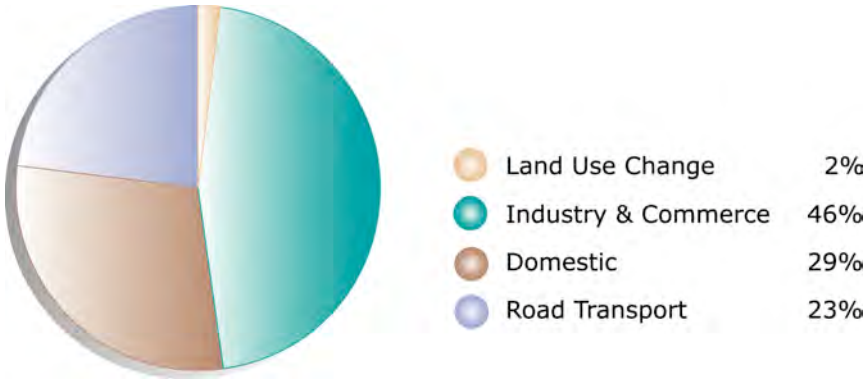
This paper debates 'carbon capture' technology.

Paving the way for those that think differently

Engineers at Airmax Remote™ are working with Origo Industries to remotely monitor carbon captured from a vehicle's exhaust. Origo have developed a process to capture, store and eventually recycle carbon from vehicles to prevent the pollutant from finding its way from a car's exhaust pipe into the atmosphere. Origo researchers envision a low or zero emission vehicle and have delivered their prototype for continuing development to Airmax. Airmax is a telematics company specialising in remote vehicle diagnostics including driver behaviour monitoring and its impact on fuel consumption and emissions via the vehicles' CANBus and ECU's.

Origo is not alone in its endeavours, as researchers at Georgia Institute of Technology; with the help of NASA funding; have also entered this hollowed space however their technology is based on hydrogen fuel as a base. The Georgia Tech concept car uses an onboard fuel processor to separate the hydrogen and carbon elements in liquid hydrocarbon fuels. The hydrogen then powers the engine, while the carbon is stored onboard.

Public and private transport accounts for 23% of emissions but is often in the spotlight because of the topics such a congestion charging, and taxation. Most of us are affected by carbon as a form of taxation; we live these days in a carbon economy.



Indeed the vehicle industry's main thrust to lower emissions appears to be based on everything except carbon capture.

Politicians raising taxes and using CO_2 as their currency and scientists warning about climate change and global warming drive the industry. However it's often at local level and subliminally that there is the most impact. Congestion and Emission Zones affect millions of drivers in Singapore and London. Even New Yorkers are debating the subject and as recent as February 2008 proposals to charge cars and trucks entering the most congested parts of Manhattan; in an effort to alleviate congestion; was approved by the Traffic Congestion Mitigation Commission.

Initiatives such as hybrid technology, stop-start engines, hydrogen power units all have plenty of exposure. Vehicle manufacturers are being forced to comply with EU law and are launching Euro4 engines that have lowered emissions with Euro5/6 standards just a few years away.

Telematics companies are also finding a market niche by promoting routing and navigation aids to offer shorter distances and calculations of CO_2 based on GPS to improve the awareness of individuals and companies of their carbon footprint. The mileage captured is then compared against government figures for emissions to calculate a simple emission statement per journey. Often driver training organisations will promote vehicle driving techniques on the basis of 'duty of care' or 'the vehicle is a work place' but essentially the message is the same. When it comes to driver league tables there is not much to differentiate between good driving and eco driving techniques.

Even private equity companies are getting in on the act. Virgin led a $14.5 third round for the five-year-old company Drive Diagnostics Inc., which changed its name in September to GreenRoad Technologies Inc., and is pinning a new marketing approach on its ability to monitor driving techniques in ways to improve fuel efficiency and reduce greenhouse gases.

More enlightened decision makers are buying vehicles based on the CO_2 output but a cynic might also observer that the cost of fuel at over £1 per litre could also have something to do with this.

Airmax's expertise also extends to the ECU re-mapping sector where diesel vehicles are downloaded with software that 'adapts' to the driver style to constantly review and minimise the CO_2 and improve fuel efficiency. This is already achieving between 7% and 12% savings overall and is finding customers from those wishing to reduce their fuel bill and the new breed of eco drivers. Vehicle manufacturers may be troubled by this trend and claim that warranties may be affected. Pity really as this low cost innovation could meet the government's targets easily. However many fleets are looking at vehicles being supplied without warranty and are not concerned. These are the guys that have their own workshops or have sufficiently large fleets for a different form of economics to apply. Life-time fuel savings on fleet cars amounting to several thousands of pounds against the off chance of a component failure speak for themselves and are self underwriting.

Re-mapping the Lambda sensor to reduce the fuel oxygen mix and event management of the cylinder firing also is interesting. An 8 cylinder diesel engine can have a weaker mixture and be programmed to fire on alternate cylinders. This is a simple but effective measure and instructs the engine to fire with a weaker fuel measure on every other piston stroke. The effect of this is that the fuel economy is drastically improved and the CO_2 often halved. On-the-fly switching between two or more firing orders and geo-coded via GPS will enable auto switching so that vehicles could potentially enter congestion zones with lower or exempt payments. These new technologies or innovations however cannot compare to the concept of Carbon Capture.

Though Carbon Capture doesn't reduce your fuel costs it can be very compelling for other reasons apart from saving the planet. This new technology is still considered by some to be as valuable as alchemy (form of chemistry that sought to change base metals into gold and discover a life-prolonging elixir) and has alluded most who have tried to develop it.

Origo Industries have developed a prototype based on a chemical catalyst and reaction with exhaust gases with the aid of a kenotic gun. Exhaust gas is accelerated to 3 times its norm and hits the chemical to capture the CO_2. This is then released into a storage device and yes it has the potential to be harvested.

There are pitfalls of course, the system is bulky and heavy (see prototype image above) and may not be suited to the design of today's cars. There is even the argument against in that it is inefficient as you use more fuel to power the vehicles. Then there are the logistics of collecting and refining the carbon, let alone the will to do it. We may have to wait until carbon is £50 ($100) per tonne before this becomes viable. The chemical catalyst is reusable but will have to be changed very frequently again adding to the disincentive. However Carbon could be stored in liquid format, this appears to be akin to the onboard LPG systems finding much favour for vehicle conversions. Time for the engineers to design the system to the next stage.

Early indication is that the system could be adapted to be used easily on stationary combustion engines like generators. However if zero CO_2 is not the game but a lowering of emissions to below 120g/km and compliance with Euro4 to obtain 100% relief of the London Congestion charge mechanism or the new Low Emission Zone then that's another matter. Even then having emissions below the threshold without a modern Euro4 engine may offer up an issue

with Transport for London (TfL) on registration. Ironically some 4x4's are large enough to install the equipment within so maybe the tide is about to turn for some. Unfortunately such new innovations do not yet appear on the list of technologies on the TfL Powershift Register or approved installer list by the Energy Saving Trust.

Thinking this through is fascinating. If this technology becomes commercially variable then the more enlightened vehicle providers could offer white-van-man or the Chelsea Tractor drivers with a package that exempts them from paying LEZ or Congestion charges.

Once captured and removed from the vehicle the carbon would then be transported back to a processing plant where it could be transformed into energy by any combination of means. This could be as a food stock to create algae and thence onto bio-diesel or stored in liquefied state. The liquid state provides a much more stable and dense form of carbon, which is easy to store and transport.

Carbon capture technology is a unique method of combating climate change – it uses the harmful material itself as a further source of power. The "perpetual motion" principle is very appealing as it seams to tick all the boxes but is seen by most as a holy grail and not achievable as it defies all logic.