

Actions to Reduce Emissions and Improve Efficiency

Case Study



Company: Denbighshire County Council
Location: Denbighshire, North Wales
Fleet: 320 vehicles

1 Introduction



Since becoming a Unitary Authority Denbighshire County Council (DCC) has looked at reducing the impact on the environment of its road vehicle operations. The council is committed to the protection and enhancement of the local and global environment and to the long-term goal of achieving a sustainable society. The decision to develop the green fleet approach in Denbighshire has been taken within this policy framework and aims, in particular, to:

- ➔ Reduce the impact of transport on the environment and develop a balanced and integrated transport and land use system
- ➔ Minimise the pollution of air, water and land from the council's own activities and seek to minimise pollution from other sources
- ➔ Continue to reduce the consumption of energy through greater energy efficiency and support the development of renewable energy sources

Denbighshire is mainly a rural county, with urban centres, coastline and mountainous areas in the south. The council runs a mixed fleet of 320 commercial vehicles and 175 pieces of plant, including:

- ➔ 26 Tonne Gross Vehicle Weight (GVW) refuse-collection vehicles and gully emptier(s)
- ➔ Tippers, including 4 x 4 wheel drive
- ➔ Hook-lifts
- ➔ Welfare buses
- ➔ Quad bikes
- ➔ Vans
- ➔ Minibuses

DCC has introduced several interventions to help reduce emissions and improve fleet efficiency. These include the use of particulate traps on exhausts, specification of multi-purpose vehicles, a 'Driven Well' scheme, accident kits, benchmarking between fleets and the reduction of CO₂ emissions by trialling bio-diesel in a number of the DCC's vehicles. It has also completed a new workshop to allow for internal and external maintenance. All of these interventions are discussed in this Case Study.

2 Benchmarking

2.1 The Process of Benchmarking

Benchmarking at its simplest is the process of performance measurement and comparison against other comparable operations, vehicles or individuals. External benchmarking measures how one organisation is performing compared to other organisations with a similar operation. The benchmarking process involves the following:

- ➔ Regularly comparing aspects of performance with best-in-class performance
- ➔ Identifying gaps in performance
- ➔ Seeking the best approach to bring about improvements in performance to match or exceed the best in class

The aim of benchmarking is to show participating organisations how their own performance compares with that of others and to identify real opportunities to maximise transport efficiency.

2.2 Benchmarking in Denbighshire

DCC are involved in a benchmarking scheme involving many of the Welsh Local Authorities. The scheme allows participating companies to benchmark the efficiency of their transport operations and estimate the potential reduction in operating costs, energy consumption and vehicle emissions.

The performance indicators used in the Welsh Local Authority benchmarking scheme are split into the following seven critical success factors:

- ➡ Legal compliance
- ➡ Workshop productivity
- ➡ Competitiveness
- ➡ Fleet costs
- ➡ Asset utilisation
- ➡ Stakeholder satisfaction
- ➡ Health and safety

As part of the benchmarking process, access to the other authorities' data is vital to the success of the scheme. Currently, once the data has been gathered by each of the local authorities it is sent to Terry Avery, Corporate Fleet Manager at the City and County of Swansea Council. Once the data has been processed, the participating local authorities meet up to discuss and share information on how they can improve their efficiency.

2.3 The Use of Particulate Traps

In 2004, DCC received £320,000 from the Welsh Assembly Government to fit all of its vehicles above 3.5 tonnes GVW (a total of 54 vehicles) with particulate traps. Denbighshire became the first authority in the UK to carry out an extensive retrofit of its vehicles. These particulate traps were of two types, including the EMINOX CRT (Continuously Regenerating Trap) system which employs a filter to trap the harmful emissions such as carbon monoxide, hydrocarbons and particulate matter before they can enter the atmosphere. The heat from the exhaust gases is used to regenerate the filter.

As a result of fitting particulate traps to 54 vehicles, a total of 474 grammes of harmful particulate matter is removed from the atmosphere in total year on year. The success of removing particulate matter and lowering emissions from Denbighshire's vehicles prompted other local authorities to fit similar particulate traps to their vehicles.

2.4 Dual-purpose Vehicles

Denbighshire introduced dual-purpose vehicles to allow for highway and winter maintenance operations to be undertaken by the same vehicle. Each vehicle has two bodies - one for tipper / general duties and the second for winter maintenance work. Denbighshire reduced its fleet size for highway and winter maintenance from 23 vehicles, consisting of 16 dedicated gritters and seven highway maintenance tippers, to 15 de-mountable vehicles and one dedicated winter maintenance gritter. This represents a saving of seven vehicles in total.

This multiple use of vehicles avoids the situation of having several vehicles parked up and out of use for long periods of time.

2.5 'Driven Well' Scheme

DCC has also introduced a 'Driven Well' scheme across the fleet. The rear of each vehicle carries a free phone number allowing anyone to contact the authority 24 hours a day, seven days a week, with a complaint or to praise the actions of any of the authority's drivers. All of the contacts are recorded and any complaints are investigated. This helps to benchmark drivers within a fleet.



3 Bodelwyddan Workshop



The Bodelwyddan workshop is a purpose-built garage on a 1.3 acre site. It operates a two-shift system which extends the working hours from 07:30 to 21:00, with the shifts overlapping in the middle of the day. The workshop allows testing of all commercial vehicle classes as it is a VOSA designated premises for HGVs and PSVs. The nearest alternative workshops are in either Wrexham or Chester. The Transport Engineer Journal described the £3m workshop as “a brilliant workshop and best value”.

3.1 Bodelwyddan Workshop Facilities

The Bodelwyddan workshop facilities consist of:

- ➔ Two 16-metre pits, additional VOSA testing which includes two dedicated test pits; one short for light vehicles and one 16 metres long for trucks, trailers and buses
- ➔ Each VOSA test lane incorporates a VL Test Systems roller brake tester
- ➔ Drive-through layout, with seven bays
- ➔ Five 5-metre doors to accommodate the largest vehicles permitted on the roads even though they do not currently operate such vehicles
- ➔ Four post lifts and a set of four mobile column lifts
- ➔ A gantry beside each bay carries Permex retractable reels for service lines
- ➔ Rooms for an Ingersoll Rand rotary screw compressor and oil storage tanks: 2,400 litres each for engine oil and hydraulic oil and 4,000 litres for waste oil

- ➔ Storage area allowing for quick and convenient deliveries
- ➔ Shipping container for tyre service company
- ➔ Office space allowing all DCC's fleet management team to be brought together
- ➔ Kitchen, toilets and showers

3.2 External Business

One of the objectives of the workshop is to generate revenue to help offset its fixed costs and thus put downward pressure on the maintenance charges made to the council's user departments that are the main customers. This was intended to give the workshop a commercial edge and enable it to take on external business. The workshop is a MOT testing station and VOSA uses it one day every fortnight as a designated facility for testing a full range of PSV and HGV vehicles. A licence to service taxis is currently being considered.

3.3 Accident Kits

Many of the vehicles operated by DCC have been fitted with an accident kit. These kits were developed to allow the driver to record all the relevant information needed for an insurance claim if required. The kit consists of an accident camera kit, a fire extinguisher and a first aid kit, providing everything a driver may need if they are involved in an accident. This simple, but effective idea was described by the Welsh Audit Office as best practice.



3.4 Vehicle Washing

The council is seeking to meet its target of minimising the pollution of water by looking to install a new vehicle wash at Bodelwyddan. The new facility will allow both exterior body washing and under vehicle washing, needed for MOT preparation, which will incorporate an internal recycling system.

“This state of the art facility will help enhance the council image and ensure vehicles meet the cleanliness standards required for MOT and Health and Safety.”

Graham Taylor, Fleet Manager, Denbighshire County Council

4 Fuel Trials

4.1 Bio-diesel

The UK now produces 30 million litres a month of pure bio-diesel and in the past 18 months oil companies have begun to blend bio-diesel into petroleum-based diesel. Bio-fuels have the potential to deliver significant environmental benefits. Government support mechanisms have been justified on the grounds that bio-fuels can deliver considerable net reductions in greenhouse gas emissions compared to fossil fuels. The Government’s Renewable Transport Fuel Obligation (RTFO) came into effect in April 2008.

Table 1 Denbighshire Fuel Trial Vehicles

| Engine Size CC | Category | Make | Model |
|---|------------|----------|----------------|
| Stage 1: Fleet Management / Vehicle Maintenance Vehicles (July 2006) | | | |
| 1905 | Car / MPV | Peugeot | Expert |
| 1868 | Car / MPV | Peugeot | Partner |
| 1868 | Car / MPV | Peugeot | Partner |
| 1700 | Car / MPV | Vauxhall | Astra Envoy DT |
| 1686 | Car / MPV | Vauxhall | Combo |
| 1686 | Car / MPV | Vauxhall | Combo |
| 1398 | Car / MPV | Peugeot | 206 Van HDI |
| Stage 2: Highways Vehicles (January 2007) | | | |
| 6871 | + 3,500 kg | MAN | 18 Tonne 4x4 |
| 6871 | + 3,500 kg | MAN | 18 Tonne 4x4 |
| 4580 | + 3,500 kg | MAN | 7.5 Tonne 4x2 |
| 4580 | + 3,500 kg | MAN | 7.5 Tonne 4x2 |

It requires road transport fuel suppliers to ensure that, by 2010 / 11, 5% of total road transport fuel supply in the UK is made up of renewable fuels, equivalent to around 2.5 billion litres of fuel per year. Approximately 50% of renewable fuels used in 2010 / 11 are likely to be made up of bio-diesel and 50% bio-ethanol.

4.2 The Trial

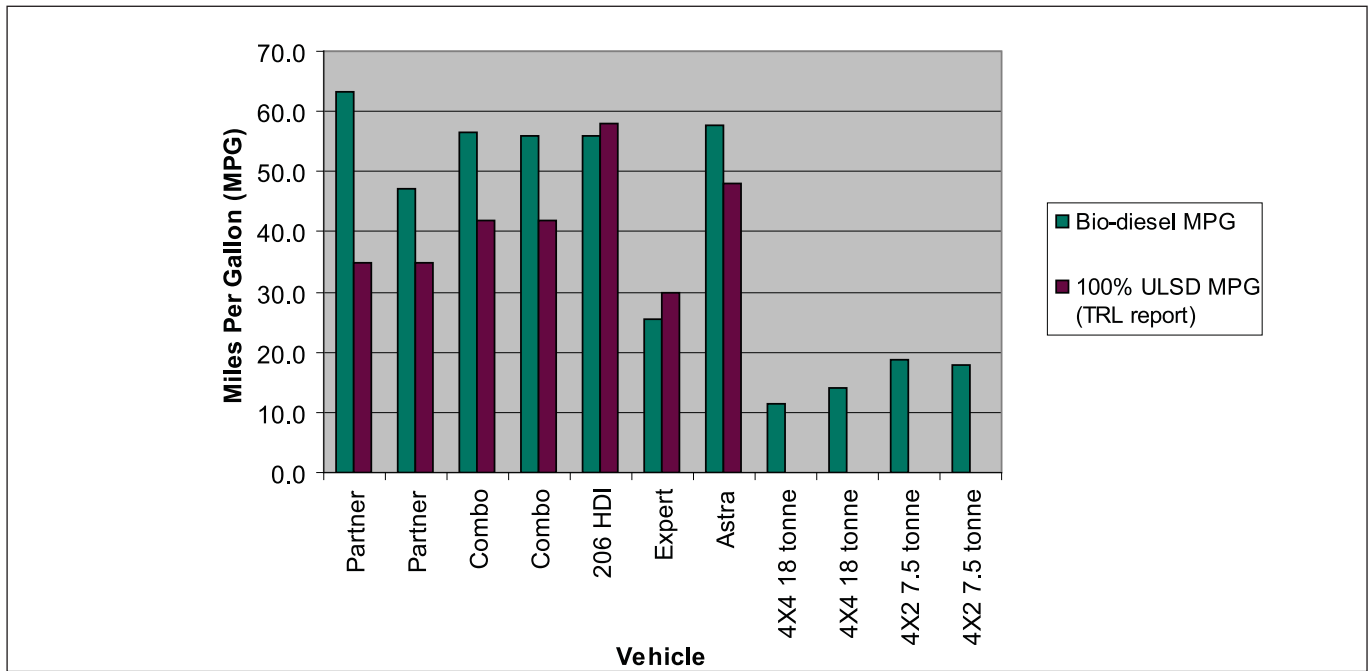
Following the installation of particulate traps on council vehicles above 3.5 tonnes GVW, DCC decided to undertake a field trial on bio-diesel. The aim of the trial was to provide sufficient evidence regarding the in-service operation of bio-diesel powered vehicles in order to determine whether it would be appropriate to adopt a bio-diesel blend of 25% bio-diesel using cooking oil and 75% Ultra Low Sulphur Diesel (B25 blend) across the whole fleet. The trials have been undertaken on a number of different vehicles of differing ages, makes and sizes.

The trial was undertaken in two stages, with vehicles selected from discrete groups within the fleet to increase control over the trial. The Bodelwyddan workshop has allowed DCC to monitor vehicles during the trial, including consideration of manufacturer engine warranties.

Stage 1 of the trial utilised vehicles from the Fleet Management / Vehicle Maintenance section of the council. The seven-vehicle trial consisted of cars / multi-purpose-vehicles (MPVs) with sub 2-litre engines (see Table 1), fuelled with the B25 bio-diesel blend. The trial began in July 2006 with the installation of a freestanding 1,000-litre fuel storage tank at the workshop. From that date a log has been kept of all fuel issued to trial vehicles along with the odometer readings, allowing for a basic estimation of the miles per gallon (MPG) achieved for each vehicle.

Stage 2 started in January 2007 with the installation of a second storage tank (2,000 litres). Initially the trial consisted of two new 18 Tonne 4x4 dual-purpose highway / winter maintenance vehicles. These vehicles were selected to study the performance of the fuel blend at lower operating temperatures to ensure that the fuel would not congeal (wax) in the fuel lines in the winter. Since no congealing of the fuel was witnessed, a further two 7.5 Tonne highway maintenance vehicles were added to the trial. As in the first trial, a record of fuel consumption and mileage were recorded for the four vehicles.

Figure 1 Comparison of Bio-Diesel MPG and 100% ULSD MPG



4.3 Maintenance

The aim of the trial was to provide information regarding the in-service fuel economy and maintenance implications of the B25 fuel blend. Vehicle maintenance records indicate that no maintenance problems have been reported as a direct result of using the bio-diesel at the current B25 blend on any of the vehicles undertaking the trials. Service on the current mileage is conducted once per year together with a fuel filter change.

“These vehicles have been operated on Local Authority business under normal driving conditions. The results have encouraged us to continue the tests and expand the trial to the rest of the fleet.”

Graham Taylor, Fleet Manager, Denbighshire County Council

4.4 Miles Per Gallon (MPG)

Determining MPG through correlating mileage against fuel provided at the pump provides a basic estimation of in-service consumption. The methodology does not provide a full reflection of the performance of the bio-diesel blend. Driving style, traffic flow, road conditions and vehicle loads/occupancy can significantly affect the fuel consumption of a vehicle and are not considered in the MPG calculations.

Figure 1 shows that the fuel consumption for the majority of the bio-diesel light vehicles used in the trial returned better than average figures compared to the vehicles on 100% ULSD, the only exceptions to this are the Peugeot 206 HDI and the Peugeot Expert. The

reason for this may be the un-measurable variables, such as driving style, identified above. The diversity of Denbighshire’s landscape may also play a role in the higher MPG for certain vehicles.

The 100% ULSD MPG was taken from the ‘Bio-diesel usage in Denbighshire County Council fleet vehicles’ report published by TRL, where the baseline figures were based on Denbighshire records and information sourced from ‘What Van?’ magazine. The baseline data provided by Denbighshire records provide an estimation of in-service fuel consumption, whereas, ‘What Van?’ magazine statistics are typically based on either a cold start or a pre-defined series of operational tests. Industry published figures for fuel consumption provide only a very general estimation of MPG statistics for a given vehicle, and are unlikely to represent fuel consumption achieved during operational applications. The bio-diesel data were provided by DCC, and fuel consumption and mileage were recorded between April 2007 and March 2008.

4.5 CO₂ Emissions

The CO₂ benefits commonly attributed to bio-diesel are the result of the differing carbon intensities of the respective fuels. The use of a bio-diesel to replace a proportion of conventional diesel can reduce the overall greenhouse gas emissions provided the carbon intensity is lower. The bio-diesel in the trial used locally sourced cooking oil as a feedstock, which is indicated as having lower carbon intensity than conventional diesel.

4.6 Future

DCC is looking into providing a fully integrated fuel monitoring system, which will allow for more accurate data in terms of fuel consumption (MPG) and CO₂ emissions. The council is also looking into obtaining its bio-fuel from a local source. If bio-fuel can be grown, processed and used locally it creates a very sustainable market. This bio-fuel could use locally grown rapeseed oil instead of the cooking oil used in the previous trials.

There is much debate about the rights and wrongs of using valuable arable land to grow crops for fuel rather than food, but the use of secondary land which might not be suitable for growing grain is likely to be a sensible policy going forward. In addition, some companies re-process manufacturing by-products or used oils into fuel and this is a prudent recycling measure. Therefore, the use of some bio-fuels is likely to remain for the foreseeable future.

This exercise supports the council's policy of lowering the impact of transport on the environment and reducing the consumption of energy through greater energy efficiency and supporting the development of renewable energy sources.

5 Conclusions

This Case Study illustrates that Denbighshire County Council is actively involved in improving its fleet efficiency and moving towards a sustainable future.

The council has conducted a two-stage trial using a 25% bio-diesel and 75% ULSD fuel blend and from this trial a number of observations can be made:

- ➡ No maintenance problems occurred while using the bio-diesel compared to the 100% diesel fuel
- ➡ Bio-diesel produces a higher MPG than the 100% ULSD in the majority of vehicles but this is not necessarily to be expected in all cases

The Bodelwyddan workshop has enabled Denbighshire County Council to make better use of its vehicles by maintaining its own vehicles and allowing the use of dual-purpose vehicles. The workshop has also enabled the council to attract commercial business by providing MOT testing for HGVs and allowing private companies to use the workshop. The new vehicle wash will also provide external business as well as MOT preparation.

Denbighshire County Council has led the way in the introduction of particulate traps by being the first authority to fit them to all of its vehicles over 3.5 tonnes, achieving 474 grams of particulate matter being removed from the atmosphere each year. The council has also reduced its fleet size through the introduction of dual-purpose vehicles in its highway / winter maintenance fleet.



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