



Fleet Health Check

for

Cherwell District Council



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Carried out on behalf of TransportEnergy BestPractice by

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1 Introduction to TEBP

TransportEnergy BestPractice (TEBP) is targeted to increase awareness of environmentally sensitive transport, and supplies hands on assistance to fleet operators in the form of advice and information.

The Fleet Health Check is one of the services offered under TEBP and provides two days of free consultancy support to analyse an organisations' fleet operation and assess its environmental credentials.

The aim is to provide non-biased, practical advice on reducing the fleet's environmental impact, and in the process reduce the fleet's operational costs. It has to be appreciated that two days is a short period of time in which to audit an entire fleet function, but the Health Check allows an external expert to gain an insight into the fleet operations, and provide an action plan to assist the organisation to realise its environmental goals. All this obviously has to take into consideration the wider needs of the organisations core business activities and objectives, and hence has to be context sensitive.

2 Client overview

Cherwell District Council is a largely rural district Council in North Oxfordshire. The main urban areas in the district are Banbury, Bicester and Kidlington. The Council vehicle fleet is the responsibility of the amenity services manager and covers largely refuse collection and cleansing operations. The Council's lease car scheme and motor mileage allowances are run by the personnel department and were not the specific subject of the fleet review.

The Council's fleet of vehicles operated by amenity services consists of 18 refuse freighters, 1 large sweeper and 3 small sweepers, 16 3.5t vans and 11 car-derived vans. The refuse freighters are used for recycling and waste collections on a 2 weekly basis. They run three loads a day and run to 3 composting sites, 1 dry recyclables site and 2 landfill sites. The 3.5t vans are used largely for special collections and street cleansing work. Included in this fleet are also 2 dog warden vans. The small vans are used by supervisors and for support work.

The responsibility for the vehicle fleet comes under the Amenity Services Manager, Geoff Melotti, with day-to-day operational responsibility carried out by the Transport Manager, Paul Chesterman.

The driver for the fleet health check came from a request from District Councillors for officers to look at the options for the use of alternative fuels in the Council's vehicle fleet and propose an alternative fuel strategy. The responsibility for the strategy is joint between the Amenity Services Manager and the Environmental Policy Co-ordinator, Alison McHugh. The Environmental Policy Co-ordinator is also looking at a Council Travel plan and issues such as lease cars and mileage allowances.

3 Aim

Cherwell DC requested a Fleet Health Check to primarily provide advice on the use of alternative fuels in their fleet and support in developing an alternative fuel strategy for their fleet. In addition a brief overview of some of the wider fleet management issues

was included. However, issues relating to lease cars and motor mileage allowances was not specifically covered.

4 Methodology

A brief telephone call was made to confirm the needs to the Council with respect the Fleet Health Check and to collect a little more detailed data on the specific vehicles in the Council's fleet. It was agreed for a site meeting to be carried out to discuss the Council's fleet, how it is operated and options for use of alternative fuels. The meeting was to be attended by the Amenity Services Manager, the Transport Manager and the Council's Environmental Policy Co-ordinator.

Initial background work was carried to look at fuel options for vehicles in the Council's Fleet. The visit itself was carried out on Tuesday 18th January and consisted of a 3 hr discussion with the attendees noted above. The meeting was structured to cover:

- A review of the Council's needs;
- A review of their current fleet management practices;
- An overview of the different alternative fuels and technologies that could be considered;
- Outline conclusions on what fuels would be most practical for the Council at present.

This report pulls together the key issues from the meeting, relevant information on alternative fuels and a suggest fuels strategy for the Council. It is expected that this report will form the basis of a Committee report to Councillors on a proposed alternative fuels strategy for Cherwell's vehicle fleet.

5 Fleet Profile

The vehicles in Cherwell's fleet are shown in the table below. All of the vehicles are currently run on low sulphur diesel.

Vehicle Type	Number	Total Miles Driven/annum	Annual Fuel Used	Average MPG
22t/26t REFUSE FREIGHTERS	18	14,500	2735/4393 Gal	5.3/3.3
7.5t TIPPER	1	10,000	770 Gal	13
LARGE SWEEPER MAIN	1	11050	1300 Gal	8.5
LARGE SWEEPER DONKEY	1	11050	1855 Gal	6
COMPACT SWEEPERS	3	1820 Hours	1036 Gal	1.76 Gal/Hour
MEDIUM VANS/TIPPERS	16	18000	666 Gal	27
SMALL VANS	11	11000	212 Gal	52

The refuse freighters are all Dennis vehicles with Cummins engines. The large sweeper has two engines: a main drive engine and a second 'Donkey Engine' running on rebated diesel for ancillary equipment. The 3.5t vans are a mixture of VW and LDV vehicles. The car-derived vans are largely Citroen Berlingo's.

6 Fleet Management Overview

6.1 Management and policy

As described above vehicle use in Cherwell DC falls into two categories: the fleet vehicles operated through amenity services and the lease cars and mileage allowances operated through personnel. There is no specific fleet management policy operated by either area, although the environmental policy co-ordinator is beginning to do this looking at both alternative fuels with amenity services and work on travel planning, business travel and lease cars with personnel.

Although this wider thinking was not discussed specially at the meeting it is suggested that while there is momentum from Councillors for some of these ideas an integrated sustainable transport policy should be developed looking across fleet management, alternative fuels and business travel and travel plans. These issues could be integrated into Cherwell's Environmental Strategy under Theme B 'Promote environmentally sound transport solutions'. These are practical measures that the Cherwell District Council can carry out directly, providing an example for other organisations in the area.

6.2 Monitoring

The district council currently have two systems to help them monitor the performance of their fleet:

- RoadBASE software for recording mileage, servicing and maintenance information, and so on;
- Computerised fuel dispensing using key cards at their two depots, one in Bicester and one in Banbury.

The two fuel dispensing sites operate independently and data is down-loaded on a regular basis to get some idea of fuel consumption. In addition to the fuel dispensers some of the light duty vehicles use fuel cards.

The fuel purchasing and operational data should be rationalised and integrated to provide a more robust picture of the performance of the fleet. Ideally an efficient monitoring system should provide data for each vehicle on mileage, fuel use, fuel costs, other operating costs and possibly an indicator of output (mileage is one, another maybe distance of streets swept). It is then possible to develop some indicators of performance such as MPG, cost per mile, cost per output.

In terms of rationalising the vehicle data the following are suggested:

- Integration of data from the two fuel dispensing system, as currently inconsistent data by be obtained through mileage readings entered at different sites.

- The fuel data needs to be properly integrated into the RoadBASE software to get a full picture of the performance of the vehicles. The system should be able to take information from fuel cards and dispensers.
- Consideration could be given to only using the depot fuel for the heavy depot-based fleet, which use over 90% of the fuel, and operating the vans through a fuel card system. This would allow greater flexibility in refuelling locations for the vans, with potentially lower mileage, and greater flexibility in fuels (important if LPG is being considered).

6.3 Vehicle acquisition and specification

The focus of the discussion here was on alternative-fuels and this is discussed below in detail. However, it was noted that there was potential to influence the user choice for lease cars and this is something the Environmental Policy co-ordinator is considering.

6.4 Servicing and maintenance

All servicing and maintenance is done in-house. It is done in line with the manufactures recommendations and the requirements of the Council's 'O' Licence. If a move is made to the use of alternative fuels training of maintenance staff or subcontract maintenance for some vehicles may be required.

6.5 Vehicle operation (improving MPG)

The estimated MPG figures provided seem quite reasonable, however, the robustness of these figures is not guaranteed with the current monitoring system. When accurate vehicle data is available it will be clearer where potential savings could be made. Some suggestions for improving MPG would be:

- Review use of ancillary equipment, such as over use of bin lifting equipment, or running compacting equipment when not needed;
- Fuel efficiency awareness provided in any driver training given
- Consideration of vehicle loads – how much stuff do support and cleaning vehicles carry just in case, do they really need it all the time?

6.6 Travel management (reducing miles)

The refuse trucks work to fixed routes and these have been planned to keep mileage to a minimum. These routes are reviewed now and again. Therefore there seems little scope for significant improvement here.

The operation of the van fleet is more ad-hoc and reactive. This may provide potential for mileage reduction if investigated. Detailed information would be required on vehicle work patterns.

7 Overview of fuels and emissions

7.1 Diesel fuels and exhaust treatment

Currently Cherwell's vehicle fleet is running entirely on low sulphur diesel meeting fuel standard BSEN590. The vehicles are relatively new, meeting a mixture of the EuroII (1996-2001) and EuroIII (2001-2005) emissions standards. For the refuse freighters this is roughly a 50/50 split, for the medium size vans there is a greater proportion of EuroIII vehicles and the small vans are mostly Euro III. Annex 2 shows the Euro emissions standards for the different vehicle types, for information.

To improve the environmental performance of the all diesel fleet, whilst retaining the use of diesel fuels, there are two things that can be considered:

- Using retrofit exhaust after-treatment to improve the vehicles exhaust emissions;
- Using bio-diesel

Exhaust after-treatment

Currently most after treatment equipment is only available for heavy-duty vehicles. There are four main types of exhaust after-treatment to consider:

- Diesel particulate filters (DPF) – these effectively trap the particulate matter from the exhaust and can reduce particulate matter by up to 95%. Some also have an oxidation element that reduces CO and HC by some 80%. However, they need to be regenerated with hot exhaust fumes on a regular basis to burn off the trapped particulate. This can be a problem for low speed urban vehicles such as refuse vehicles. The likely cost of DPF is £3,000 to £5,000. They are suitable for EuroII and EuroIII, effectively moving them towards a EuroV standard for particulates.
- Diesel Oxidation Catalyst (DOC) – These are used to oxidise the carbon content of the exhaust and will reduce CO and HC emissions by up to 80% and particulate emissions by up to 50%. These are suitable for older vehicles and cost around £1,000.
- Selective Catalytic Reduction (SCR) – this uses a reductant (ammonia or urea) which is injected into the exhaust to reduce NOx. They have the potential to reduce NOx by up to 70%. They are likely to cost between £5,000 and £10,000.
- Exhaust gas recirculation (ERG) – this reuses exhaust gases to reduce engine temperatures and NOx production. It may reduce NOx by some 40-50%. It is generally combined with a DPF or DOC to reduce CO, HC and PM emissions. The typical cost of a combined unit is around £10,000.

Many of these technologies will be used in new vehicles to help them meet Euro IV and EuroV emission standards, therefore with such new vehicles the retrofit options will become redundant.

Bio-diesel

Bio-diesel is made from vegetable oil, either used oil from the catering industry or new oil such as rapeseed oil. The main benefit of bio-diesel is that it has a lower life-cycle

carbon content than mineral diesel, but not zero, and is considered a renewable fuel. However, in terms of emissions it is unlikely to give any significant improvement over normal low sulphur diesel. Some suppliers suggest that bio-diesel can give a slight improvement in fuel efficiency, maybe up to 3%.

The fuel can be used in 100% form, but is usefully blended with mineral diesel. The most common blend is 5% and this fuel will meet the normal diesel standard BSEN590 and is acceptable in all vehicles. The 5% blend is now becoming more widely available. Higher blends than this will work quite happily in most vehicles, although the manufacture may not support their warranty. However, blends of up to 30% should generally be problem free and some vehicle manufactures are happy to warrant vehicles with these levels of blend.

With the current duty regime bio-diesel (or blends of) sell at the same price as normal diesel.

Any bio-diesel used should conform to BSEN14214.

7.2 Gaseous fuels

The two main gaseous fuels to consider are liquid petroleum gas (LPG) and compressed natural gas (CNG).

Liquid Petroleum Gas (LPG)

LPG requires a spark ignition engine and so can't be used with diesel-engined vehicles. It is relatively simple to convert petrol-engined vehicles to LPG or produce spark ignition gas engines directly. The vehicles are generally designed as bi-fuelled vehicles allowing the use of either petrol or LPG. The gas is stored in liquid form on the vehicles in tanks, and refuelling takes a similar time to that of a normal petrol vehicle. Because of the use of spark ignition engines, and bi-fuel operation, LPG has been used mainly with light duty vehicles – cars and vans.

LPG will have significant improvements over diesel in terms of particulate emissions and NO_x, but are slightly worse on CO₂. Against petrol the PM and NO_x benefits are relative minor, but there are CO₂ benefits.

In terms of cost LPG is about half the cost of diesel. However, it has a lower energy content and so will have a lower MPG than an equivalent diesel vehicle. Overall for light duty vehicles a cost saving of something like 30% in fuel use may be achieved over diesel, and greater than this over petrol.

The cost of a conversion or the additional cost of a new vehicle for cars and van is likely to be of the order of £1000 to £1500.

Compressed Natural Gas (CNG)

CNG like LPG requires a spark ignition engine, however, unlike LPG the engines tend to be specifically designed for gas and have been developed for both light duty and heavy duty vehicles. Unlike LPG the gas is stored in compressed form at about 200bar and so requires larger heavier storage tanks, which can be a problem where payload is an issue. In terms of emissions however, they will out perform both LPG and diesel, giving an emissions performance similar to EuroV.

The cost of CNG fuel is lower than diesel, but like LPG, it will give a lower MPG. However, overall fuel costs are likely to be lower. The cost of buying a CNG vehicle is significantly higher than its diesel equivalent and availability is currently poor in the UK.

7.3 Electric and hybrid vehicles

Electric vehicles using batteries can provide a good solution for short-range urban vehicles, perhaps for street cleaning or for use in parks. The typical range of a vehicle on a single charge is 50-60 miles. The costs of operating these vehicles can be low but the whole package, including battery life and replacement, needs to be assessed quite carefully.

Hybrid vehicles combine an electric drive motor with an internal combustion engine to provide a more efficient drive chain. There are commercial examples of this technology in vehicles such as the Toyota Prius and Honda IMA that are achieving very good emissions and fuel consumption. However, for heavy-duty applications the technology is still developing.

7.4 Grants

The main source of grants for vehicles and fuels is the Energy Savings Trust, through their TransportEnergy programme. There are three grant schemes:

- *Powershift* – provides grants for new and conversions of nearly new vehicles running on alternative fuels. They have a register of vehicles and conversions that they have tested and only these will receive grant funding. They may also provide support for new refueling infrastructure at depots.
- *Cleanup* – this funds mainly exhaust after treatment for older larger vehicles, but can also be used for re-engining with a gas engine for example. Again there is a register of approved equipment.
- *New vehicle technology fund* – is designed mainly for demonstration projects of new vehicles and technologies that may eventually end up on the register.

The level of the grant depends on the type of vehicle technology and its performance in terms of emissions. The grant can range from 25% to 75% of the additional cost of the new vehicle or conversion.

8 Suggested fuel strategy

8.1 Heavy duty vehicles

It is suggested that the gaseous fuels and electric/hybrid technology are not currently practical for Cherwell's HGV fleet. For example, although CNG may give significant environmental benefits there are likely to be difficulties in procuring an appropriate vehicle, significant costs in getting a vehicle even with grants and payload issues will affect operating patterns and offset some of the fuel and emissions benefits.

Therefore I would propose looking at bio-diesel and exhaust after-treatment. With regards bio-diesel a 5% blend can be used now, at no extra cost, with no operational difficulties, and produce a small environmental benefit and a positive image for the

Council. In the longer term consideration should be given to using higher blends of bio-fuel of up to 20% or 30%.

Exhaust after treatment can be considered for any vehicles that will not be renewed to EuroIV standard in the next 2 or 3 years. An excellent starting point is the offer by Dinex to trial their DPF/SCR combination system on one of Cherwell's refuse vehicles. A trial of this nature will provide strong evidence of any benefits of going down this avenue and at no cost to the Council. However, a longer-term programme of retrofits will accrue costs to the Council, even with the use of appropriate grants, and these need to be weighed against the environmental benefits.

8.2 Light duty vehicles

There is a little more flexibility with the light duty fleet. With existing vehicles the bio-diesel route can be taken, although this may conflict with a decision to go for fuel cards unless there are a significant number of filling stations supplying bio-diesel fuel. With these vehicles, however, there is no refit solution for exhaust treatment as with the heavy fleet.

For new vehicles there is potential for the inclusion of LPG vehicles in the fleet. The benefits here include both reduced running costs and potential improvements in environmental performance. In going down this route the issues to consider are:

- Use of OEM vehicles with a good support network – there are currently OEM LPG versions of LDV, Ford Transit and Citroen Berlingo vehicles that would meet Cherwell's needs;
- Careful analysis of likely fuel cost savings taking account of changes in MPG and actual fuel cost per litre;
- Consideration of bunkered against off site supply of fuel – a bunkered solution only makes sense if using a number of LPG vehicles or sharing the facility with other users, but can give lower costs. Off site provision can be a good starting point and will work with fuel cards, but consideration needs to be given to the number and location of filling stations for operational purposes.
- Servicing and maintenance – this is currently done in-house and with LPG vehicles either outsourcing will be required or training for in-house staff.

There is also some merit at looking at the use of electric vehicles for the light duty fleet, for vehicles that do short duty cycles, slow duty cycles and lots of stop-start work. There are both purpose built electric vehicles such as those from Cushman, and also electric versions of more conventional light vans such as the Citroen Berlingo electric. Again these could offer cost and environmental benefits but would have to be examined in detail. They can be seen as a particularly 'green' solution when used with a renewable electricity supply.

9 Action Plan

<i>Short term actions</i>	
1	Integrate RoadBase system and fuel data, to get a robust monitoring system
2	Consider use of fuel cards for light duty fleet
3	Consider use of 5% bio-diesel blend for bunkered fuel
4	Progress with DINEX exhaust treatment trial
5	Detailed assessment of LPG and electric vehicles for use in light duty fleet
<i>Medium to longer term actions</i>	
6	Consider moving to higher bio-diesel blend for bunkered fuel
7	Consider rolling out exhaust treatment if Dinex trial is successful
8	Implement recommendations of LPG/electric study for new light duty vehicles
9	Integrate fleet management and fuel strategy with wider sustainable transport actions across the Council such as travel plans and staff business travel.

10 Appendices

- 1. Completed Fleet Health Check Application Form**
- 2. EU emissions standards**
- 3. Useful Links**

Annex 2 European Vehicle Emissions Standards

Table 1 EU Emission Standards for Light Commercial Vehicles (Category N₁), g/km

Class† *	Tier	Year	CO	HC	HC+NOx	NOx	PM
Diesel							
N1 , Class <1305 kg	IEuro 1	10/1994	2.72	-	0.97	-	0.14
	Euro 2, IDI	10/1998	1.0	-	0.70	-	0.08
	Euro 2, DI	10/1998 ^a	1.0	-	0.90	-	0.10
	Euro 3	01/2000	0.64	-	0.56	0.50	0.05
	Euro 4	01/2005	0.50	-	0.30	0.25	0.025
N1 , Class 1305-1760 kg	II Euro 1	10/1994	5.17	-	1.40	-	0.19
	Euro 2, IDI	10/1998	1.25	-	1.0	-	0.12
	Euro 2, DI	10/1998 ^a	1.25	-	1.30	-	0.14
	Euro 3	01/2000	0.80	-	0.72	0.65	0.07
	Euro 4	01/2005	0.63	-	0.39	0.33	0.04
N1 , Class >1760 kg	III Euro 1	10/1994	6.90	-	1.70	-	0.25
	Euro 2, IDI	10/1998	1.5	-	1.20	-	0.17
	Euro 2, DI	10/1998 ^a	1.5	-	1.60	-	0.20
	Euro 3	01/2000	0.95	-	0.86	0.78	0.10
	Euro 4	01/2005	0.74	-	0.46	0.39	0.06
Petrol (Gasoline)							
N1 , Class <1305 kg	IEuro 1	10/1994	2.72	-	0.97	-	-
	Euro 2	10/1998	2.2	-	0.50	-	-
	Euro 3	01/2000	2.3	0.20	-	0.15	-
	Euro 4	01/2005	1.0	0.1	-	0.08	-
N1 , Class 1305-1760 kg	II Euro 1	10/1994	5.17	-	1.40	-	-
	Euro 2	10/1998	4.0	-	0.65	-	-
	Euro 3	01/2000	4.17	0.25	-	0.18	-
	Euro 4	01/2005	1.81	0.13	-	0.10	-
N1 , Class	III Euro 1	10/1994	6.90	-	1.70	-	-

Table 1 EU Emission Standards for Light Commercial Vehicles (Category N₁), g/km

Class†*	Tier	Year	CO	HC	HC+NOx	NOx	PM
>1760 kg	Euro 2	10/1998	5.0	-	0.80	-	-
	Euro 3	01/2000	5.22	0.29	-	0.21	-
	Euro 4	01/2005	2.27	0.16	-	0.11	-
† Classification based on the <i>Reference Mass</i> defined as the mass of the vehicle in running order less the uniform mass of the driver of 75 kg and increased by a uniform mass of 100 kg.							
* For Euro 1/2 the weight classes were Class I < 1250 kg, Class II 1250-1700 kg, Class III > 1700 kg.							
a - until 1999.09.30 (after that date DI engines must meet the IDI limits)							

Note: EuroV Standards not yet agreed.

Table 2 EU Emission Standards for Heavy Duty Vehicles and Buses (g/kwh)

Class†*	Tier	Year	CO	HC	HC+NOx	NOx	PM
HGV	Pre Euro 1	04/1991	12.3	2.6	-	15.8	-
	Euro 1	10/1993	4.9	1.23	-	9.0	0.4
	Euro 2	10/1996	4.0	1.1	-	7.0	0.15
	Euro 3	10/2001	2.1	0.66	-	5.0	0.10
	Euro 4	10/2006	1.5	0.46	-	3.5	0.02
	Euro 5	10/2009	1.5	0.46	-	2.0	0.02

Annex 3 Useful Links

TransportEnergy – grants and information	www.transportenergy.org.uk
LPG Association	www.lpga.co.uk
Natural Gas Vehicle Association	www.ngva.co.uk
British Association of Bio-fuels	www.babfo.co.uk
Bio-diesel suppliers	
Greenergy	www.greenergy.co.uk
Rix	www.rixbiodiesel.co.uk
Petroplus	www.petroplus.co.uk
E-diesel	www.ebony-solutions.co.uk