

Hybrid and Retrofitted SCRT bus fleets

Simon Carlisle
Engineering Director
First West Yorkshire



- First West Yorkshire operates a fleet of 882 buses across the region and employee over 2200 staff
- Depots in Leeds, Bradford, Halifax and Huddersfield
- First West Yorkshire is a part of FirstGroup Plc



- First Bus recognising our responsibilities to reduce our impact on the environment
- Working with Leeds in planning for a Clean Air Zone as part of the UK Air Quality Plan
- Collaborative partnerships supporting local and regional objectives
- Bus18 Partnership includes all operators who have signed up to Eco Stars helping reduce emissions of vehicle fleets
- New bus investment of £71m by 2020 as part of the Leeds Public Transport partnership



- Traditional Hybrids
- New EuroVI Hybrids
- Benefits of EuroVI
- Retrofitting After-treatment

- 22 Volvo EuroV Hybrids in Leeds since 2011



These Hybrids offered a Step change in efficiency

- 25% more fuel efficient than standard comparable buses
- Less fuel = less Carbon Dioxide (CO₂) emissions.
- The 22 bus fleet saves around 300 tonnes of CO₂ per year, demonstrating the contribution therefore these vehicles have made in the battle against climate change.

Hybrid Advantages:

- 25% Fuel Savings
- Low Carbon Emission Bus Certification = Additional BSOG
- Reduced CO₂ & improves air quality

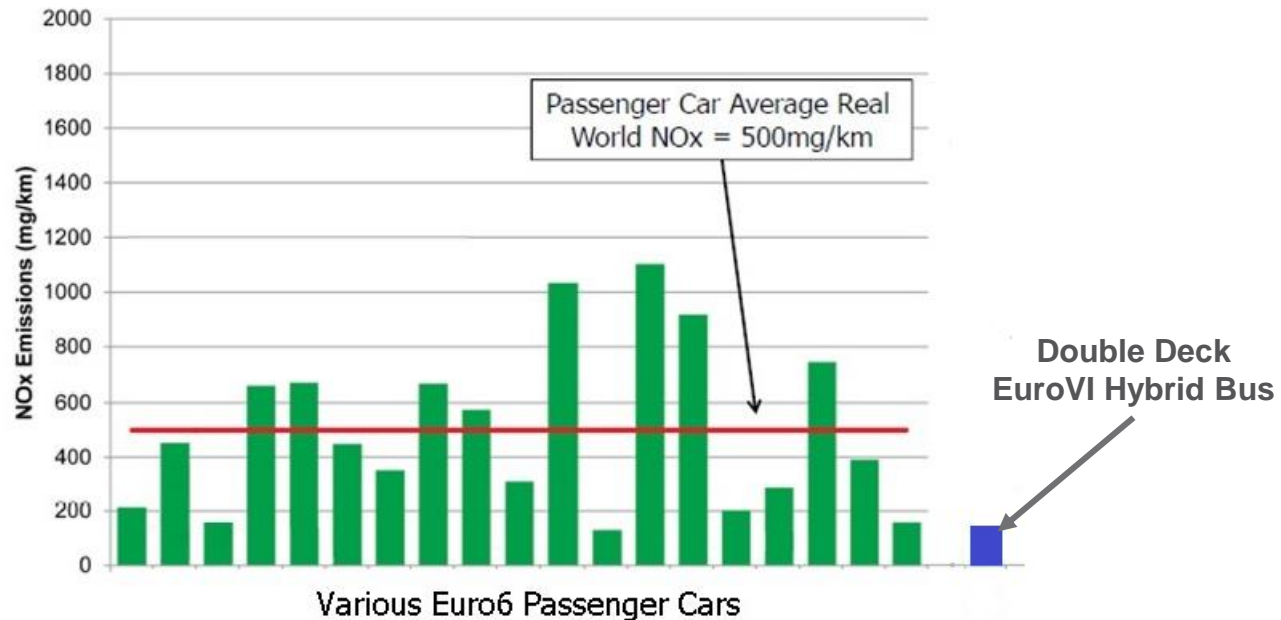
Hybrid Disadvantages:

- Purchase Cost: Initial purchase cost more expensive than a standard bus
- Need to consider route deployment to maximise benefits
- Maintenance Costs can be expensive:
 - Energy Storage System- batteries expensive if they go wrong.
 - Maintenance subcontracted to manufacturer – This covers parts & Labour and protects us from unforeseen spikes in cost, but is not cheap!

- Latest Generation of Hybrids now emerging
- OLEV funding has been granted in partnership with Leeds City Council will see 8 new EuroVI hybrids introduced to the fleet and will operate on Park and Ride services
- Compared to traditional hybrids the latest generation offers :
 - Lower purchase costs, although do still carry a cost premium
 - Reduced maintenance requirements
 - Similar levels of fuel saving
 - EuroVI engines will help to improve air quality



- EuroVI has independently proven to produce significantly less NO_x emissions (up to 99%) than older buses.
- **In perspective:** Test data also shows EuroVI double deck buses can produce much less NO_x than many new diesel car models.



DfT Euro6 Diesel Car Testing 2016, verses Low Emission Bus Test Data for modern EuroVI Hybrid

- Over last 2 years First West Yorkshire have purchased 64 Euro VI buses - Another 42 are planned for this year.

- Retrofitting enhanced emissions after treatment systems on older fleet can also help to reduce NOx & PM Emissions by up to 95%.
- With help of Clean Vehicle/Bus Technology Funding so far we have retrofitted:
 - 12 x Volvo B7TL converted to SCRT
 - 76 x BMC Condor converted to SCRT
 - 23 x Volvo B9TL converted to SCRT
- System cost – Generally around £12-15k
- Small amount of vehicle down time during fitment
- Operational cost increase
 - Ad-Blue (4% of Diesel Consumption)
 - Maintenance – Annual CRT cleans and periodic replacement
 - Fuel Efficiency - slight penalty

Retrofit does provide the most cost effective means of reducing NOx emission but there are things to be aware of:

- Increased complexity, increases risk of reliability issues
- It is important to:
 - Complete Pre-Install Checklist
 - Agree Method Statements with supplier
 - Ensure staff are trained
 - Ensure system is maintained correctly



When Things go wrong –
Ad-Blue crystallisation build up

Vehicle Pre-Modification Check Sheet



Fleet No		Reg No	
Date of Last Service		Date of Last MOT	
Contractor		Modification due	
Where		Date	
Mileage pre-mod		Mileage post-mod	

Engine: Record Findings

Engine oil level / Condition	
Engine oil usage in last two months (give the under 1.5 litres per 7 day period/1000 miles)	
Carry out Cylinder Compression Check & record	
Smoke level prior to CRT	
Smoke level at tailpipe	
Engine back pressure	
Measure and record engine oil pressure	
Measure and record engine trouble by	
Check, record, clear fault codes	

Cooling System:

Check cooling system fan operation	
Check air flow through radiator at 0 positions, average over 5 mins	
Pressure check cooling system – holds pressure?	

Gearbox:

Gearbox oil level and condition	
Check for fault codes and record/clear	

Rear Axle:

Check oil level and condition	
-------------------------------	--

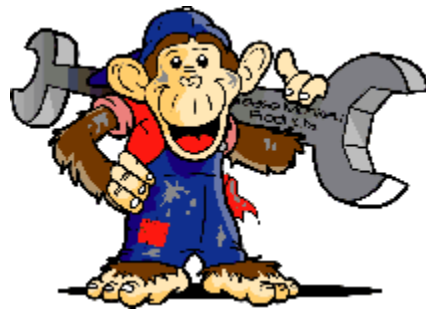
Brakes:

Carry out brake retention test at 100 mph	
---	--

Declaration – to be completed by Supervisor/Planner

Bus Fit for Modification	Sig	
--------------------------	-----	--

Pre-Fit Check List



Thank you!