

	Selby HVO Fuel Trial Outcome Report	Doc. Code	
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1. SUMMARY

Selby District Council (the Council) in partnership with its Environmental Services Contractor, Urbaser Ltd, conducted a 3-month trial of Hydrogenated Vegetable Oil (HVO) on six of its waste and recycling collection and street cleansing vehicles. HVO is an environmentally friendly alternative for fossil diesel, to reduce fleet emissions and improve local air quality.

Emissions testing was undertaken in November 2021 on two of the operational vehicles that were running on EN590 fossil diesel before the trial and then again in February 2022 after the vehicles had been running on HVO for 12 weeks. The results showed a significant reduction in emissions in both vehicles, but the percentage reduction was greater in the newer Euro 6 waste collection vehicle compared to the earlier generation Euro 6 caged tipper vehicle.

The newer Euro 6 waste collection vehicle reduced measurable carbon emissions by 100% compared to fossil diesel, and reduced Particulates by 22% and NOx by 69%.

The earlier generation Euro 6 caged tipper vehicle reduced measurable carbon emissions by 44% compared to fossil diesel, and reduced Particulates by 35% and NOx by 24%.

The trial saw large variations in miles per gallon between the vehicles which overall resulted in a small reduction in the MPG of 4.54% when averaged across these six trial vehicles. The large variance of -15.49% to 22.06% could be due to a number of factors that would impact the efficiency of the vehicles such as a change of driver with different driving behaviours, change of collection areas with different rurality and seasonality of services impacting the vehicle workloads during the trial period.

The trial saw a total of 68.17 tonnes of CO₂e/L displaced by the HVO fuel during the trial period. This would result in an annual reduction of 890.83 tonnes if the whole fleet were to switch over to HVO. The only exception would be a small mechanical road sweeper, Hako City Master 1600 (KX19EZL), used on the Environmental Services Contract which is unable to run on HVO fuel.

Following the successful trial, it is recommended that the Council make a permanent switch to HVO fuel across the whole of the Environmental Services fleet. It is expected that the cost of switching to HVO would result in an additional annual cost of between £31,531.05 and £47,296.58 for fuel and a one-off cost of £1,872.00 for an inspection and cleanse of the fuel tank at the Prospect Way depot, Selby.

2. INTRODUCTION

By 2030, the Council and its operations will be carbon neutral, positively helping Selby District and the North Yorkshire area move to a net zero carbon economy. The Low Carbon Strategy aims to understand the Council's carbon emissions, what steps can be taken to reduce them and how it can positively influence the wider district carbon footprint.

The Scope 1 emissions (fuel usage in vehicles) on the Environmental Services Contract are a significant contributor to the Council's total carbon footprint. In line with this net zero commitment, the Council has worked with its contractor Urbaser to explore measures that can be implemented to reduce these Scope 1 emissions and improve local air quality.

In September 2021, Urbaser put forward a business case to the Council to undertake a trial of HVO fuel as a replacement for fossil diesel on the Selby Environmental Services Contract. The aim of the trial was to gauge whether HVO fuel is a viable intermediary fuel to deliver carbon emission savings on municipal services contracts ahead of a switch to electric or other alternative fuels which are currently too expensive for the transition of a whole contract fleet.

HVO fuel is renewable, sustainable and 100% biodegradable: synthesised from waste fats and vegetable oils. Urbaser’s selected HVO supplier, Green Biofuels provides full traceability of the feedstock, sourced from Neste all within the Netherlands, and it is palm oil free. It is a 100% drop in replacement fuel meaning that it can directly replace fossil diesel without any engine modifications.

Green Biofuels is a founder member of the UK Government’s Renewable Fuel Assurance Scheme (RFAS), managed by the Zemo Partnership. Under the scheme, Green Biofuels is audited on its controls and processes for ensuring the provenance of the fuel supplied to each customer and the underlying feedstock on a quarterly basis. Green Biofuels also has International Sustainability and Carbon Certification (ISCC) approval, which confirms they comply with the RED II Directive and the ISCC certification system.

3. SCOPE OF TRIAL

The aim of the trial was to deliver the outcomes detailed later in this report but in summary it is to demonstrate that it could significantly reduce emissions and with the exception of the price difference, that there would be little or no noticeable difference between HVO fuel and fossil diesel in terms of its impact on operations.

A number of national leading fuel suppliers stock and deliver HVO fuel in the UK. Three suppliers were approached for pricing: Bunkercard (Urbaser’s current fossil diesel fuel card supplier), Speedy Fuels (a previous fossil diesel supplier to Urbaser who are competitive on pricing) and Green Biofuels (HVO fuel specialists). The three companies were asked to provide their current market price for HVO fuel delivered to Prospect Way depot, Selby.

The Green Biofuels HVO trial price was the lowest per litre compared to the Speedy Fuels and Bunkercard HVO pricing. This price also included the provision of a 5,000L fuel tank and fuel management system as the existing fuel tank at the depot would be required to hold fossil diesel for the rest of the fleet. Green Biofuels is the largest importer and stockist of HVO in the UK, with multi terminal storage facilities. Green Biofuels operate from four key strategic bulk storage hubs and store between 10 to 25 million litres of fuel in the UK at any one time. In February 2022, BP acquired a 30% stake in Green Biofuels Ltd¹, further enhancing their position as the HVO supplier UK market leader.

Six Environmental Services vehicles were selected for the trial following discussions with the contract hire provider for the small vehicles, Hitachi, and the vehicle maintenance provider for the waste collection vehicles and large sweeper, GMG, which are owned by the Council.

Vehicle Registration	Vehicle Make & Model	Environmental Service Allocation	Average Monthly Fuel Consumption (L)
SH18YDK	Ford Transit 350 3.5t Caged Tipper	Street Cleansing	326
LN70YAO	26t Mercedes Econic with Faun Body RCV	Commercial Waste Collection	1478
LN70YAY	26t Mercedes Econic with Faun Body RCV	Green Waste Collection	1231
LN70YBZ	15t Mercedes Atego with Faun Body RCV	Rural Collections	1016
LN70YAF	26t Mercedes Econic with Faun Body RCV	Refuse/Recycling Collection	1213
LN70YCD	18t Mercedes Chassis Scarab Body Sweeper	Mechanical Sweeper	1093

The cost of the trial was calculated based on the average monthly fuel consumption of the 6 vehicles included in the trial, a total of 6357L per month. It is important to note that the price below was a discounted rate trial price offered by Green Biofuels and the actual cost per litre would be in the region of 10-15 pence per litre more expensive. As shown with this trial price there was a minimal cost of the trial compared to normal operations.

Fossil Diesel Bulk Delivered	Green Biofuels HVO
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¹ <https://www.bp.com/en/global/corporate/news-and-insights/press-releases/bp-acquires-30-per-cent-stake-in-the-uks-largest-provider-of-low-emission-hydrogenated-vegetable-oil-fuels.html>

Quote Date	November 2021	November 2021
Price per Litre	119.13p	119.21p
Price per Month	£7573.09	£7,578.18
Total Trial Price – 3 Months	£22,719.28	£22,734.54
3 Month Price Difference Vs Fossil Diesel	-	£15.26

Once Green Biofuels had been selected, Urbaser set them up as a new supplier on their system to order the HVO fuel and completed the necessary Green Biofuels requested documentation. The 5,000L fuel tank was delivered in November 2021 and the Urbaser Selby management team arranged for an engineer to connect it to the power at the Prospect Way depot.

A Green Biofuels engineer then attended site to deliver training to Urbaser Selby staff on the fuel tank dispensing system and undertake initial tailpipe emissions testing on one of the waste collection vehicles (LN70YAF) and the 3.5t caged tipper (SH18YDK). A follow up emissions test then took place on these same vehicles once they had been running on HVO fuel for 12 weeks.

4. OUTCOMES

The trial saw the following outcomes:

1. The trial saw 68.17 tonnes of CO₂e/L displaced by the HVO fuel during the trial period.

The emissions savings have been set out below based on the total fuel used by the 6 vehicles during the trial period at Selby (23,752 litres) and using the UK Department for Transport standard Diesel B7 and Green Biofuels GreenD+ HVO emissions assumptions for fuel Scope 1. The emissions savings of switching from fossil diesel B7 to Green Biofuels GreenD+ HVO have been calculated based on the total fuel consumption of 23,752 litres during the trial period.

	Fossil Diesel B7	Green Biofuels GreenD+ HVO	Difference / Emissions Savings
Kg CO₂e/L	3.12	0.25	2.87
Total Trial Kg CO₂ Emissions (Usage - 23,752L)	74,106.24	5,938.00	68,168.24
Total Trial t CO₂ Emissions (Usage - 23,752L)	74.11	5.94	<u>68.17</u>

2. The emissions testing undertaken on the waste collection vehicle (LN70YAF) and the 3.5t caged tipper (SH18YDK) showed a significant reduction in emissions in both vehicles but the percentage reduction was greater in the newer Euro 6 waste collection vehicle compared to the earlier generation Euro 6 caged tipper vehicle.

The newer Euro 6 waste collection vehicle reduced measurable carbon emissions by 100% compared to fossil diesel, and reduced Particulates by 22% and NO_x by 69%. The earlier generation Euro 6 caged tipper vehicle reduced measurable carbon emissions by 44% compared to fossil diesel, and reduced Particulates by 35% and NO_x by 24%.

Vehicle	PN (#/cm ³)	NO (ppm)	NO ₂ (ppm)	NO _x (ppm)	CO (ppm)
LN70YAF	-22.1	-68.6	-100.0	-69.4	-100

APPENDIX A

SH18YDK	-35.1	-22.7	-100.0	-23.6	-43.7
Average	-28.6	-45.65	-100.0	-46.5	-71.85

3. The trial saw large variations in miles per gallon between the vehicles which overall resulted in a small reduction in the MPG of 4.54% when averaged across these six trial vehicles. The large variance of -15.49% to 22.06% could be due to a number of factors that would impact the efficiency of the vehicles such as a change of driver with different driving behaviours, change of collection areas with different rurality and seasonality of services impacting the vehicle workloads during the trial period.

Vehicle	Vehicle Type	White Diesel			HVO			Difference in MPG	% Change in MPG
		KM	Fuel used (litres)	MPG	KM	Fuel used (litres)	MPG		
SH18YDK	Ford Transit	6734	1273	14.94	6498	1334	13.76	-1.18	-7.90%
LN70YAO	Mercedes Econic	9692	4909	5.58	9437	5540	4.81	-0.77	-13.80%
LN70YAF	Mercedes Econic	2725	3770	2.04	3764	4278	2.49	0.45	22.06%
LN70YAY	Mercedes Econic	2325	2214	2.97	2095	2359	2.51	-0.46	-15.49%
LN70YBZ	Mercedes Atego	6563	2489	7.45	4587	2850	7.32	-0.13	-1.74%
LN70YCD	Scarab Magnum	4170	4201	2.8	6555	7391	2.51	-0.29	-10.36%
								-0.40	-4.54%

4. The drivers reported no noticeable drive difference of the vehicles when they were operating on HVO fuel during the trial period. With the exception of refuelling in a different part of the depot and using a different fuel tank, there were no other changes to operational practices resulting from the trial.

5. RECOMMENDATIONS

Following the successful trial, it is recommended that the Council make a permanent switch to HVO fuel across the whole of the Environmental Services fleet.

5.1. OPERATIONAL CONSIDERATIONS

The Prospect Way depot already has its own 39,000 litre on-site fuel tank to refuel the vehicle fleet which could be used to store the HVO fuel. A tank inspection will be required ahead of the first HVO fuel delivery to make sure it is clean and free from sludge internally as fossil diesel has Fatty Acid Methyl Esters (FAME) in it which attracts water.

The Environmental Services Contract uses a small mechanical road sweeper, Hako City Master 1600 (KX19EZL), which is unable to run on HVO fuel. A fuel card would need to be used to refuel this vehicle.

5.2. FINANCIAL CONSIDERATIONS

The price of HVO has seen recent sharp increases similar to the EN590 fossil diesel price. This is due in part to increased cost of HVO production, but it has also been impacted by the current crisis in Ukraine. Although the HVO feedstock is secure (it is sourced from Neste all within the Netherlands), the oil price rise has caused customers to look for alternative options in the market which has subsequently increased the demand on HVO.

The price of HVO tracks the price of EN590 fossil diesel, with HVO being on average in the region of 10-15 pence per litre more expensive than EN590 fossil diesel. This is shown in Appendix 1 of this report which compares the historical monthly averages of the HVO index against the ULSD index for EN590 fossil diesel. Note these indices do not include end user costs such as delivery, fuel supplier margin etc.

Based on the historical annual fuel usage of the Environmental Services Contract, it is expected that the cost of switching to HVO would result in an additional annual cost of between £31,531.05 and £47,296.58 for fuel. These calculations exclude the small mechanical road sweeper, Hako City Master 1600 (KX19EZL) which is unable to run on HVO fuel.

Time Period	Litres Used	Litres Used (Excl. Hako Sweeper)	Lower Estimate (10ppl More)	Higher Estimate (15ppl More)
1 Feb 21 - 28 Feb 22	319,832.52	315,310.52	£31,531.05	£47,296.58

As HVO tracks the EN590 fossil diesel price, any future oil price fluctuations would be expected to impact fossil diesel and HVO in a similar manner and it is envisaged that the Environmental Services Contract fuel indexation would be dealt with by applying the existing contractual mechanisms.

In addition to the spot market price, Green Biofuels provide a 12-month fixed rate that offers a locked in price for its customers which given the recent market direction of the HVO fuel price may offer better value than the spot market price. This is the most popular option amongst Green Biofuels customers. In addition, it is recommended to approach alternative suppliers to benchmark Green Biofuels price and ensure that best value is achieved. As part of this benchmarking exercise, it will be important to check that any other supplier approached holds the same quality accreditations as Green Biofuels, i.e. part of the UK Government’s Renewable Fuel Assurance Scheme (RFAS) and International Sustainability and Carbon Certification (ISCC) approval.

The only other cost associated with switching to HVO would be the requirement for an inspection and cleanse of the fuel tank at the Prospect Way depot, Selby. This consists of a full service and calibration to the Merridale pump, draining of residual sludge and waste from the bottom of the tank and removal from site. A waste certificate / consignment notice would be issued on completion. The cost of this would be £1,872.00 excluding VAT.

5.3. ENVIRONMENTAL CONSIDERATIONS

The switch to HVO fuel across the whole of the Environmental Services fleet would result in a significant reduction in Scope 1 carbon emissions (fuel usage in vehicles) on the Contract. The Scope 1 emissions of the Environmental Services Contract is a significant contributor to the Council’s total carbon footprint and as such would support the Council’s Low Carbon Strategy commitment to be carbon neutral by 2030.

The trial saw 68.17 tonnes of CO2e/L displaced by the HVO fuel during the trial period. This would result in an annual reduction of 890.83 tonnes if the whole fleet were to switch over to HVO. The only exception would be a small mechanical road sweeper, Hako City Master 1600 (KX19EZL), used on the Environmental Services Contract which is unable to run on HVO fuel.

In addition, HVO fuel is biodegradable, non-toxic and odourless as its made from 100% renewable waste materials meaning it is safe for operatives to handle and significantly lower risk in the event of any spillages to the environment compared to fossil diesel.

6. APPENDIX 1 – HVO VS ULSD INDEX COMPARISON

Month / Year	HVO - PPL FT (North West Europe)	Blended ULSD FAME-10 NS (RED) UK - PPL FT + Duty (Rotterdam Blended)	Monthly Average Difference
Apr-21	107.50	96.06	11.44
May-21	110.18	98.67	11.51
Jun-21	118.93	100.93	18.00
Jul-21	114.62	101.76	12.86
Aug-21	112.20	101.19	11.01
Sep-21	112.44	105.58	6.87
Oct-21	118.24	114.09	4.16
Nov-21	127.96	113.81	14.15
Dec-21	133.97	110.19	23.78
Jan-22	130.08	114.67	15.41
Feb-22	130.44	118.62	11.82
Mar-22	151.38	140.21	11.16