Clean Our Air with HVO

Presented by

johnston oils

HVO offers: net GHG CO_2 reduction of up to 90% vs fossil diesel fuel.

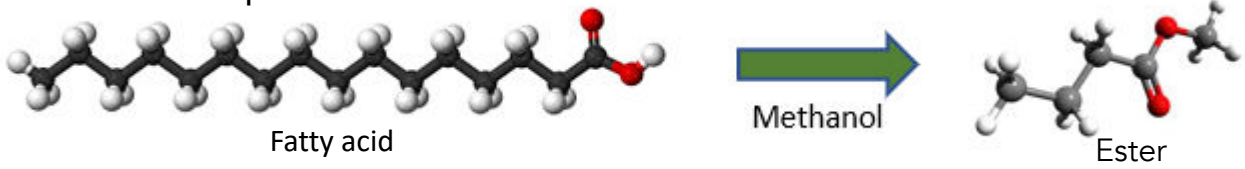
HVO is: manufactured from 100% renewable & sustainable waste derived raw materials, accepted by the Road Transport Fuel Obligation and certified by the ISCC.

HVO is: a drop in fuel that can replace mineral diesel with no changes required to the engine or operational infrastructure. HVO is legal for road and non-road use.

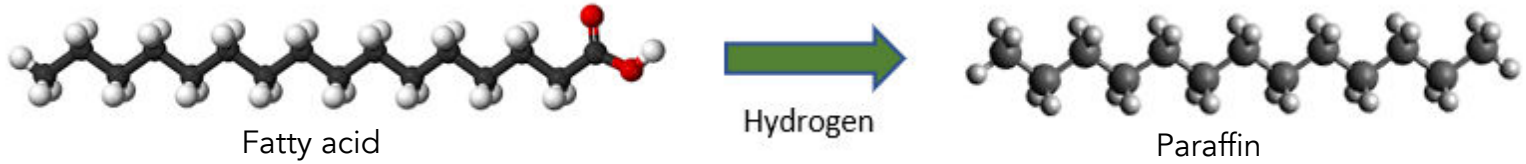
HVO gives: significant reductions in noxious tail pipe emissions.

HVO is a **renewable** diesel – HVO is **not** a biodiesel

Biodiesel production



HVO production



Benefit vs biodiesel

- ✓ Consistent product
- ✓ A true Diesel fuel
- ✓ No storage concerns (10 year shelf life)
- ✓ No heating required during storage
- ✓ Will not block filters in cold temperatures
- ✓ Can be mixed in all proportions with Mineral Diesel

Benefit vs diesel

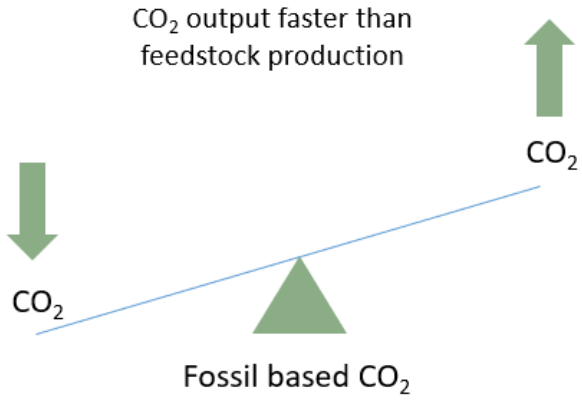
- ✓ Non-blend - consistency of quality and structure
- ✓ No aromatics – improved burn efficiency
- ✓ Reduced health and environmental risk
- ✓ Fuel savings, particulate matter & NOx reductions

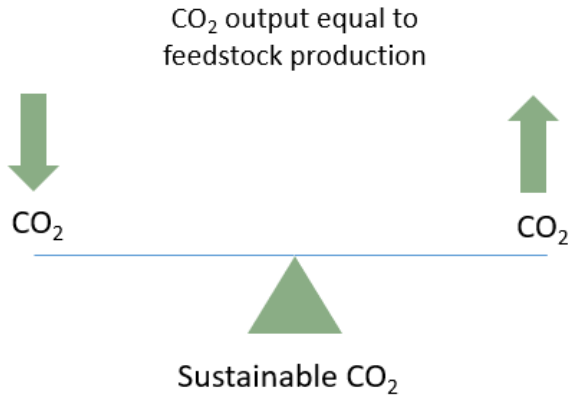
Why renewable, sustainable and low GHG?

Renewability = short term use and renew cycle

Sustainability = No damage to the environment during renew cycle

Low GHG = CO_2 does not linger within the atmosphere





Sustainability chain

RTFC (Road Transport Fuel Certificate(s)) issued

Each sale independently verified

Compliant with and approved by the Road Transport Fuel Obligation

Each import accompanied by Proof of Sustainability issued by an approved 3rd party

Meet the requirements of the Renewable Energy Directive

HVO is accepted by the UK Government as a renewable fuel and therefore plays a contributing role within the RTFO

To qualify for the RTFO a fuel must:

- ✓ Not contain products which contribute to global deforestation
- ✓ Not contain products grown on land transferred from the production of food
- ✓ Provide a minimum GHG saving of 60%
- ✓ Have independent confirmation of sustainability and GHG savings
- ✓ Crown HVO also qualifies for further RTFO credits as it is produced from 100% waste thus providing Crown HVO with a more favourable carbon intensity

Volume, million litres eq.[2]

		Supply periods[3]							
	Fuel Type	Jan	Jan-Feb	Feb - Mar	Mar - Apr	Apr - May	May - Jun	Total*	Percentage of total fuel supply
Fossil fuels	Diesel	947	2,408	2,295	1,501	1,154	-	**8,305**	54%
	Low sulphur gas oil	137	422	402	451	355	-	**1,767**	12%
	MTBE (fossil portion)	0	0	0	0	0	-	**0**	0%
	Petrol	580	1,297	1,277	733	408	0	**4,295**	28%
	Total	**1,664**	**4,127**	**3,975**	**2,685**	**1,916**	**0**	**14,367**	**94%**
Renewable fuel	Bio Petrol	-	3	4	4	6	-	**17**	0%
	Biodiesel HVO	0	2	2	4	5	1	**14**	0%
	Biodiesel ME	67	157	133	118	85	1	**561**	4%
	Bioethanol	29	64	59	36	20	-	**208**	1%
	Biomethane	-	-	-	13	-	-	**13**	0%
	Biopropane	-	-	-	-	-	-	-	0%
	Diesel (origin Bio)	-	1	1	1	2	-	**6**	0%
	Methanol (bio)	5	9	6	4	4	-	**29**	0%
	Off road biodiesel	4	8	11	11	6	0	**39**	0%
	Pure vegetable oil	-	-	-	6	-	-	**6**	0%
	Total	**106**	**243**	**217**	**198**	**127**	**2**	**893**	**6%**
Total		**1,770**	**2,044**	**4,191**	**4,370**	**2,883**	**2**	**15,260**	**100%**

https://www.gov.uk/government/statistics/renewable-fuel-statistics-2020-first-provisional-report

Each import of HVO is certified by the ISCC and it's GHG credentials confirmed and documented

Criteria Name	GHG	Criteria Value	Savings %	Bio quantity nl	Bio quantity kg
Total quantity				**1 787 181**	**1 393 823**
Quantity				**1 023 591**	**798 299**
Biofuel feedstock		UCO (vegetable origin) (waste/res			
Certificate ISCC		ISCC-EU			
Country of Origin of Feedstock		USA			
GHG from production (actual)	2,91				
GHG from transportation (act)	2,84				
Total GHG CO2e g/MJ	5,75		93,14%		

Each proof of sustainability confirms:

- Production facility
- Raw material origin and type
- Supplier
- Traceability
- The carbon intensity of the fuel – based on a full WTT LCA (outlined in RED) - including production and transportation emissions
- The ability to sell into the market
- SCOPE 3 GHG emission factor which can be used to report emission figures

Dealing with Palm….

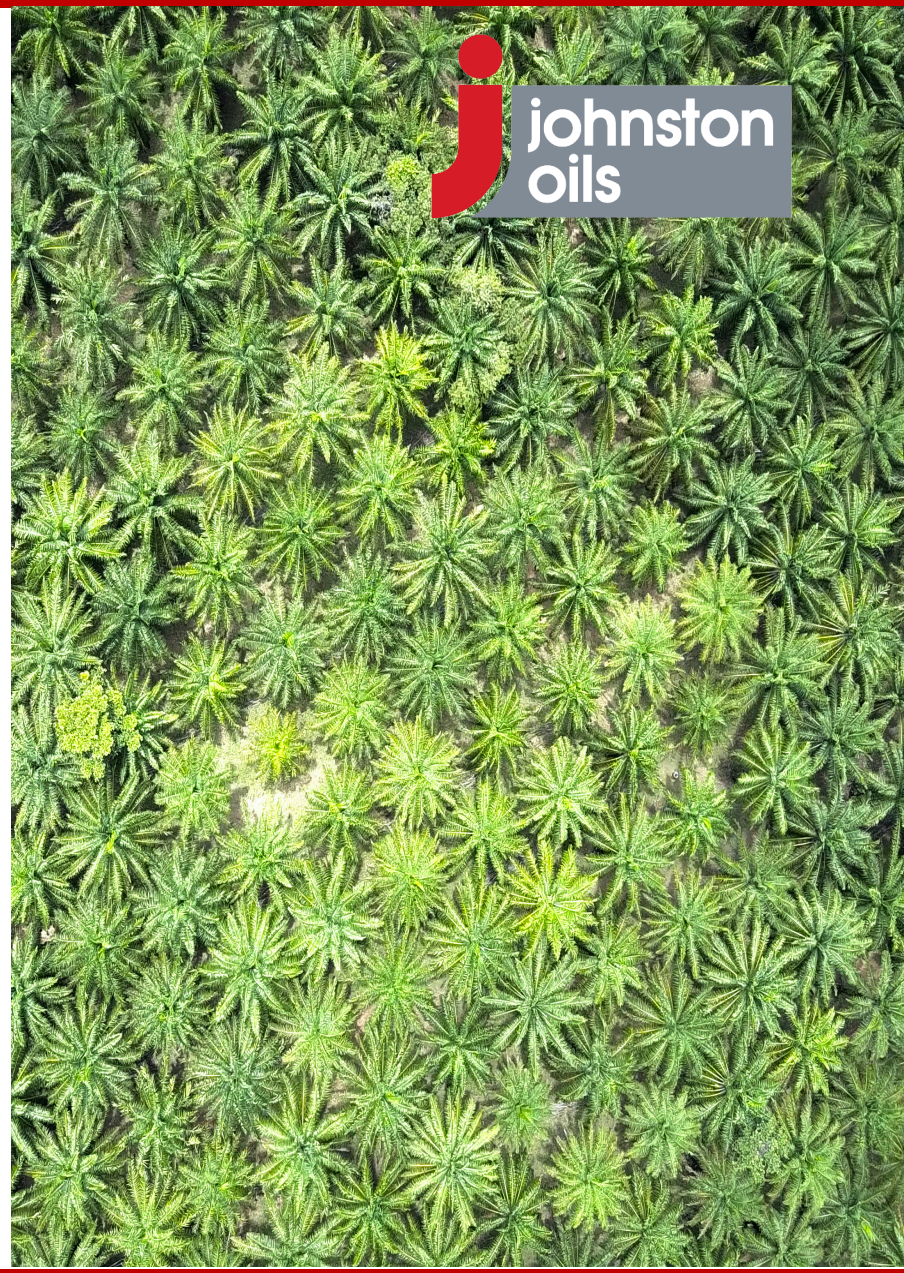
Yes HVO can be manufactured from Palm oil. But it doesn't have to be

Crown Oil does not support the use or sale of Palm oil derived HVO and will only supply ISCC verified waste derived product into the market

The POS will prove the origin of the raw material and ensures that you as a user can verify the credentials of the product

Palm oil or Palm derived products are used in a massive number of different consumer products. These applications are high value and therefore the prevalence of Palm oil in cooking oil is low

Waste materials are not the driver for cultivation



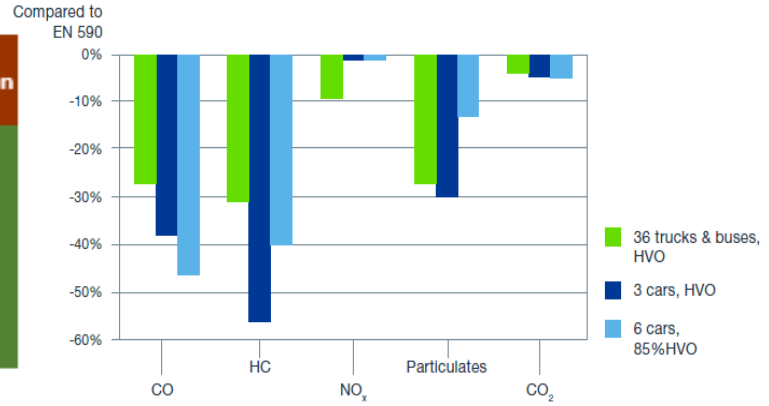
Tailpipe benefits

=-30% of PM (fine particulates)
=-30% of Hydrocarbons (HC)
=-25% of Carbon Monoxide (CO)
=-10% of Nitrogen Oxides (NOx)

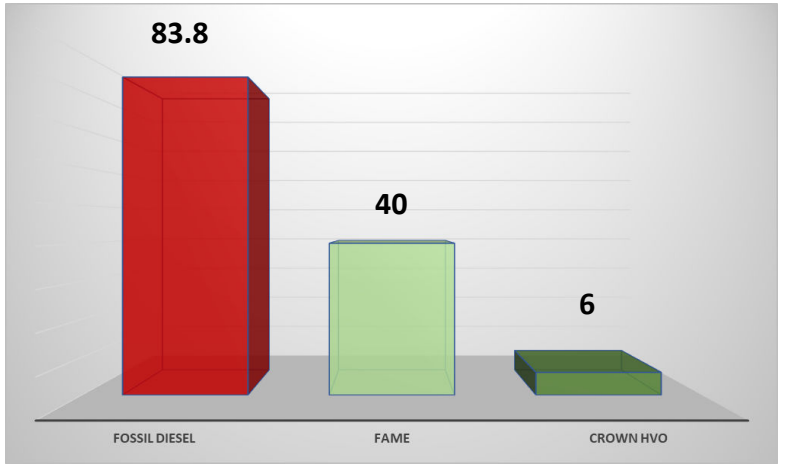
NRMM

	Gas Oil (g/kWh)	HVO (g/kWh)	% Reduction
CO	0.396	0.362	8.6
CO2	663.1	636.1	4.1
HC	0.119	0.07	41.2
NOx	6.041	5.615	7.1
HC+NOx	6.16	5.686	7.7

On road



GHG benefits



gCO_2e/MJ

Diesel – 3.6 tonnes GHG CO_2 / 1000L burned

HVO – 195 Kg GHG CO_2 / 1000L burned

HVO isn't as new as people think…

- ✓ It meets international fuel standards EN15940 & ASTM D975
- ✓ It has a large number of direct OEM approvals – others can use as an ASTM D975 fuel
- ✓ It's been available in continental Europe for 10+ years
- ✓ It's available on pump in Scandinavia and Benelux to the general public

Don’t just take our word for it…

Crown HVO trial at Rainham Marshes

- ✓ Conducted using a 28T excavator
- ✓ Tier IV engine
- ✓ 6000 litres of HVO used – fuelled using separate bowser
- ✓ Arduous conditions during a very wet winter
- ✓ Daily operating average – 15 hrs

Latest Hour Meter Reading	1,218 hr(s)	Time since Delivery	0Year(s) 4Month(s)
No. of Operating Days	26 Days	Machine Operating Hours	319.3 hr(s)

Operating Conditions Calendar

Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
			1	2	3	4
					5.3	
					101	
5	6	7	8	9	10	11
	8.9	9.0	14.8	15.2	8.5	15.9
	127	153	253	263	145	273
12	13	14	15	16	17	18
11.6	16.8	18.2	16.6	14.8	15.8	1.4
163	265	349	288	224	232	26
19	20	21	22	23	24	25
	9.3	4.6	9.7	6.5	9.2	7.7
	156	68	147	101	149	86
26	27	28	29	30	31	
5.0	15.3	18.9	18.8	21.9	19.6	
66	273	232	260	321	252	

Color Legend

15.0 / 225	Daily operating hours are 6.1 hrs or more.
5.0 / 75	Daily operating hours are 6.0 hrs or less.
2.0 / 30	Daily operating hours are 4.0 hrs or less.
	No Operating

Item Legend

1	Date
5.0	Operating Hours[hr(s)]
75	Fuel Consumption[l]

Power Mode Ratio

PWR Mode	100 %	ECO Mode	0 %

* Fuel consumption can be improved by using ECO mode.

Fuel Efficiency & CO2

Fuel Consumption	4,964 l	Over Preceding Month	+1,389 l

* The fuel consumption amount shown above was theoretically calculated and is slightly different from the actually consumed amount.
It is either calculated from theoretical injection amounts or extrapolated from hydraulic pump loads.

Fuel Efficiency	15.6 l/hr	Over Preceding Month	+0.2 l/hr

* Fuel efficiency is calculated based on fuel consumption / operating hours. Fuel Efficiency improves with less non-operation hours.

Latest Hour Meter Reading	1,646 hr(s)	Time since Delivery	0Year(s) 5Month(s)
No. of Operating Days	29 Days	Machine Operating Hours	427.6 hr(s)

Operating Conditions Calendar

Sun.	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.
						1
						18.3
						225
2	3	4	5	6	7	8
17.6	13.2	12.2	17.0	17.1	16.6	18.9
210	177	211	270	209	217	267
9	10	11	12	13	14	15
5.5	14.6	17.9	18.7	17.7	15.8	20.0
82	224	263	316	271	230	319
16	17	18	19	20	21	22
7.9	21.7	20.4	17.1	18.3	8.0	12.1
129	326	279	273	269	124	180
23	24	25	26	27	28	29
0.3	6.5	11.2	21.8	16.7	14.6	10.2
1	94	190	269	244	194	135

Color Legend

15.0 / 225	Daily operating hours are 6.1 hrs or more.
5.0 / 75	Daily operating hours are 6.0 hrs or less.
2.0 / 30	Daily operating hours are 4.0 hrs or less.
	No Operating

Item Legend

1	Date
5.0	Operating Hours[hr(s)]
75	Fuel Consumption[l]

Power Mode Ratio

PWR Mode	100 %	ECO Mode	0 %

* Fuel consumption can be improved by using ECO mode.

Fuel Efficiency & CO2

Fuel Consumption	6,191 l	Over Preceding Month	+1,227 l

* The fuel consumption amount shown above was theoretically calculated and is slightly different from the actually consumed amount.
It is either calculated from theoretical injection amounts or extrapolated from hydraulic pump loads.

Fuel Efficiency	14.5 l/hr	Over Preceding Month	-1.1 l/hr

* Fuel efficiency is calculated based on fuel consumption / operating hours. Fuel Efficiency improves with less non-operation hours.

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- ✓ Work rate levels comparable between HVO and diesel
- ✓ No issues with running or breakdown
- ✓ Operator reported no issues with the machine and no pow reduction
- ✓ Crown HVO provided a 10% reduction in fuel consumptio

	SCOPE 1 CO_2	SCOPE 3 CO_2	NOx
DIESEL	15,243 Kg	3,660 Kg	210 Kg
HVO	0 Kg	1170 Kg	168 Kg

So why wouldn't you use Crown HVO fuel?

- Operability under no question
- Legislative back up
- Performance accepted
- Environmentally beneficial
- Offers a fast and simple step toward "NET zero" with no CAPEX requirement

? COST

Availability / Capability

- HVO capacity is growing quickly globally (+50% in three years)
- Majority of production is in Europe, with N. America and Asia also growing capacity

- Crown Oil has product (Red and White) positioned across the UK
  - Vast majority of deliveries available either same day or within 3 days
  - Smaller drops and “hard to reach” locations also within scope

- Packs – 1000L & 205L drums available next day.

In summary

- 100% bioderived but biodiesel free – avoids the stability and operability issues faced by many low blend Diesels and high blend biofuels
- Production process leaves shelf life of up to 10 years
- Reduces net GHG CO_2 emissions by ca 90%
- Reduces particulate matter and NO_x emissions
- Zero CAPEX costs (plant and infrastructure) to move to HVO
- Users can make a contribution to "Net Zero" target quickly
- High flashpoint – improves safety, handling and storage
- Low CFPP of -32°C
- Biodegradable so avoids environmental damage if accidentally released into the ecosystem
- Improved fuel consumption compared to mineral diesel in NRMM machinery

- Crown Oil are able to supply nationally in bulk or as packed stock