FREQUENTLY ASKED QUESTIONS ON RENEWABLE DIESEL (HVO)

INDUSTRIAL APPLICATIONS

WHAT IS HVO?

1. **What is HVO fuel made of?** *Renewable diesel, also known as paraffinic fuel, is a low carbon biofuel produced by processing waste lipids, such as vegetable oils, tallow or used cooking oils. Hydrotreated Vegetable Oil (HVO) is the most popular and readily available renewable diesel, or paraffinic fuel, and is the renewable diesel used by Cummins for testing purposes. HVO is derived from the same feedstocks used to produce biodiesel. However, instead of using transesterification process, HVO is produced via hydrotreated process.*
2. **What is the difference between HVO and biodiesel/FAME (Fatty Acid Methyl Ester)?** *Both HVO and biodiesel can be derived from the same feedstocks but through different processes. The major difference between biodiesel and HVO is biodiesel contains oxygenated groups which potentially impacts the fuel stability. However, HVO is produced via a hydrotreatment process, so there is no oxygenated group, which helps improve fuel oxidation stability.*
3. **What is the difference between HVO and GTL fuels?** *Physically and chemically, both fuels are the same fuel and meet the EN 15940 fuel specification. However, there are two major differences between HVO and GTL fuels. While HVO is produced from renewable feedstocks, GTL is produced from a fossil fuel, natural gas. Moreover, HVO is produced via a Hydrotreated process, whereas GTL is produced via the Fischer – Tropsch process.*
4. **What is the reason for HVO fuel getting promoted more when compared with other renewable fuels?** *HVO is being promoted due to its lifecycle emissions advantage and its chemical similarity to conventional diesel fuel. Unlike biodiesel, HVO has good oxidation stability and is not prone to bacterial growth, making HVO suitable for standby applications. All of these factors help operators meet their carbon reduction goals.*
5. **What are the differences between HVO Fuel and Diesel Fuel?** *HVO, chemically and physically, is very similar to diesel fuel. Despite this, there are some differences: HVO has (1) ~ 7% less fuel density, (2) limited aromatic content, (3) limited sulfur content, (4) higher cetane value, (5) a bit higher H/C (Hydrogen/ Carbon) ratio.*

CUMMINS APPROVAL AND WARRANTY

6. **Does Cummins approve the use of HVO fuel on Cummins high-horsepower engines?** *Cummins approves use of HVO fuel in all high-horsepower engines (19L-95L), including the QSK19, K19, QSK23, QST30, QSK38, K38, QSK45, QSK50, K50, QSK60, QSK78, QSK95, V903 and ACE for all industrial markets. No engine modifications are required; engines currently in the field can be used with HVO at any percentage.*
7. **Is there a Cummins recommendation for HVO fuel specification?** *Cummins requires that HVO fuel comply with the requirements of EN15940.*
8. **Can we purchase HVO fuel from any manufacturer?** *HVO may be sourced from any supplier provided that the fuel complies with EN15940. However, exact carbon reduction measurements vary based on the feedstock and fuel pathway, so to be sure of carbon intensity reductions, please consult directly with the fuel manufacturer.*
9. **Are Cummins products covered under warranty using HVO fuel?** *Warranty is covered for all products listed for use with HVO fuel on the Cummins fuels bulletin, available in QSOL.*
10. **What is the procedure that we should be following to use HVO fuel on a product that is not approved by Cummins?** *Contact your Cummins distributor or account manager.*
11. **Our local regulation has a higher min. flash point requirement than what is stated in EN15940 (e.g. Local Regulation - Min flash Point is 65 deg C vs EN15940 - Min flash point is 55 deg C). Can this fuel be used?** *Yes, fuel with higher flash point then the min requirement by EN15940 can be used. Confirm with supplier that it meets the local regulations.*

PERFORMANCE

12. **What is the performance difference when using HVO fuel compared to standard Diesel Fuel?** *With the exception of fuel consumption, there are no inherent differences in performance between diesel and HVO beyond normal site and unit to unit variation. There is a potential mechanical power loss of 1 – 2% due to the lower energy density of HVO fuel.*
13. **What is the difference between standard fuel and HVO fuel in fuel consumption?** *HVO fuel will have up to 5% higher fuel consumption than what is documented on the data sheet. Add 5% to data sheet values for application needs.*
14. **What are the typical failures for Cummins Engines running with HVO fuel?** *There are no anticipated failures attributed to running engines with HVO fuel.*
15. **Can we mix HVO fuel with Diesel Fuel in the fuel tank?** *Any blend of diesel and HVO is acceptable with no anticipated difference in engine behavior except for slightly greater fuel consumption.*

EMISSIONS COMPLIANCE

16. **Is there any impact to emissions performance when using HVO?** *NOx emissions are comparable and PM emissions are lower when using HVO fuel compared to diesel.*
17. **Is there any impact to Emissions Certifications?** *EPA Tier 2 certification and TA Luft 2g compliance are not impacted by using HVO fuel. (EPA certification requires a specific blend for certification and publishes requirements for fuels to be used in the field. HVO meets those requirements.)*
18. **Are there separate emissions data sheets for HVO?** *No, standard emissions data sheets are to be used for submittals and permitting.*

OPERATION AND MAINTENANCE

19. **What are the recommendations for maintenance, storage and fuel polishing of HVO?** *Maintenance, fuel polishing and storage recommendations are the same for diesel and HVO. Most fuel polishing systems will work with either diesel or HVO without modification.*
20. **Is bacterial growth a concern with HVO as it is with biodiesel?** *No, HVO is a more stable fuel than biodiesel and is not susceptible to bacterial growth and oxidation stability concerns.*
21. **What are the considerations regarding cold weather operability with HVO?** *Confirm with the fuel supplier that the HVO purchased will work at all site ambient conditions. Note that traditional methods of fuel blending or anti-gelling agents may not be effective.*
22. **Are there any differences between HVO and diesel in terms of what additives can be used?** *In general Cummins neither approves nor disapproves of additives, however many diesel additives can be used with HVO. There are only two additives endorsed by Cummins for use with either diesel or HVO: PowerService Diesel Kleen +Cetane Boost and PowerService Diesel Fuel Supplement +Cetane Boost. Check with your fuel supplier to confirm the effectiveness of other additives.*

GLOSSARY

Feedstocks: *A feedstock is defined as any renewable, biological material that can be used directly as a fuel, or converted to another form of fuel or energy product.*

Hydrotreated: *Hydrotreated is a hydrogen process known to remove Sulphur and nitrogen impurities. This method is used to create substitutes for gasoline/diesel/gasoline/diesel/other chemical feedstock.*

Transesterification Process: *Transesterification is defined as chemical conversion process of triglycerides with alcohol into alkyl esters with help of a catalyst. This process is typically used to produce bio-diesel fuel.*

Oxygenated Groups: *Major organic functional groups that contain oxygen are called oxygenated groups. There are 5 functional groups with oxygen called aldehydes, ketones, carboxylic acids, esters and ethers.*

GTL Fuels: *GTL (Gas-To-Liquid) is a cleaner alternative to normal diesel. Clear, bright, and almost water-like in appearance, GTL Fuel produces no characteristic "diesel" odor due to a lack of Sulphur and aromatics. GTL Fuel is part of the paraffinic family of fuels and complies with EN15940 standards.*
As a synthetic fuel produced from natural gas using the Fischer-Tropsch process, its improved combustion properties help to reduce emissions of regulated pollutants and improve local air quality.

Fischer – Tropsch: *The Fischer – Tropsch process is a collection of chemical reactions that converts a mixture of carbon monoxide and hydrogen, known as syngas, into liquid hydrocarbons.*

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