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Public consultation on the future EU 2020 strategy

Biofuels for automotive vehicles, general

The use of biofuels in automotive vehicles is one option for moving towards a smarter and greener transportation system with a lower carbon footprint. Ethanol and its derivates like ETBE can be used in cars without major drawbacks. But replacing diesel fuel with biofuels is more challenging especially at the higher biofuel ratios as will be required in the future.

Diesel fuel can be extended by the 1st generation ester type biodiesel also called FAME (fatty acid methyl ester) at low concentrations. However, FAME faces certain challenges with respect to fuel storage stability, deposit formation in vehicle fuel systems, engine oil compatibility and lifetime of exhaust aftertreatment systems as the concentration increases. In the future, new low emission vehicle designs with longer durability requirements will require even cleaner fuels than today. Additionally, diesel vehicles must be able to operate in all climatic conditions, even to temperatures as low as -30 to -40°C in some markets. This is difficult with FAME. The demand that the fuel must be shown to be fit-for-purpose intended has not gotten enough attention in many discussions since the official vehicle emission certification is performed in test facilities only at +20°C and -7°C temperatures.

Hydrotreated vegetable oil, HVO, for diesel vehicles

The hydrotreating of vegetable oils (HVO) is an alternative process for producing renewable fuel for diesels. HVO goes by the name Renewable Diesel in USA markets. The composition of HVO is similar to that of the clean burning GTL (gas-to-liquids) and BTL (fuel made by gasification of biomass and synthesis, not yet in commercial scale) diesel fuels.

Feedstocks for the HVO process are the same as for FAME: vegetable oils that can be extended with some waste animal fats. In both the FAME and HVO processes, a secondary feedstock is used. For FAME this is methanol derived from natural gas and for HVO hydrogen produced from natural gas. Both processes use approximately the same amount of natural gas. In the future, this fossil natural gas may be replaced by ethanol for esterification and bio-hydrogen for HVO. Due to the special features of the HVO process, feedstock volumes are larger than that of FAME since all types of vegetable oils can be used for HVO without sacrificing diesel fuel quality, especially cold operability.

Since the HVO and FAME process use similar feedstocks and the same amount of fossil natural gas, the carbon footprint of HVO is about the same or even slightly more beneficial than that of FAME. The reason for this is due to the method used to calculate the benefit of the co-products: glycerol for FAME and propane for HVO.

HVO as a product is a very clean burning paraffinic fuel that can be used in high blending ratios (e.g. about 30 %) in diesel fuel or as a neat fuel in dedicated vehicles such as city buses. Some problems with FAME have been found already at 5 … 7 % blends (engine oil deterioration, deposits, cold operability). Tests have shown that particulate and nitrogen oxides exhaust emissions of HVO are actually lower than those of sulfur-free standard diesel fuel. HVO being a pure hydrocarbon has good storage stability and does not cause troubles with fuel system deposits and engine oils. Since combustion of HVO is ash-free it does not limit lifetime of particulate filters used for exhaust aftertreatment. HVO is fully suitable for the current fuel logistics and vehicle park.

Fuel grades for severe and arctic winter conditions can be produced by the HVO-process by adjusting the severity of the process.

The advantages of the diesel engine fuel efficiency will be maintained with HVO. HVO use in diesel cars is very fuel efficient: fuel consumption of a mid sized car is less than 5 liters per 100 kilometers. Corresponding consumption in a car designed for ethanol (FFV-car running with E85) requires by comparison about 10 liters per 100 km.

For these reasons automotive manufacturers commonly prefer HVO over FAME as a blending component in diesel fuel or a fuel as such. HVO and in the future BTL will offer engine designers the possibility to create even more fuel efficient, low emission engines.

HVO is therefore a very important component of the overall biofuel mix. A wide variety of feedstocks may be used in it’s production, a fuel of premium quality is produced for fuel sensitive low emission vehicles as well as trouble free operation in all climate conditions. HVO processes are operating already today at a proven commercial scale. This means that due consideration should be given to HVO whenever and wherever biofuels are being looked at and when the production capacity of biobased diesel fuels is increased during the decade 2010 … 2020.

Technologically neutral, fit-for-purpose low-carbon solutions

Optimum solutions for the future should be technologically neutral and based on carbon footprint, fit-for-purpose of vehicles in all driving conditions, low exhaust emissions, and durability of engines and exhaust aftertreatment systems. Hydrotreating process (HVO) instead of esterification (FAME) offers many benefits when diesel fuels are produced from renewable feedstocks.

Compared to FAME, HVO offers savings in logistics. Because of its perfect fit for all current diesel engines due to its chemical structure, the use of HVO does not require additional investments in transportation, storing or pumping logistics. This translates into significant savings in indirect investment costs for all parties involved.