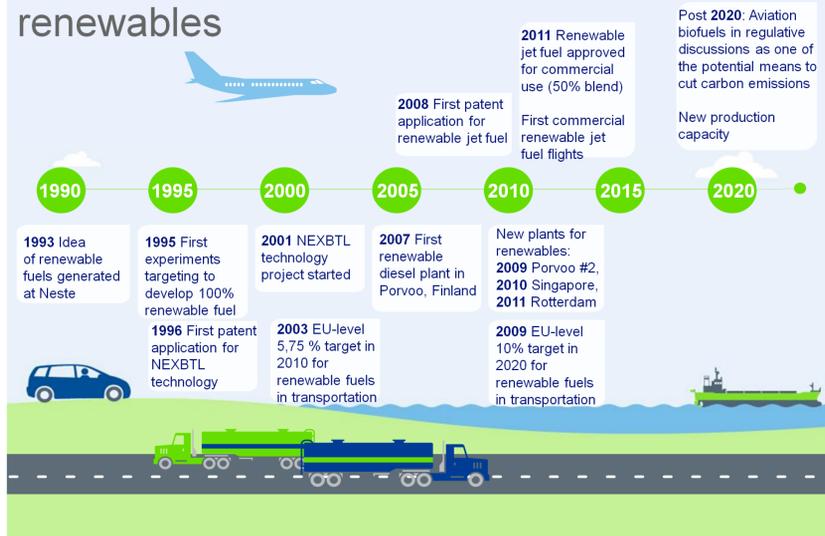


Development of Neste Renewable Products

From Idea to Premium Quality Neste MY Renewable Diesel and Beyond

History

Neste's milestones in the development of renewables



Development of renewables

First literature studies in 1993 and first laboratory tests in 1994. In early 2000's research on conventional biodiesel route (FAME) was discontinued as NEXBTL technology offered more promising production technology and product properties. The technology was developed further, but the time was not ripe for building a **full-scale production plant until 2007.**

Production gradually rose to 2.6 Mt/a by building of additional production plants and by de-bottlenecking production processes.

An extensive field trial^[1] with some 300 busses was conducted in Helsinki Metropolitan area **2007-2010.** The project confirmed Neste MY Renewable Diesel can be used to replace fossil diesel without any modifications to refuelling system or to the vehicles, and without any operational problems.

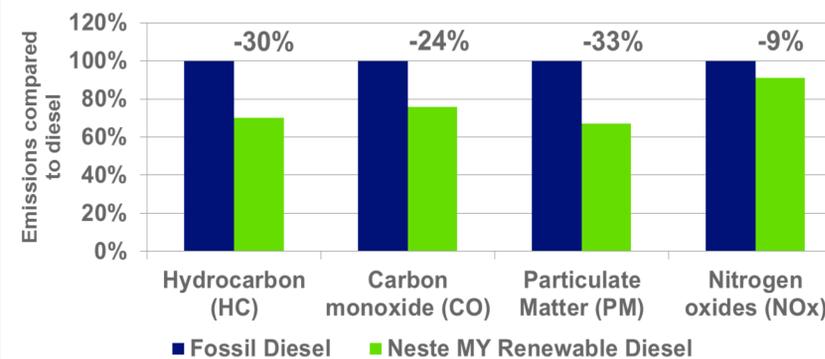
In 2011, Neste Renewable Jet Fuel was approved to be used as a blending component up to 50 vol-%, and first commercial flights with it were flown.

In 2016 standard EN 15940 for paraffinic diesels, such as Neste MY Renewable Diesel, was finalised.

Properties of Neste MY Renewable Diesel

1. **Neste MY Renewable Diesel**, based on Neste's proprietary NEXBTL technology, is an **excellent choice for lowering traffic emissions^[2]** and **reducing carbon footprint up to 90%** (throughout the life cycle of the fuel compared to conventional fossil diesel).
2. Neste MY Renewable Diesel is **produced from 100% renewable raw materials**, with **waste and residues accounting for nearly 80%**. Neste only accepts sustainably-produced raw materials.
3. Neste MY Renewable diesel is a **premium-quality fuel** that offers **better performance** and has **excellent cold properties**. Automotive companies recommend HVO-type fuels instead of FAME^[3].
4. Neste MY Renewable Diesel is **compatible with all diesel engines and existing distribution systems**, meaning that it **does not require any additional investments**.

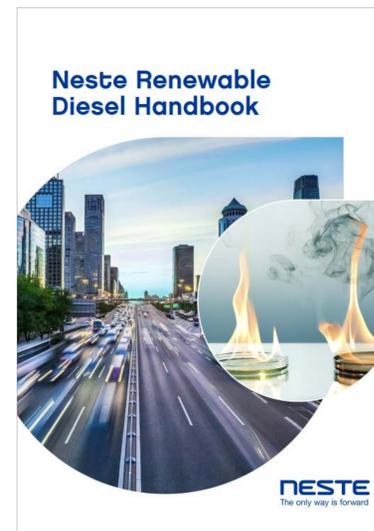
Influence of Neste MY Renewable Diesel on exhaust emissions



More information can be found in Neste Renewable Diesel Handbook^[4] and Nestemy.fi website^[5] which provide information on properties of Neste MY Renewable Diesel, in Europe classified as a Hydrotreated Vegetable Oil (HVO), and its use in diesel engines.

Potential readership of Neste Renewable Diesel Handbook consists of, e.g., fuel and exhaust emission professionals in oil companies, automotive industry representatives, fuel blenders, research facilities, and people preparing fuel standards and regulation.

Neste Renewable Diesel Handbook can be downloaded at Neste's website.



Future

Neste MY Renewable Diesel

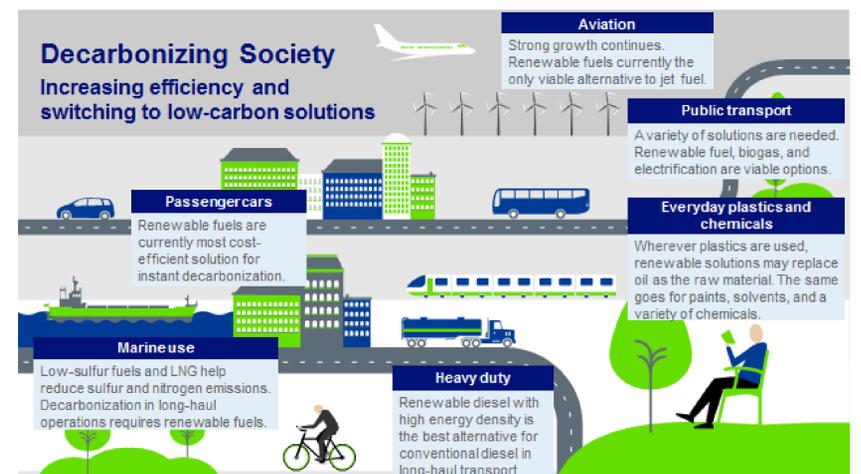
Previous studies have proven benefits of Neste MY Renewable Diesel in vehicles designed for the use of fossil diesel. Additional energy efficiency and emission benefits could be achieved by **optimizing engine and exhaust after treatment calibration** for Neste MY Renewable Diesel. Various fuel detection technologies are already being developed, thus this kind of **Flexi-Fuel technology** is not necessarily that far away.

Neste Renewable Gasoline

With NEXBTL process it is possible to produce gasoline components made of renewable feedstocks. As a blending component, it offers a **possibility for increasing bio-content** in gasoline **without exceeding allowed oxygen content**.

Renewable Jet Fuel

Growth of air travel is predicted to continue strong in the coming years. **Renewables** are currently the only viable alternative to jet fuel, and it **offers an easy way to cut emissions in aviation**.



^[1] Nylund, Nils-Olof et al. Optimized usage of NEXBTL renewable diesel fuel. OPTIBIO. Espoo 2011. VTT Tiedotteita – Research Notes 2604. 167 p. + app. 5 p.
^[2] Erkkilä, Kimmo et al.(2011). Emission performance of paraffinic HVO diesel fuel in heavy duty vehicles. JSAE/SAE Technical Paper JSAE 201119239. SAE 2011-01-1966. 12 p
^[3] Worldwide Fuel Charter 5th Edition. September 2013. http://www.acea.be/uploads/publications/Worldwide_Fuel_Charter_5ed_2013.pdf
^[4] Nortio, Jenni et al. Neste Renewable Diesel Handbook. Espoo 2016. https://www.neste.com/sites/default/files/attachments/neste_renewable_diesel_handbook.pdf
^[5] <https://nestemy.fi/>