



# Renewable fuels

*for use in diesel engines.*

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A microscopic view of green algae cells, showing numerous spherical and elongated structures with varying degrees of focus, creating a bokeh effect in the background. The colors range from bright green to dark teal.

## Introduction

Renewable fuels are derived from renewable resources such as planted crops (soy, palm, rapeseed, etc.), used cooking oil, animal fat, biomass, algae, and others. When considering the life cycle of the fuel, renewable fuels have lower-carbon footprints. Renewable fuels that are derived from fats and oils may be processed through hydrotreating. The result is a high paraffinic renewable diesel (RD), also called hydrotreated vegetable oil (HVO), that can be used in diesel engines.

Biomass and syn gas can be converted into liquid fuels through various processes and their products are typically known as biomass-to-liquid (BTL) or gas-to-liquid (GTL). Depending on the original feedstock these products may be renewable. BTL, GTL and HVO have similar chemistries and performance specifications, and all can be used in diesel engines.



# Guidelines

Note that lower-carbon intensity fuels covered in this paper are different than biodiesel fuel.

Lower-carbon intensity fuels are typically paraffinic hydrocarbons, hence these fuels, whether at 100% or blended, can be used as drop-in replacements for diesel fuel. These fuels have many potential benefits:

- They can be renewable with lower life cycle carbon intensity.
- They can be formulated to provide low temperature capability. Consult with your supplier to ensure the fuel meets the ambient temperature requirements of the application.
- They can reduce the emissions of certain products of incomplete combustion, such as unburned hydrocarbons (UHC), soot, and carbon monoxide (CO). They may also reduce Nitrogen Oxide (NOx) emissions under certain engine loads and cycles.

In order to be applicable for Perkins diesel engines, Perkins recommends that renewable and lower-carbon intensity fuels meet the latest version of any of the following specifications:

- EN15940, which defines quality requirements for BTL, GTL and HVO. This is the preferred

specification for renewable and lower-carbon intensity fuels covered in this paper.

- ASTM D975, which is the specification for diesel fuel in the United States.
- EN 590, except for its density provisions. This is the specification for diesel fuel in Europe.
- The Perkins Diesel Fuel Specification, except for its density provisions.

Renewable and lower-carbon intensity fuels that meet the requirements listed above can be used at:

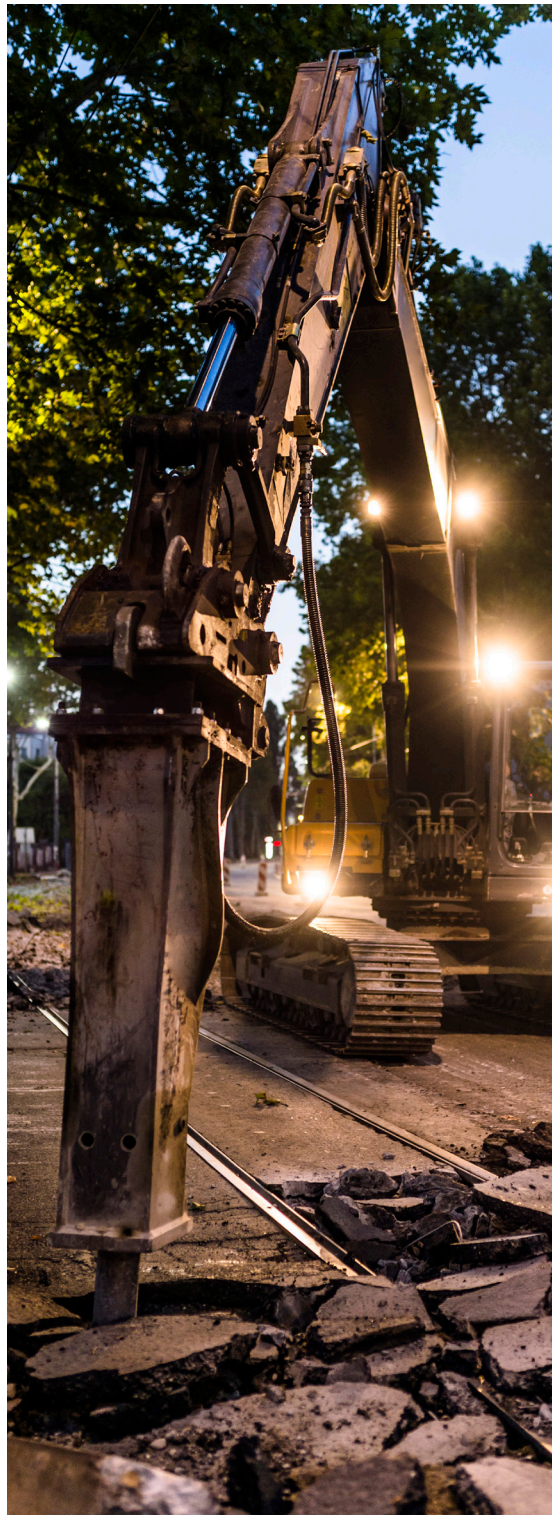
- 100 percent (may be called RD100, HVO100, or GTL 100);
- Any blend level with diesel fuel;
- Any blend level with a maximum of 20% biodiesel\*;
- Any blend level with a combination of diesel fuels and a maximum 20% biodiesel\*.

\*see your engine's Operation Maintenance Manual for specific biodiesel limits on your engine

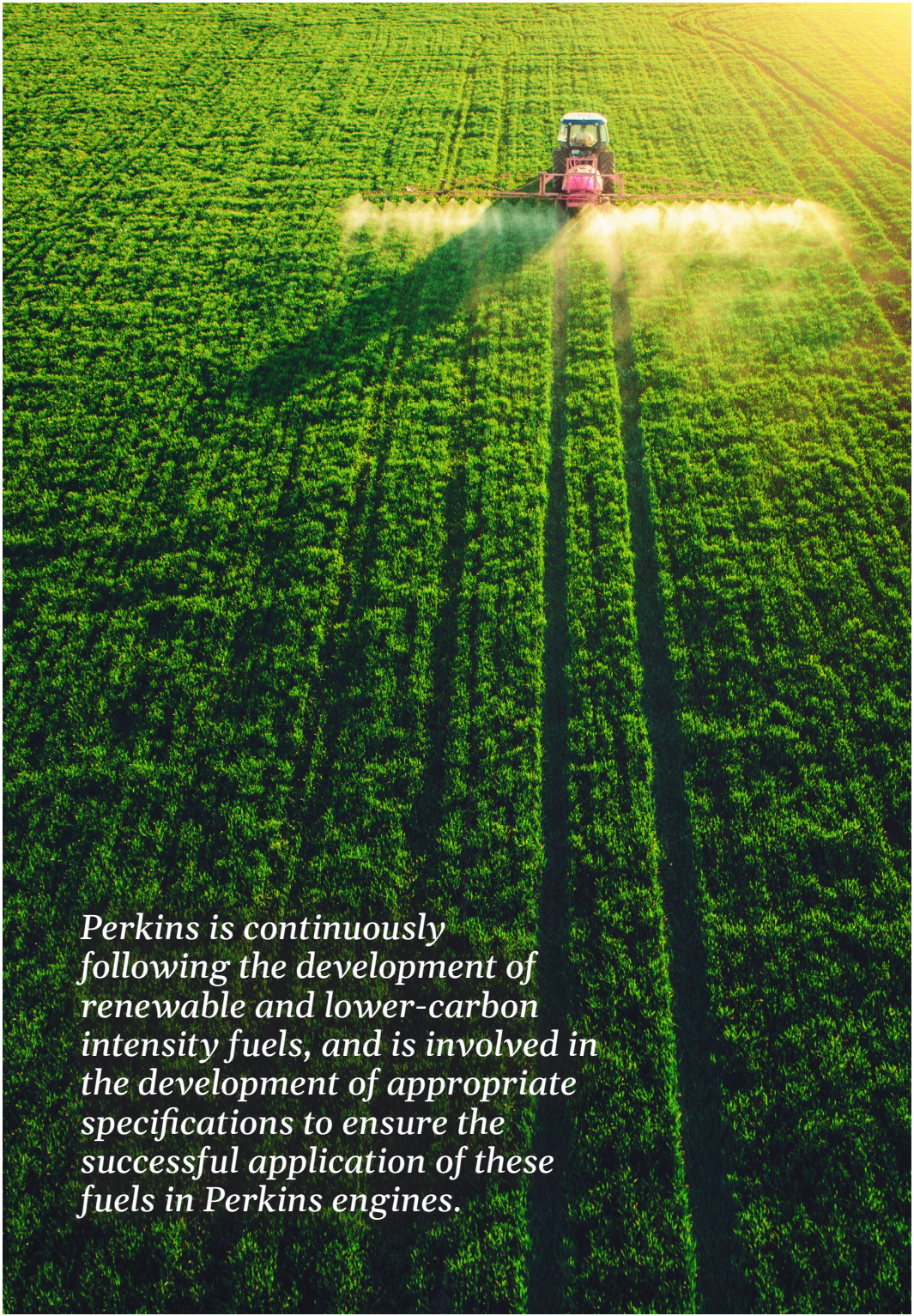


Here is Perkins' guidance and potential impacts for the use of renewable and lower-carbon fuels according to the specifications detailed above:

- No specific engine conversion process is needed when these fuels are used for the first time or thereafter.
- These fuels may reduce the power output of engines due to their low density. Up to a 5% reduction may be noted at full load, along with slightly increased fuel usage.
- They are compatible with aftertreatment technologies such as diesel particulate filter (DPF), diesel oxidation catalyst (DOC) and SCR (selective catalytic reduction), and they can be used on engines that meet U.S. EPA Tier 4, EU Stage V, and similar advanced emission standards.
- They are compatible with filters and engine oils used with typical diesel fuels. No impact on maintenance intervals is expected. In general, it is recommended that oil drain intervals are based on oil analysis.
- They are compatible with elastomeric materials and hoses used on most modern engines. Certain elastomers used in older engines, such as those manufactured prior to the early 1990s, may not be compatible with the new alternative fuels. Refer to your Perkins distributor for guidance.
- They can be stored in the same tanks used for diesel fuel, and they have a similar aging life as diesel fuel.
- As with all fuels, renewable and lower-carbon intensity fuels have to be managed to reduce contamination and water ingress.







*Perkins is continuously following the development of renewable and lower-carbon intensity fuels, and is involved in the development of appropriate specifications to ensure the successful application of these fuels in Perkins engines.*

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