Did you know that...

- As a drop-in biofuel, NEXBTL diesel behaves exactly like fossil diesel.
- Because of its diesel-like behavior, quality-related blending limitations do not apply to NEXBTL diesel.
- NEXBTL diesel offers 40–90% CO_2 reduction compared to fossil diesel.

NESTE OIL

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NESTE OIL

NEXBTL renewable diesel

Premium quality renewable diesel

2014

Cover image: Shutterstock

High performance from NEXBTL renewable diesel

Premium-quality NEXBTL renewable diesel outperforms both conventional biodiesel and fossil diesel by a clear margin.

Unlike conventional biodiesel, Neste Oil's NEXBTL renewable diesel has no blending wall, and therefore it also offers greater possibilities for meeting biofuel mandates.

NEXBTL renewable diesel is unique. Proprietary hydrotreating technology converts vegetable oil and waste fats into premium-quality fuel. Therefore, NEXBTL renewable diesel is a pure hydrocarbon with significant performance and emission benefits.

Benefits in brief

- Superior quality – outperforms both conventional biodiesel and fossil diesel
- Compatible with all diesel engines – in cars, buses, trucks and non-road machinery
- Engines running on NEXBTL renewable diesel simply perform better, are more fuel-efficient, and have cleaner combustion.
- Excellent cold weather performance
- No blend wall – can be blended up to 100%
- Fully compatible with existing distribution and logistics systems
- Can be stored over long periods of time with no deterioration in quality

"Our experience has been extremely positive in our own fleet. We have experienced zero customer complaints or issues."

Pat O'Keefe,
Vice President, Golden Gate Petroleum, US

Excellent solution for fleet to improve local air quality

NEXBTL renewable diesel is ideal for use in urban areas and can make a valuable contribution to improving local air quality, particularly when used 100%.

No need for additional investments in vehicles or logistics

The low emission profile of NEXBTL renewable diesel is a major plus for fleet use in buses, delivery trucks and vans. As it behaves just like conventional fossil diesel, whatever the blend, no additional investments are needed, either in new vehicles or fuel logistics. Fleets can switch to a cleaner fuel overnight – literally.

Performance proven in extensive field trials

More than 40 trials covering numerous different engines and after-treatment systems have shown that NEXBTL renewable diesel delivers significant reductions in major air pollutants. The more renewable NEXBTL diesel in a vehicle's fuel, the greater the benefit.

Lower maintenance costs

Service and maintenance costs of vehicles running with NEXBTL diesel are lower than with other alternative fuels and the regular oil drain intervals suit the use of this renewable diesel.

Based on over 40 scientific studies with different engines and after-treatment systems, 100% NEXBTL diesel provides significant reductions in major air pollutants:

Particulate matter (PM)	-33%
Nitrogen oxides (NO_x)	-9%
Carbon monoxide (CO)	-24%
Hydrocarbons (HC)	-30%

Excellent results from the world's largest renewable diesel trial in Helsinki

A three-year trial using NEXBTL renewable diesel in 300 buses in Greater Helsinki, Finland, highlighted what the fuel offers. Some of the 17 different types of buses in the trial ran on a 30% blend and some ran exclusively on 100% NEXBTL diesel. Regardless of the blend, none of the buses experienced any engine problems, even when temperatures dropped to as low as -25°C. The vehicles delivered an average particulates reduction of as much as 1/3 compared to fossil diesel.

Cost-efficiency into blending and logistics

NEXBTL renewable diesel is a 'drop-in solution' and can be used exactly like fossil diesel – with no special logistics or strict blending limits.

Fully compatible with existing infrastructure

Unlike traditional biofuels, NEXBTL is a 'drop-in' fuel and is fully compatible with existing fuel infrastructure, distribution systems, and engines. No costly conversion of tanks, pipelines, pumps, or ships is needed. In fact, it can be distributed exactly like fossil diesel, all the way from the refinery to service stations and the end-user.

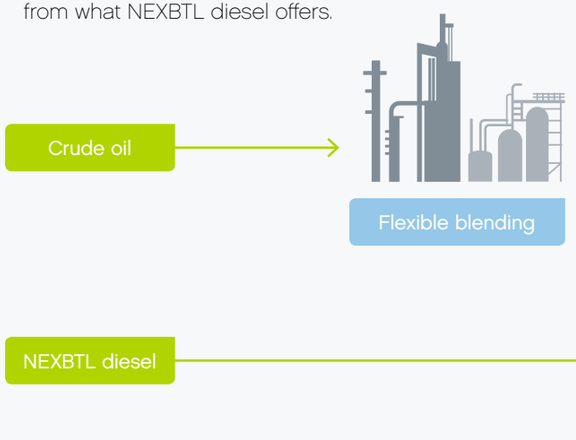
No blend wall

There is no blend wall with NEXBTL. While regular diesel engines can run on fuel containing no more than 7% conventional biodiesel, they suffer no performance problems whatever the amount of NEXBTL renewable diesel in their fuel.

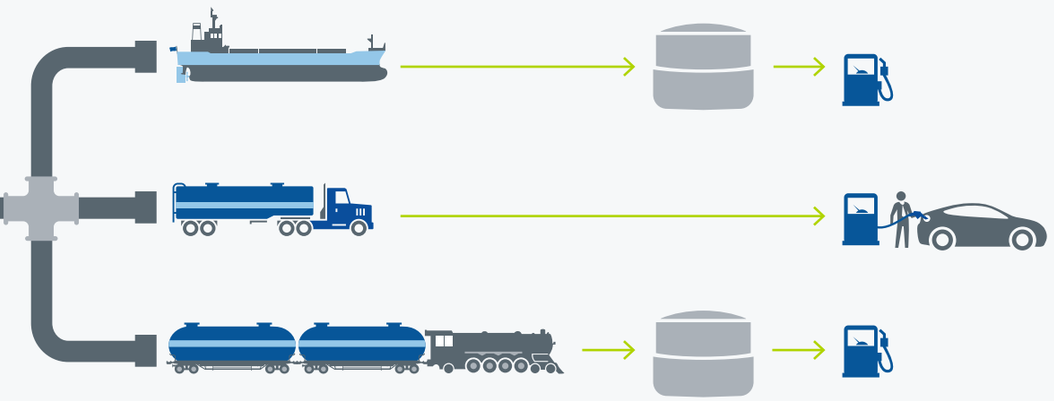
NEXBTL renewable diesel can be blended into fossil diesel at concentrations well beyond 7%, all the way to 100% . As NEXBTL can be treated exactly like fossil diesel, blending can take place where it is most cost-effective: at refineries or terminals.

	NEXBTL renewable diesel	Regular fossil diesel	FAME biofuel
Compatible with tank and pipeline materials	✓	✓	✗
Suitable for standard tanker rail cars	✓	✓	✗
Suitable for standard tanker trucks	✓	✓	✗
No heating required	✓	✓	✗
No risk of water uptake during logistics	✓	✓	✗
No JET A1 pipeline contamination risk	✓	✓	✗
No filter issues at retail stations	✓	✓	✓
No best before date	✓	✓	✗

By blending NEXBTL renewable diesel at the refinery and offering this as a service to retail operators, refiners can fully benefit from what NEXBTL diesel offers.



Rather than focusing on blending standard amounts of biofuel prior to retail distribution, NEXBTL renewable diesel enables everyone to concentrate on minimizing the total cost of fulfilling biofuel mandates.



Upgraded quality with NEXBTL diesel

Refiners can produce heavier, lower-cetane diesel cuts and then upgrade them to specification limits by adding NEXBTL renewable diesel, thanks to its blending properties. The result is an on-spec fuel that meets biomandate needs in one easy step.

Refiner's biofuel of choice

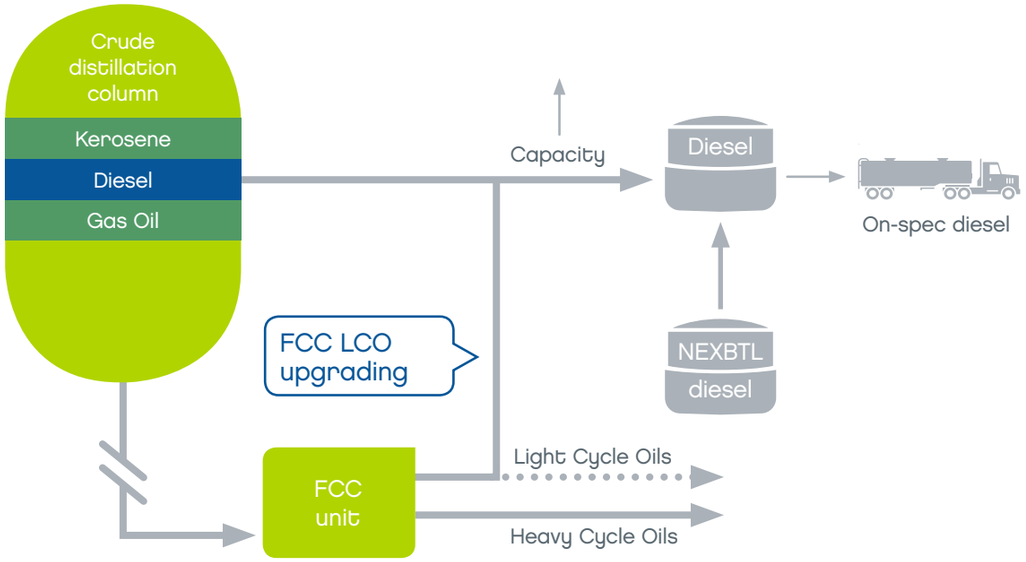
Refiners can adjust their crude distillation parameters or upgrade light FCC-cycle oils into the diesel pool. With no CAPEX requirement, this can yield significant financial benefits.

Biofuel mandates and diesel optimization

NEXBTL renewable diesel is very much the refiner's biofuel of choice, enabling them to fulfill their biofuel mandate – and that of their customers too – while simultaneously optimizing their diesel production.

By taking full advantage of combined refinery and biomandate planning and the blending flexibility this gives, everyone benefits. The fact that customers no longer need to handle the official reporting that goes with biomandate fulfillment only underlines the value-added nature of using NEXBTL renewable diesel.

Heavier and lower-cetane diesel cuts



Excellent performance year-round

NEXBTL is a biofuel with even better cold weather properties than fossil diesel.

Thanks to the cloud point typical of NEXBTL renewable diesel, it can be supplied in all the major winter grades used with fossil diesel.

This translates into year-round savings on blending, logistics, refinery output, and retail costs, and means that the same level of refinery and biomandate optimization can be achieved whatever the time of year, and in extreme weather conditions.

NEXBTL diesel cold property grades	Cloud point and CFPP (°C)	Cloud point and CFPP (°F)
Summer	Max. -5	Max. 23
Winter 1	Max. -15	Max. 5
Winter 2	Max. -22	Max. -8
Northern	Max. -34	Max. -29

Testing cold weather performance in Canada

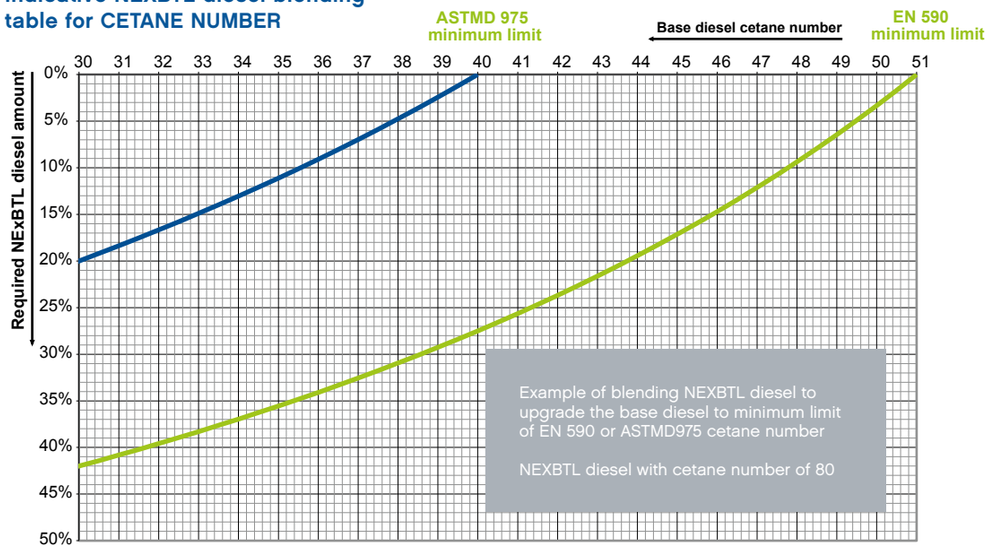
Neste Oil and NEXBTL renewable diesel took part in an extensive renewable diesel demonstration project in Alberta, Canada, over a period of two years.

A total of 75 different trucks and buses were used over a period of 10 months as part of the trial, which was primarily sponsored by the Canadian federal authorities, the Alberta provincial authorities, and Shell Canada.

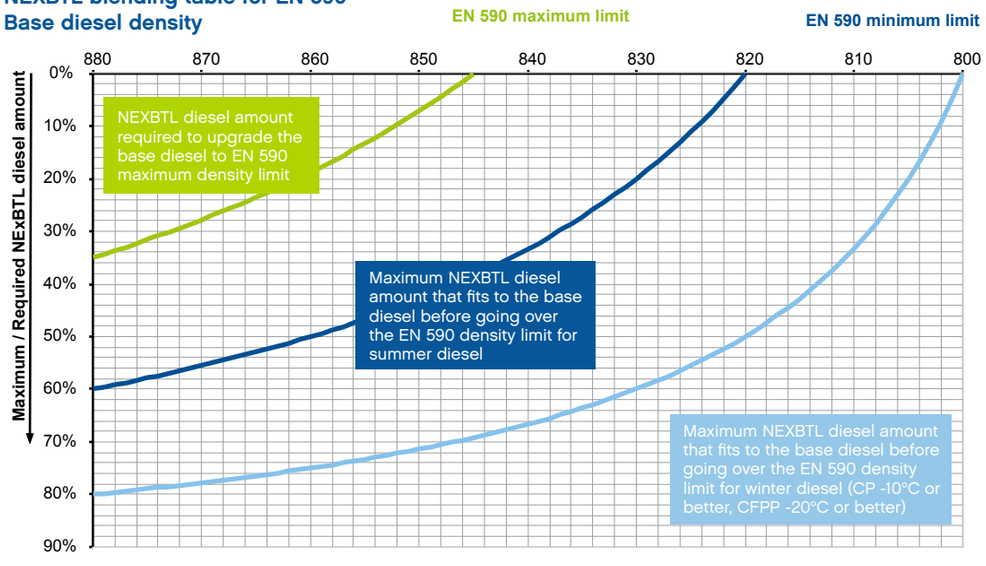
The results showed that the fuel performed excellently in both laboratory conditions and in the field, at temperatures low as -44°C.

Blending tables

Indicative NEXBTL diesel blending table for CETANE NUMBER



NEXBTL blending table for EN 590 Base diesel density



NEXBTL diesel is a bio-based paraffinic diesel fuel defined in the CEN/TS 15940 specification

Properties from EN 590	Unit	NEXBTL diesel limits Min.	NEXBTL diesel limits Max.	EN 590 limits	Test method
Cetane number		70	-	51	EN 15195
Density at 15°C	kg/m³	770.0	790.0	800.0–845.0	EN ISO 12185
Polycyclic aromatic hydrocarbons content	% (m/m)	-	0.1	8.0	EN 12916
Sulfur content	mg/kg	-	5.0	10.0	EN ISO 20846
Flash point	°C	61	-	55	EN ISO 2719
Carbon residue (on 10% distillation residue)	% (m/m)	-	0.10	0.30	EN ISO 10370
Ash content	% (m/m)	-	0.001	0.01	EN ISO 6245
Water content	mg/kg	-	200	200	EN ISO 12937
Total contamination	mg/kg	-	10	24	EN 12662
Copper strip corrosion (3h at 50°C)	rating	Class 1		Class 1	EN ISO 2160
Oxidation stability	g/m³	-	25	25	EN ISO 12205
Lubricity	µm	-	see footnote b	460	EN ISO 12156-1
Viscosity at 40°C	mm²/s	2.00	4.00	2.00–4.50	EN ISO 3104
Distillation 95% (V/V) recovered at	°C	-	320	360	EN ISO 3405
Cloud point and CFPP	°C	Max. -5/ -15/ -22/ -34 Cloud point as agreed, report only for CFPP, see footnote a		-	EN 23015 and EN 116
Properties additional to EN 590					
Appearance		Clear and bright			Visual
Colour			70		ISO 6271-2
Total aromatics content	% (m/m)	-	1.0		EN 12916
Distillation FBP	°C		330		EN ISO 3405
Acid value	mgKOH/g		0.01		ASTM D3242
Additives					
Static dissipator additive (SDA)		added			
Lubricity improver additive (LIA)		not added, see footnote b			
Cold flow improver (FI) additive for CFPP		not added, see footnote a			

a) NEXBTL diesel's CFPP is comparable to its cloud point. Due to the inaccuracy of the CFPP test method with low temperature values, only a report for CFPP is given (cloud point is guaranteed). CFPP of NEXBTL diesel is already low and can not be further lowered with existing cold flow improver (FI) additives. FI additives affect heavy molecules that are absent in NEXBTL diesel. Fossil diesel part in the ready blends can be corrected normally.

b) Lubricity of 100% NEXBTL diesel is approximately 650µm, analysis report is given with each delivery. The lubricity of the final fuel blend has to be checked and corrected with lubricity additive if need be.

NEXBTL diesel compared to North American requirements

Property	Unit	NEXBTL renewable diesel limit		ASTM D975 limits	CAN/ CGSB-3.517 limits	Test method ASTM	Test method CAN/CGSB-3.517
		Min.	Max.				
Flash point	°C	60	-	Min. 52	Min. 40.0	D93	D93 or 3828
Water and sediment	% vol		0.02	Max. 0.05	Min. 0.02	D2709	D1796 (mod) or D2709
Distillation temperature °C 90% vol. recovered	°C	282	315	282–338	Max. 360	D86	D86 or D2887
Kinematic Viscosity	mm^2/s	2.00	4.00	1.9–4.1	1.70–4.10	D445	D445
Ash	% mass		0.001	Max. 0.01	Max. 0.010	D482	D482
Sulfur	ppm (mg/kg)		5	Max. 15	Max. 15	D5453	D2622, D5453 or D7039
Copper strip corrosion (3h at a minimum control temperature of 50°C)	rating		No 1.	Max. No. 3	Max. No. 1	D130	D130
Cetane number		70		Min. 40	Min. 40	D613	D613, D6890 or D7170
Cetane index		70		Min. 40		D976	
Aromatic content	% vol		1	Max. 35		D1319	
Cloud point and CFPP	°C	Max. -5/ -15/ -22/ -34 Cloud point as agreed, report only CFPP, see footnote a				D2500, D4539 D4539	D2500, D5771, D5772 or D5773
Ramsbottom carbon residue on 10% distillation residue	% mass		0.10	0.35	0.2	D524	D524 or D4530
Lubricity	µm		see footnote b	Max. 520	Max. 460	D6079/ D7688	D6079 or D7688
Conductivity	pS/m	50		Min. 25	Min. 25	D2624/ D4308	D2624
Acid number	mg KOH/g		Max. 0.1		Max. 0.1		D664 or D974

a) NEXBTL diesel's CFPP is comparable to its cloud point. Due to the inaccuracy of the CFPP test method with low temperature values, only a report of CFPP is given (cloud point is guaranteed). CFPP of NEXBTL is already low and cannot be further lowered with existing cold flow additive.

b) Lubricity of 100% NEXBTL diesel is approximately 650µm, analysis report is given with each delivery. The lubricity of the final fuel blend has to be checked and corrected with lubricity additive if need be.

Transportation classification

Inland waterway Rail Road	UN number 1202 Transport hazard class 3 Packing group III
Sea	Blends up to 25% – MARPOL Annex I vessels Blends above 25% – MARPOL Annex II vessels
Flash Point	Min. 61°C

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