Neste Renewable Diesel Distributed by Golden Gate Petroleum

Clean Fuel has never been this easy.
Sustainable supply chain is a cornerstone with our renewable raw materials

- Waste animal fat
- TCO
- Waste animal fat
- Rapeseed
- Waste fish fat
- Palm oil
- Waste animal fat

Neste Oil has global and fully traceable, compliant and sustainable feedstock sourcing for renewable feedstock.
Broad range of renewable raw materials

Waste animal fat from the food processing industry
Waste fat from the fish processing industry
Vegetable oil residues (stearin, PFAD and spent bleaching earth oil)
Technical corn oil
Tall oil pitch
Soybean oil

Crude palm oil
Camelina oil
Jatropha oil
Rapeseed oil
Used cooking oil

Neste Oil is the world's only biofuel producer capable of refining renewable fuel from more than 10 different feedstocks
Benefits of NEXBTL Renewable Diesel

**Drop-In fuel**
- Can be used neat or blended
- No need for infrastructure changes: meets ASTM D975 and CARB diesel spec

**Better for Climate**
- Reduces GHG emissions by 40 - 90%

**Lower tailpipe emissions**
- Reduces NOx, particulate matter, and VOC emissions

**Premium quality**
- Can be used in passenger vehicles, heavy trucks, marine, aviation etc. to replace petroleum fuels
- Very high cetane number (80-100):
  - Less noise, easier starts;
- Very stable - can be stored over long periods of time with no deterioration in quality

**Feedstock flexibility**
- Wide range of feedstock in use and supply being increased
Neste Oil is a global leader in renewable hydrocarbon diesel

- Annual production capacity 2 million tons of NEXBTL renewable diesel
  - Aim to increase capacity to 2.3 Mt/a by 2015
  - Production based on Neste Oil’s proprietary NEXBTL technology

- Flexible and sustainable raw material base
  - Currently 12 different renewable raw materials
  - Significant investments in development of future raw material base
  - 70% of total R&D costs ($50 million in 2013)
NEXBTL renewable hydrocarbon diesel is fully compatible with petroleum diesel

<table>
<thead>
<tr>
<th>Raw material</th>
<th>Biodiesel</th>
<th>Petroleum diesel</th>
<th>NEXBTL Renewable diesel</th>
<th>BTL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable oils &amp; waste animal fats</td>
<td>Crude oil (mineral oil)</td>
<td>Vegetable oils &amp; waste animal fats (including high free fatty acids)</td>
<td>Biomass</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technology</th>
<th>Esterification</th>
<th>Traditional refining</th>
<th>Hydrotreating</th>
<th>Gasification &amp; Fischer-Tropsch</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>End product</th>
<th>Ester</th>
<th>Hydrocarbon (gasoline, jet fuel, diesel)</th>
<th>Bio-based hydrocarbon (renewable diesel, jet fuel, bionaphtha, biopropane)</th>
<th>Bio-based hydrocarbon (renewable gasoline, jet fuel, diesel)</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Chemical composition</th>
<th>O II</th>
<th>( \text{C}<em>n\text{H}</em>{2n+2} ) + aromatics</th>
<th>( \text{C}<em>n\text{H}</em>{2n+2} )</th>
<th>( \text{C}<em>n\text{H}</em>{2n+2} )</th>
</tr>
</thead>
</table>

FAME = Fatty Acid Methyl Ester, conventional biodiesel  
RME = Rapeseed Methyl Ester, conventional biodiesel  
HVO = Hydrotreated Vegetable Oil, advanced biofuel i.e. renewable fuel  
BTL = Biomass to Liquid
## Fuel property comparison

<table>
<thead>
<tr>
<th></th>
<th>Biodiesel</th>
<th>NEXBTL Renewable Diesel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity at +40° C (mm²/s)</td>
<td>≈ 4.5</td>
<td>2.9 ... 3.5</td>
</tr>
<tr>
<td>Cetane number</td>
<td>≈ 51</td>
<td>≈ 84 ... 99 *1</td>
</tr>
<tr>
<td>Cloud point (° C)</td>
<td>≈ - 5</td>
<td>≈ - 5 ... – 25*3</td>
</tr>
<tr>
<td>Heating value (lower) (MJ/kg)</td>
<td>≈ 38</td>
<td>≈ 44</td>
</tr>
<tr>
<td>Heating value (MJ/l)</td>
<td>≈ 33</td>
<td>≈ 34</td>
</tr>
<tr>
<td>Polyaromatic content (wt-%)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Oxygen content (wt-%)</td>
<td>≈ 11</td>
<td>0</td>
</tr>
<tr>
<td>Sulfur content (mg/kg)</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Carbon / hydrogen</td>
<td></td>
<td>≈ 5.6</td>
</tr>
</tbody>
</table>

Note *1: Blending cetane number
Note *2: ASTM specification > 40
Note *3: Product can be engineered to specific cloud point within this range by adjusting process conditions
In California renewable feedstock provide ~70% CI reductions achieved with NEXBTL renewable diesel

Currently Used Raw Materials in California

- Neste Oil is currently the world's only biofuel producer capable of refining high-quality renewable hydrocarbon diesel from more than ten different feedstocks on an industrial scale.

- In California NEXBTL renewable diesel is produced from:
  - Australian Animal Fat
  - New Zelandian Animal Fat
  - North American Animal Fat
  - South American Animal Fat
  - Fish Fat

- Produced in Neste Oil's Singapore plant and delivered with ocean going vessels

GHG Emission Reduction

Carbon Intensities of different feedstock under CARB LCFS:

- Petroleum: CARB Diesel 98
- NEXBTL: Fish Fat 30
- NEXBTL: Australian Animal Fat 33
- NEXBTL: New Zelandian Animal Fat 37
- NEXBTL: North American Animal Fat 50
Results of the bus trial in Finland

- Average emission reductions with 100% NEXBTL diesel
  - NOx-emissions: -10 %
  - PM-emissions: -30 %
  - CO-emissions: -35 %
  - THC-emissions: -40 %
  - PAH compounds: reduced significantly
- Standard service interval
- No changes in fuel logistics
- No operability issues with blend or 100% NEXBTL
- Average daily low temp in 2009 was app. negative (-) 20 °C
- Winter grade NEXBTL had cloud point of negative (-) 25 °C
- There are approximately 1400 urban buses in the Helsinki area
NEXBTL renewable diesel for off-road vehicles

- NEXBTL renewable diesel can be used in the construction sites to replace petroleum diesel
- Decreases emissions significantly as well as results cleaner air for the workers
- Fully fungible
- No retrofitting of engines
- No additional infrastructure
- No storage stability problems
Several studies on-going in mining industry in Europe and North America

NIOSH Study

- National Institute for Occupational Safety and Health (NIOSH), Office of Mining Safety and Health Research in US is currently conducting research on various viable control technologies and strategies suitable for reducing exposure of underground miners to particulate and gaseous emitted by diesel-powered vehicles.

- Changing the fuel supply from petroleum diesel to neat or blended renewable fuels is considered by a number of underground mine operators to be a viable method for controlling diesel particulate matter (DPM) emissions.

- The objective of this study is to characterize and quantify the effect of the Neste Oil’s NEXBTL Renewable Diesel on aerosols and gases emitted by one light-duty and one medium-duty diesel engine typical of those used in underground mining vehicles.

Results available in Q2 2015
The True Cost of Petroleum Alternatives?

- Modifications to Fuel Systems – Alternate Tanks, Fuel Lines
- Infrastructure Costs – Existing Vs Building-
- New Equipment Purchase Vs Existing Maintenance Costs -
- Disposal/Recycling for “end of useful life” components –
- How will Vehicle Range and longevity be affected –
- Local Air Board Mitigation – CARB Example - Increased NOx emissions can lead to penalties costly mitigation
About Golden Gate Petroleum

• Golden Gate Petroleum is one of the largest petroleum and biofuel distributors in the Western United States. The company was founded in 1946 in San Francisco, CA. The company is currently headquartered in Martinez, CA.

• Golden Gate Petroleum has consistently been a leader in bringing new alternative fuels to the marketplace. Golden Gate started distributing biodiesel in 1996 and grew to be one of the largest biodiesel distributors in the United States.

• In early 2013, Golden Gate continued the tradition of bringing new alternative fuels to the market by beginning to distribute Renewable Diesel. Golden Gate was the first company globally to focus on the distribution of RD99 as a drop-in replacement fuel versus it being a blend stock into petroleum diesel.

• Since 2013, Golden Gate has delivered over 50 million gallons of RD99 to our customers with tremendous success.
How can Golden Gate Petroleum help?

Contact Golden Gate Petroleum to see what we can do today that will provide solid and functional alternatives to Petroleum based Fuels in a way that will be both environmentally and financially responsible.

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