

Biodiesel ... Deere Perspective

Boise, Idaho
September 9, 2004



Engine Fuels Important to Deere

Diesel Fuel

#1 and #2 diesel with various sulfur content

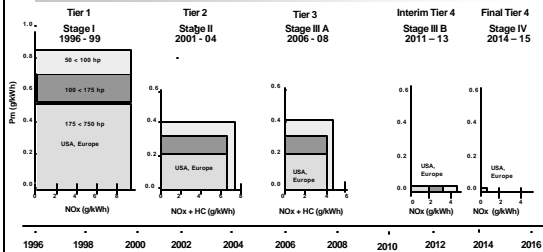
Alternate Fuels

Biodiesel
Ethanol diesel (E-Diesel or Oxidiesel)
Jet Fuel
PuriNOx
Compressed Natural Gas
Liquid Natural Gas
Propane
Dimethyl ether
Fischer Tropsch
Methane
Hydrogen
Gasoline

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Nonroad Emission Regulations: 50 - 750 HP



Emission compliance required over 8000 hours of engine life
in-use EPA audit on Emission Warranty

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Definition

Biodiesel (100% or B100)

A fuel comprised of mono-alkyl esters of long chain fatty acids derived from "bio" feedstocks like

- Vegetable Oils (soybean, rapeseed / canola, sunflower, etc.)
- Animal Fats (beef tallow, pork lard)
- Yellow Greases (waste cooking oil & grease)

Biodiesel blended with diesel fuel is designated BXX (B2, B5, B20, etc)

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General Characteristics

Pros

Renewable energy alternative
B2 level provides significant lubricity improvement
Improves cetane, aromatics, and sulfur
Lowers engine particulate emissions

Cons

Increases engine NOx emissions
Cold weather flow degradation
Impacts filtration systems - ie water separator
Stability / Storage - shorter shelf life
Thermal degradation at higher temperatures
Elastomer and other material compatibility
Lowers BTU content - lower power
Higher cost

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Current Status

EU adopted Directive in 2003 to promote the use of Biofuels

- Targets B2 in 2005 for all gasoline and diesel fuel in the transport sector
- Market estimated to be \$2.4B by 2007
- Allows member states to grant partial or total exemption from excise tax

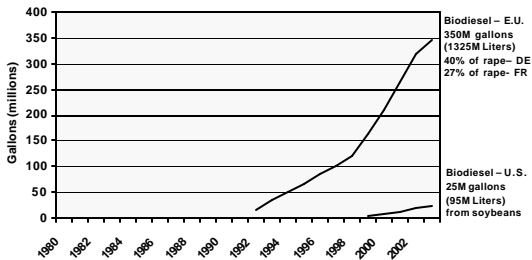
Some US states adopting mandates for B2 as early as 2005

EU and US production of Biodiesel continues to grow

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Biodiesel Usage Continues to Grow



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Shell and British Petroleum recently started to sell blends up to B5 at gas Stations in Germany

Engine and Fuel Injection Equipments Manufactures approve up to B5

US National Biodiesel Board promoting B20 – tax credit level in US

NBB and Deere requesting the DOE to allocate \$7.2M (\$2.4M for three years) for Biodiesel testing on Tier 3 and 4 engines

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Technical Standards

ASTM D6751 for B100 as blending stock was published in Nov. 2002

European EN14214 for B100 as commercial fuel was issued in Oct. 2003

B5 spec will be included in the appendix of ASTM D 975

Work in progress for a stand alone B20 standard from ASTM task force

Canadian version of B20 spec using canola feedstock is underway

NBB working on its accreditation program BQ-9000 for

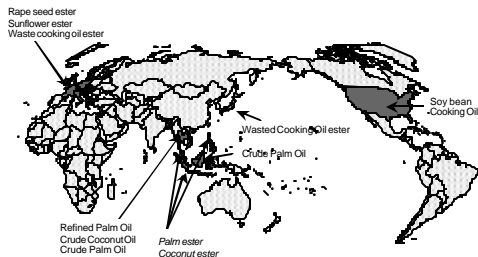
- Accredited Producer (manufacturer end)
- Certified Marketer (customer end)

Experts pondering global standards and critical issues of biodiesel

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No Global Standards for B100 and BXX



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Rate Limiters

Advanced Fuel Injection Systems & Aftertreatment compatibility

- Most data is on Tier 1 / Stage I or prior engines

Engine emissions impact out to 8000 Hours not known

No blended fuel specification

Compatibility with future PC -10 engine oil formulation (fuel dilution)

Limited petroleum industry involvement

Production capacity

- B2 level in all US diesel fuel would require
950 Million gallons production capacity
630 Million bushels of soybeans (20% of soybean crop)

- US production capacity is estimated to be 60 to 80 Million gallons

Cost

- Tax incentives needed to be competitive

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John Deere is working with
National Biodiesel Board
to address these rate limiters

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