

Biodiesel & Renewable Diesel

Low Carbon, Alternative Liquid Fuel Solutions

Eric Lawson

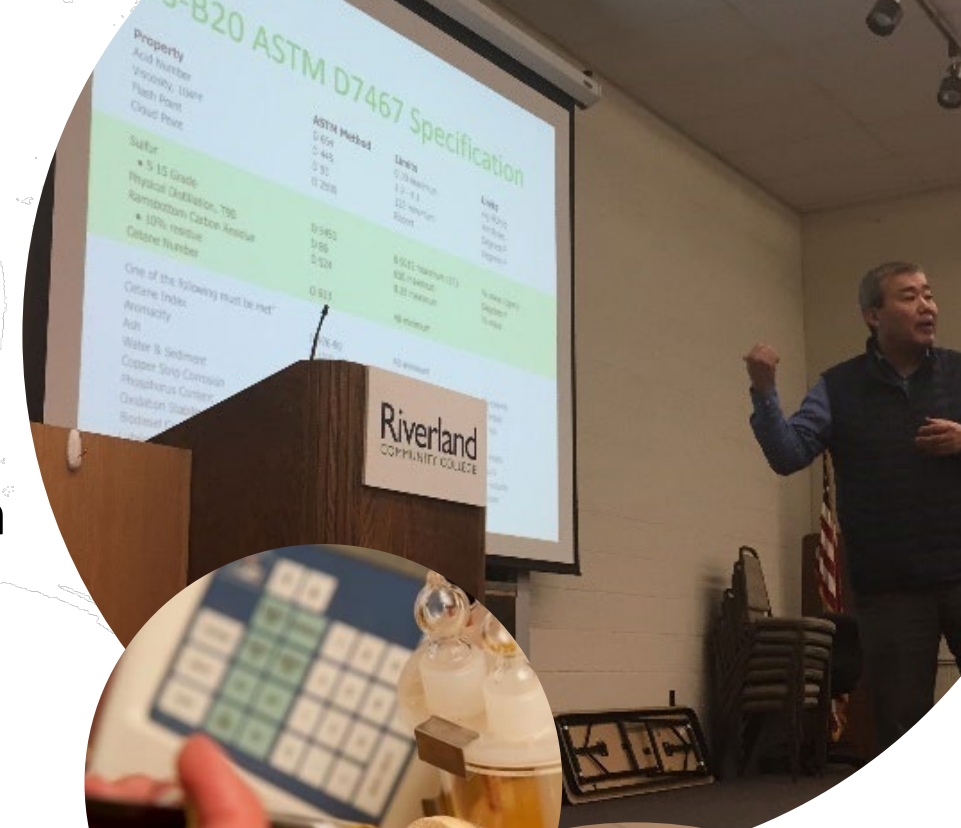


Sponsored by





- Technical fuel experts with over 90 years combined experience in petroleum and renewable fuels.
- Operate fuel quality testing lab and Diesel Hotline to provide technical support to all levels of fuel distribution chain.
- Since 2005, have worked with agricultural community to provide assistance for biodiesel with technical support, education and promotion
- Conduct over 100 educational seminars/events annually
- Help fuel distributors with technical support, economics and supply
- Work with diesel end-users to utilize higher biodiesel blends



Accredited Training Provider

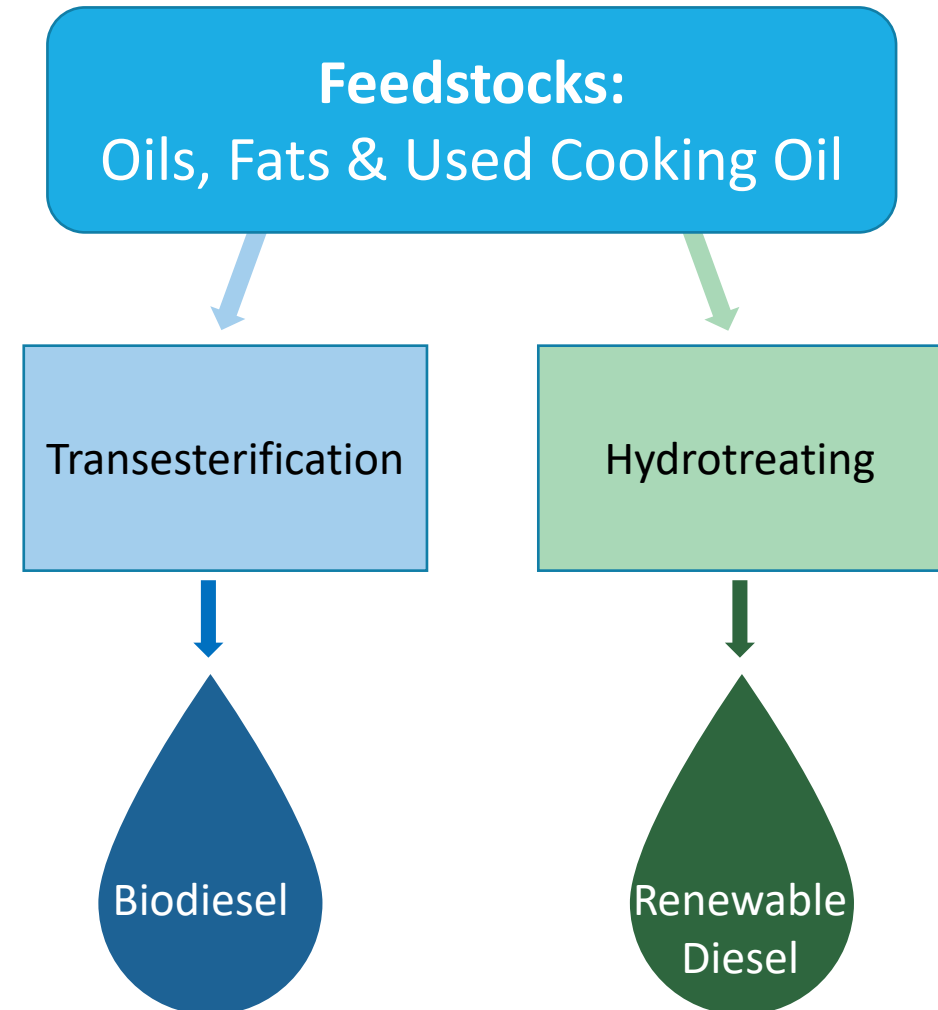
Biodiesel

Renewable Diesel

Two North Dakota-Grown, Renewable, Liquid Fuels

Similar feedstocks, different production process

- Biodiesel is produced by transesterification:
 - Triglycerides are reacted with an alcohol to produce biodiesel (fatty acid methyl ester - FAME) and glycerin
 - Contains oxygen atoms
 - B100 meets ASTM D6751 (standard for biodiesel)
- Renewable diesel is often produced through hydrotreating:
 - Converts triglyceride molecules into paraffinic hydrocarbons
 - Oxygen molecules are removed
 - Chemically the same as petroleum diesel
 - Only detectable by carbon dating
 - Meets ASTM D975 (standard for diesel)



Similar Characteristics



Feedstocks:
agricultural or
waste products

Renewable

Supports farmers and local industries



Produced in ND

Biodiesel: ADM in Velva (85 mill gal/year)

Renewable Diesel: Marathon Dickinson (192 mill gal/year)



Cleaner Fuel

Advanced Biofuel: reduces lifecycle greenhouse gas emissions by more than 50%

Reduces tailpipe pollutants

Decreased frequency of injector maintenance and DPF regenerations compared to ULSD

Differences



Drop It In

Biodiesel: Typically used in blends up to 20%

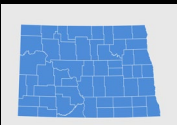
Renewable Diesel: Use up to 100%



Lubricity & Cetane

Biodiesel: High lubricity & cetane

Renewable Diesel: Low lubricity but high cetane



Availability

Biodiesel: Available in ND and throughout country

Renewable Diesel: Currently limited to California and other low carbon fuel markets

Today's Fleets Have Targets to Meet

- Performance & Maintenance
- Budgetary
- Emissions & Sustainability

McDonald's Sets Net-Zero Greenhouse Emissions Target by 2050



Customers order from a walk up window at a McDonald's Corp. restaurant on 42nd Street in Times Square in New York. Photographer: Michael Nagle/Bloomberg

By Thomas Buckley

October 4, 2021, 6:58 AM CDT



CNN @CNN · Feb 14, 2020

Delta Air Lines plans to become carbon neutral over the next decade. But that doesn't mean it will stop emitting carbon. Delta will need to use carbon offsets, either buying them in the market or investing in projects to reduce carbon in the atmosphere.



cnn.com

Delta burns tons of jet fuel - but says it's on track to be carbon neutra...
Delta Air Lines plans to become carbon neutral over the next decade. But that doesn't mean it will stop emitting carbon. In fact, it can't.

Exclusive: A Look At FedEx's \$2bn Sustainable Aviation Investment

BY SUMIT SINGH

PUBLISHED JUL 04, 2021



CLIMATE

Exxon pledges net-zero carbon emissions from operations by 2050

PUBLISHED THU, JAN 18 2022, 10:16 AM EST

Over 200 companies pledge net-zero emissions by 2040 as pressure on private sector mounts

The announcement comes in the wake of a dire warning from a UN climate panel.



By Catherine Thorbecke

September 20, 2021, 11:17 AM • 8 min read



@PepsiCo

We're taking bold action on climate change, regenerative agriculture, and much more to enable long-term growth while protecting people + the planet. Take a look: pepsi.co/2Sk4q5X #WorldEnvironmentDay



Working to achieve net-zero emissions by 2040

0:11 | 614 views



BP aims to invest more in renewables and clean energy

Boss says his industry is changing but 'the world is going to need oil and gas for decades'

Today's Fleets Have Targets to Meet

- Emissions & Sustainability
- Performance & Maintenance
- Budgetary

Many Fuel & Vehicle Technology Options

- Clean Diesel
- Hybrid
- Biodiesel
- CNG
- Propane
- Electric

**Why choose
biodiesel?**

Why Biodiesel?

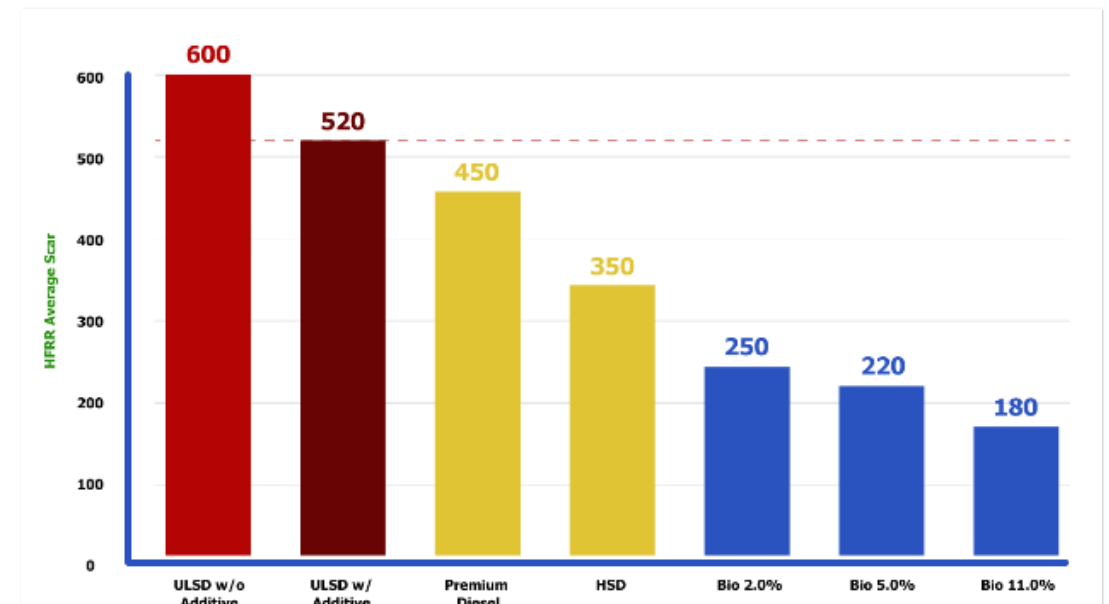
Biodiesel is a High-Performance Fuel



- Similar power & performance as ULSD
- High cetane provides quicker starts with less smoke
- Significantly enhances the lubricity of ULSD, reducing wear & prolonging engine life

Lubricity & Diesel Fuel

- Before 1993 the sulfur content of diesel was unregulated and could be as high as 5000ppm
- To protect the environment and allow for the addition of advanced pollution control devices, a majority of the sulfur is now removed from diesel fuel, resulting in ultra low sulfur diesel (ULSD)
- The process of removing sulfur negatively impacted the lubricity of the fuel
- Blends of biodiesel even lower than 2% (B2) replace the lost lubricity



Why Biodiesel?

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- Significantly enhances the lubricity of ULSD, reducing wear & prolonging engine life
- Detergency effect keeps injectors & fuel systems clean
- Using B20 with DPF filters results in longer intervals between regeneration, reducing fuel consumption (same MPG as ULSD)
- Less soot, reduced maintenance



CITIES AREA TRANSIT GRAND FORKS, ND

- High idle percentages create issues with emissions systems/DPF filters
 - B20 has helped address DPF filter plugging
 - Major reduction of maintenance costs and down-time of equipment
- Reduction in DEF use
- Oil samples are coming back cleaner
 - Reduction of ~30% to 40% in soot levels
- Slight MPG improvement

PLUGGED DPF FILTER BEFORE BIODIESEL



Photos provided by Cities Area Transit

PLUGGED EGR BEFORE BIODIESEL



DPF FILTER RUNNING BIODIESEL FOR 6 MONTHS - NO ISSUES



SECONDARY DPF FILTER RUNNING BIODIESEL



Photos provided by Cities Area Transit

Dale Bergman,
Division Director
at Cities Area
Transit

“While we were confident in biodiesel when we began using it, we were stunned by the benefits we saw, and continue to see, in our maintenance needs. Biodiesel has been a game-changer and will continue to fuel our fleet for the foreseeable future.”

2021 Fleet Purchasing Outlook Study

Conducted by the NTEA – The Association for the Work Truck Industry



For the 4th year in a row, fleet respondents ranked **biodiesel** as their number one choice for current alternative fuels use.

Why Biodiesel?



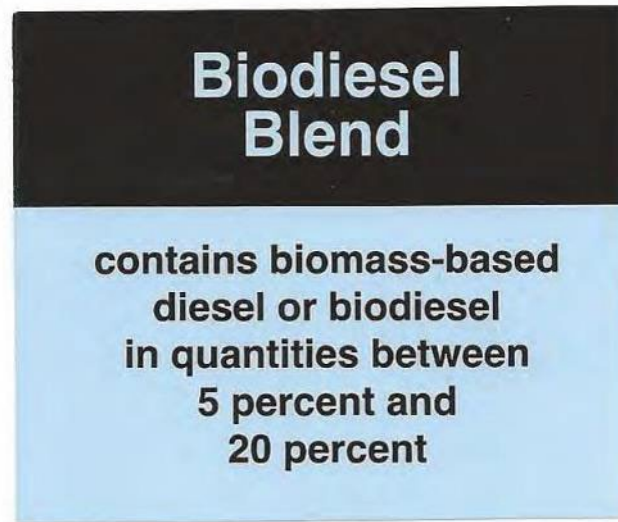
DROP-IN FUEL

- Biodiesel is an ultra low sulfur fuel, meeting ULSD sulfur requirements
- B20 can be stored and dispensed through your existing diesel fuel system – no expensive infrastructure investment needed
- Biodiesel blends up to B20 can be used in existing diesel engines without modifications
- Like diesel fuel, biodiesel meets strict quality standards

ASTM Biodiesel Specifications

D975: Petroleum diesel including biodiesel blends up to 5% for on/off road engines. Physical properties of blends up to B5 do not change from those of ULSD. Blends up to B5 should be treated the same as No. 2 diesel (B0) and are used year-round throughout the country.

No pump label required



D7467:

Blends containing 6% to 20% biodiesel for on/off road engines
Requires biodiesel blend label

Biodiesel Meets Strict Quality Standards



BQ9000 National Biodiesel Accreditation Program:

- Accreditation program for producers and marketers of biodiesel fuel
- Combination of ASTM standard for biodiesel and a quality systems program that includes storage, sampling, testing, blending, shipping, distribution, and fuel management practices
- Open to any biodiesel manufacturer, marketer or distributor in the United States and Canada
- Over 92% of biodiesel now in the market is produced and handled by BQ-9000 approved companies

2019 National Renewable Energy Laboratory (NREL) Biodiesel Quality Testing:

Biodiesel production consistently meets and exceeds strict quality standards

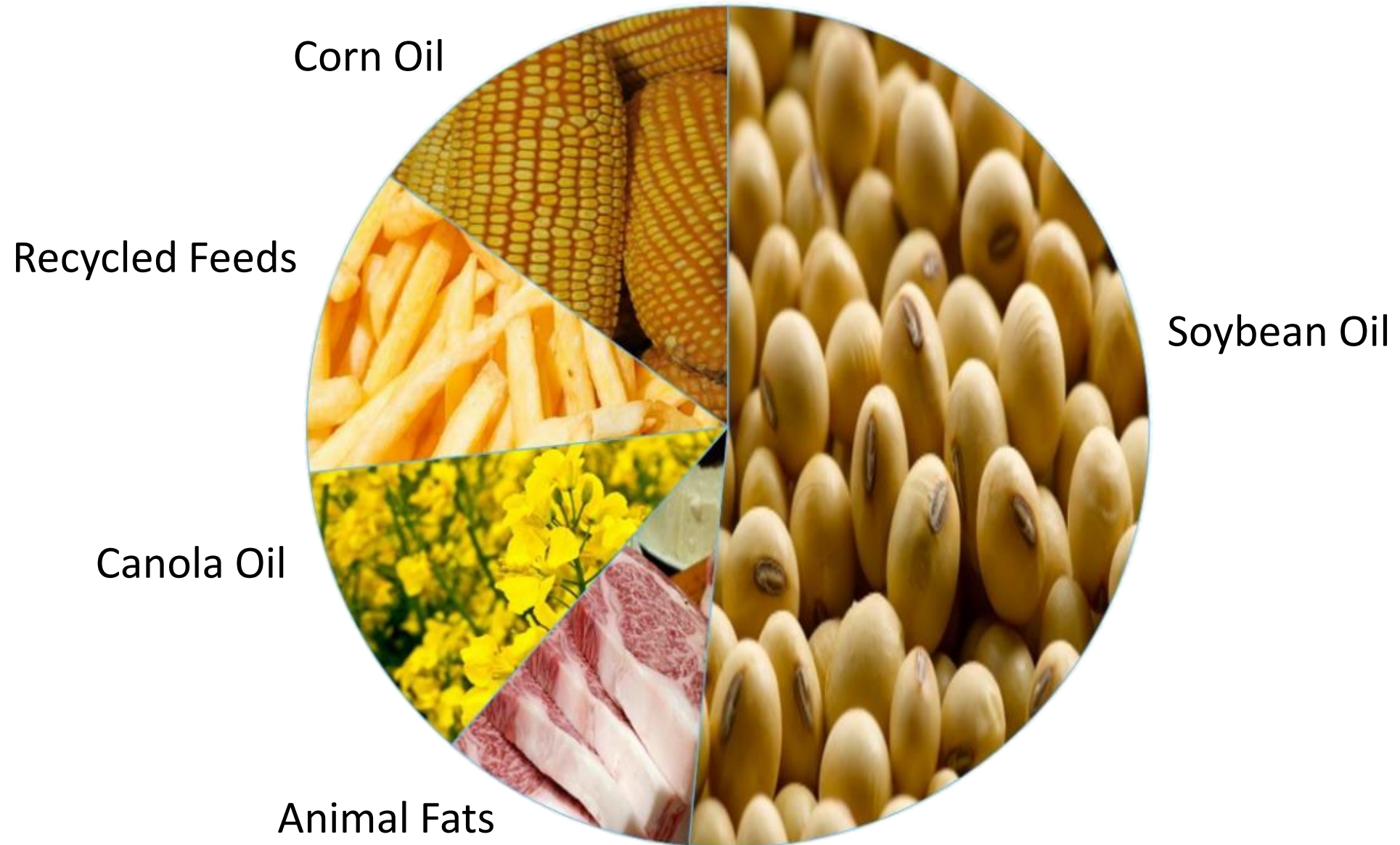
Why Biodiesel?

Meet Fleet Sustainability Goals

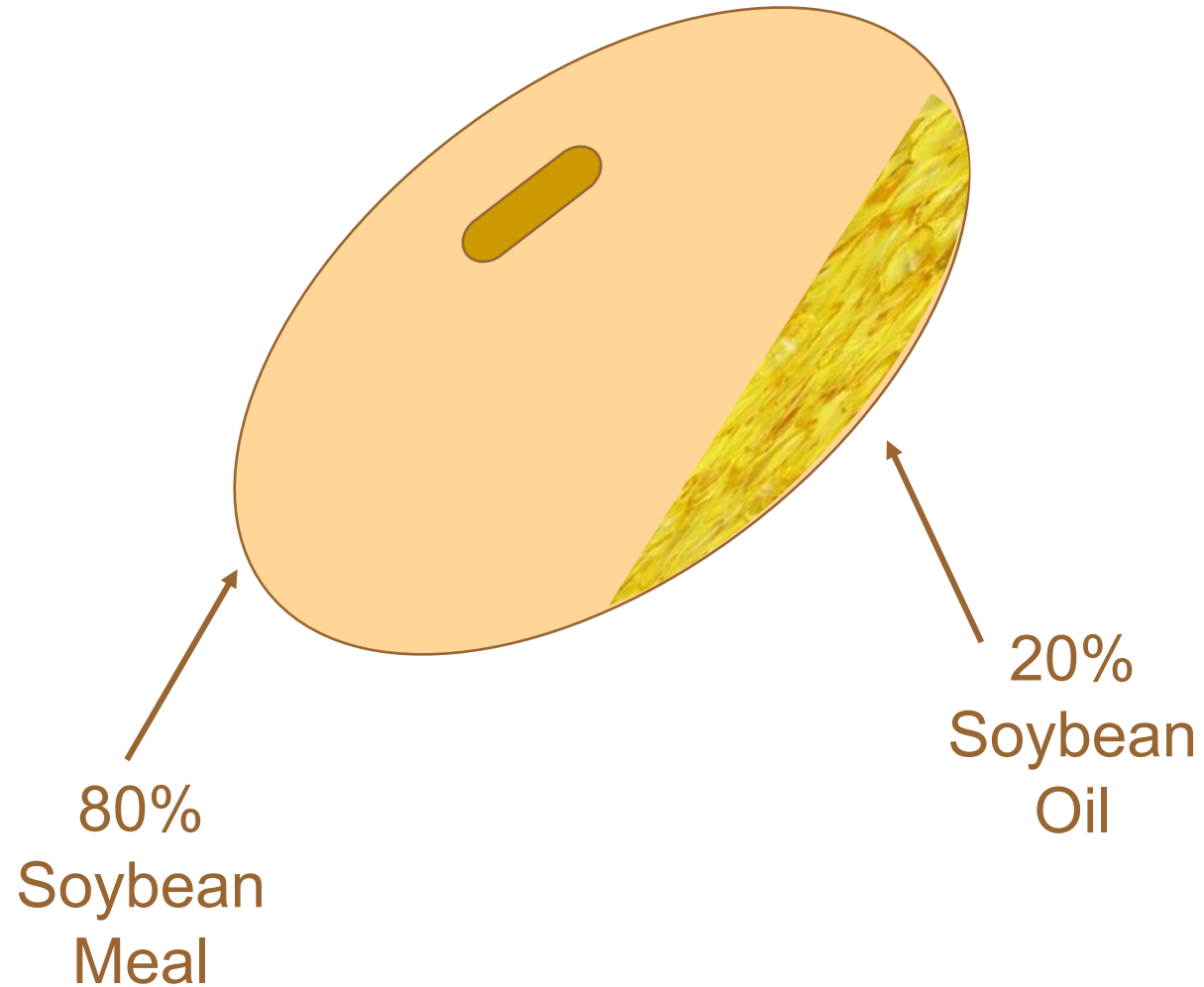


- Non-toxic (less toxic than table salt)
- High energy balance:
 - For each unit of fossil energy used to produce biodiesel, 3.5 units of renewable energy are returned
 - The best of any U.S. fuel!
- Made from renewable, local sources

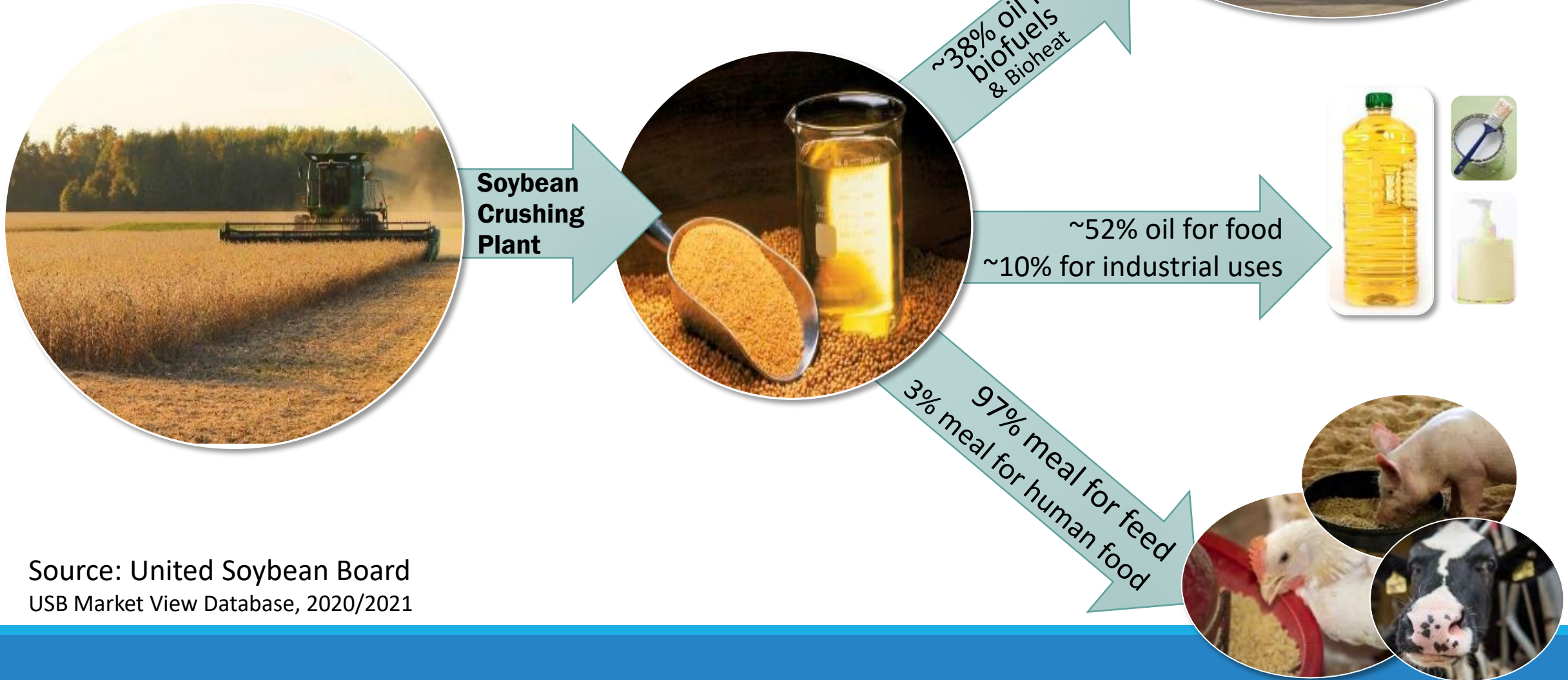
Biodiesel Feedstocks



Soybeans: Food and Fuel



Biodiesel Production



Source: United Soybean Board
USB Market View Database, 2020/2021

Why Biodiesel?

Reduce Your Carbon Footprint



Biodiesel is an Advanced Biofuel: Reduces lifecycle greenhouse gas emissions by 50%+ compared to petroleum diesel

B100 reduces GHGs by up to 86%

B20 blend reduces GHGs by 15%

Reduce Tailpipe Emissions in Remaining Older Diesel Engines

| | B100 | B20 |
|----------------------------------|------|------|
| Particulate Matter | -47% | -12% |
| Carbon Monoxide | -48% | -12% |
| Total Unburned Hydrocarbons | -67% | -20% |
| Polycyclic Aromatic Hydrocarbons | -80% | -13% |
| Ozone Potential | -50% | -10% |

Biodiesel's Effect on Emissions (Pre-2007 Diesel Engines)

A Comprehensive Analysis of Biodiesel Impacts on Exhaust Emissions
<http://www.epa.gov/otaq/models/analysis/biodsl/p02001.pdf>

Health Benefits Study

Study conducted in 13 sites and communities in the U.S. that are regularly exposed to high rates of petroleum diesel pollution.

~National Biodiesel Board, in partnership with Trinity Consultants, 2021

In the transportation sector, benefits included a potential 45% reduction in cancer risk when heavy-duty trucks such as semis use B100 and 203,000 fewer or lessened asthma attacks.

Common Biodiesel Myths

Myth: Biodiesel has a shorter shelf life than petroleum diesel

Fact: As with ULSD, biodiesel without additives has a shelf life of 6 months. Biodiesel producers utilize stabilizing additives to prevent product degradation. With additives and proper housekeeping, the shelf life of biodiesel blends can be extended up to 2 years.

Myth: Biodiesel causes microbial contamination

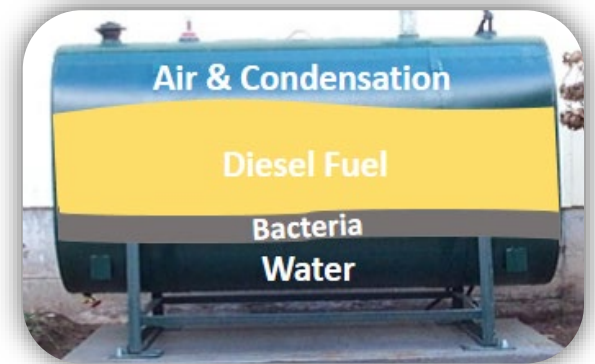
Fact: Water in diesel fuel leads to microbial contamination. Prior to 2006 the sulfur in diesel fuel prevented growth of bacteria and fungus by acting as a natural anti-microbial. When sulfur was removed to meet ultra low sulfur diesel fuel requirements, this beneficial property was lost. Bacteria grows in the water-fuel interface.

Myth: Biodiesel blends, even at low levels, cause fuel to gel

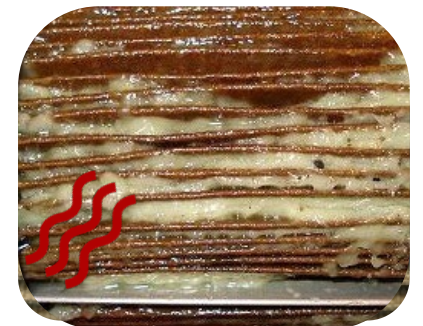
Fact: What many diesel users describe as fuel gelling is icing. Water freezes at 32°F and below. When temperatures drop in the fall, diesel tank and vehicle owners may experience filter plugging when water that has collected on the fuel filter freezes, preventing flow of fuel through the filter.

Myth: When it's cold, the biodiesel drops out of the fuel and plugs filters

Fact: Once blended correctly, biodiesel and petroleum diesel do not separate. When the temperature of fuel is at or below its cloud point, paraffin wax (which is part of petroleum diesel) will precipitate out and collect on the bottom of the tank and then plug fuel filters. Paraffin melts back to liquid at room temperature.



90% of gelling problems are caused by icing





Best Practices

- Buy premium diesel or use an additive to prolong the shelf life of your fuel and prevent thermal oxidation.
- Buy biodiesel blends pre-blended by your supplier.
- Keep storage, vehicle and equipment tanks topped off to eliminate head space which leads to condensation.
- Check hoses, fill/vapor caps, gaskets for leaks.
- In the fall before colder weather sets in, check tanks for water. Check again in the spring. Remove any free water.
- Install a 30-micron filter on the dispenser to accommodate the higher viscosity of fuel in winter.
- When using additives, make sure the fuel is at least 10 degrees above its cloud point.

With biodiesel, your fleet can:

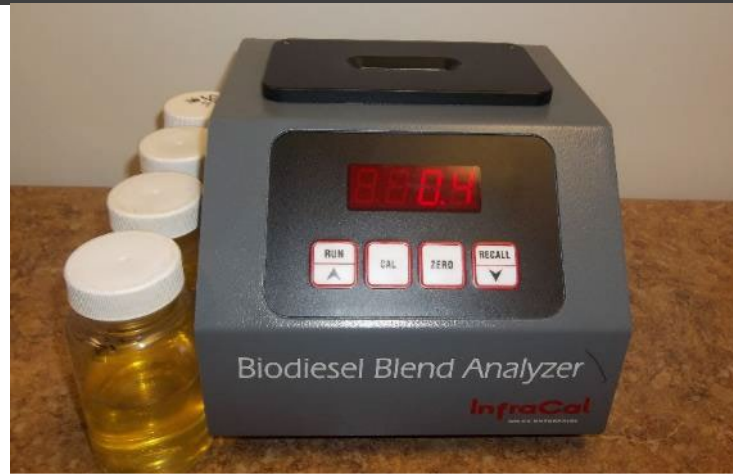
- Support local economy
- Increase energy security
- Increase lubricity and cetane
- Reduce maintenance and downtime
- Reduce tailpipe pollutants
- Decrease carbon footprint
- Drive renewably
- Meet sustainability goals

**B20
Biodiesel**
80% No. 2 Diesel

Trial:
B20 in summer
B5 in winter

MEG Corp Support

- Review current fueling system and procedures and provide recommendations for successful transition and use
- Develop fueling system routine maintenance and provide training to retrieve samples
- Conduct fuel quality testing on a regular basis to assure proper tank management and fuel quality
- Conduct staff training as needed



Diesel Helpline

Questions about diesel or biodiesel?
Experiencing fuel-related problems?

Contact the Helpline for:

- Answers to general fuel questions
- Recommendations for storage, handling & blending best practices
- Diagnosis of fuel issues and filter plugging

Guidance & recommendations provided at no charge. (800) 929-3437 • info@megcorpnm.com

VISIT THE BIODIESEL BOOTH 12

Eric Lawson

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- eric@megcorpnmn.com

Diesel Helpline:

- General guidance issues
- Fuel related problems

(800) 929-3437 • info@megcorpnmn.com

