



**energy solutions, pure and simple**

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**Biodiesel for New England**

March 26, 2003

Eastern Connecticut State University

617-889-7300

[www.worldenergy.net](http://www.worldenergy.net)

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# What is Biodiesel - Terminology

- Pure biodiesel or 100% Biodiesel (B100)
  - Also called NEAT Biodiesel
- Biodiesel Blend
  - BXX for XX% biodiesel
  - B20 is 20% biodiesel and 80% petro diesel fuel
  - B50 is 50% biodiesel and 50% petro diesel fuel
- Avoid calling blends “biodiesel” because it can lead to a lot of confusion!
  - What is true for B100 may not be true for B20
  - And visa versa

# What is Biodiesel

- Defined by ASTM, EPA and DOE
  - “A fuel consisting of long-chain fatty acid alkyl esters made from renewable vegetable oils, recycled cooking greases, or animal fats “ that meets ASTM standards (ASTM D6751)

# What is Biodiesel?

- Biodiesel (Methyl Esters) is a diesel replacement fuel made from Virgin Vegetable Oils such as Soybeans or Rapeseed. It can also be made from recycled restaurant oils or animal fats.
- It is all Natural, renewable, and dissolves in water faster than sugar.
- It is 11% oxygen by weight and contains no sulfur.
- It takes the black smoke from the back of a vehicle and makes the exhaust smell faintly of *Popcorn!*
- Biodiesel Lowers toxic emissions and Particulate Matter
- B20 has roughly 1.8% lower BTU content and offers similar range and power.
- Biodiesel is safe to store, and has a higher flash point than petro diesel
- Biodiesel has greater Cetane (50-56) and Lubricity than diesel fuel  
In Fact, 1% biodiesel increases lubricity by up to 30%
- Biodiesel requires no engine modification and does not affect engine performance. Just pour and go!
- Biodiesel is generally delivered blended with diesel fuel at an 80%(diesel) 20% (biodiesel) blend.

# What is biodiesel ?

## The Answer to a number of issues!

- **National Security:** A reduction of imported Petroleum
- **Environment:** A reduction in greenhouse gases
- **Public Health:** Less toxic to human health
- **Economic:** Aid to US Farmers
- **Operations:** A performance enhancer to conventional diesel



# What is the appeal of Biodiesel?

- It works in existing diesel engines with no modification.
- It can achieve emissions reductions across an entire diesel fleet.
- It is an immediate solution.
- It works in heavy duty applications.
- It can work in conjunction with any new vehicle program (I.E. CNG in new vehicles, biodiesel in existing vehicles)
- It requires no new refueling infrastructure.
- Biodiesel is as easy to transition out of as it is to implement.
- Biodiesel can be used in conjunction with Ultra Low Sulfur diesel, particulate traps, catalytic converters, or diesel hybrid electric vehicles.
- Biodiesel provides direct aid to US farmers.
- It is available right now anywhere in the country.
- It has a closed carbon cycle
- 3.2:1 production value (highly efficient)

# O.K...so what's the downside?

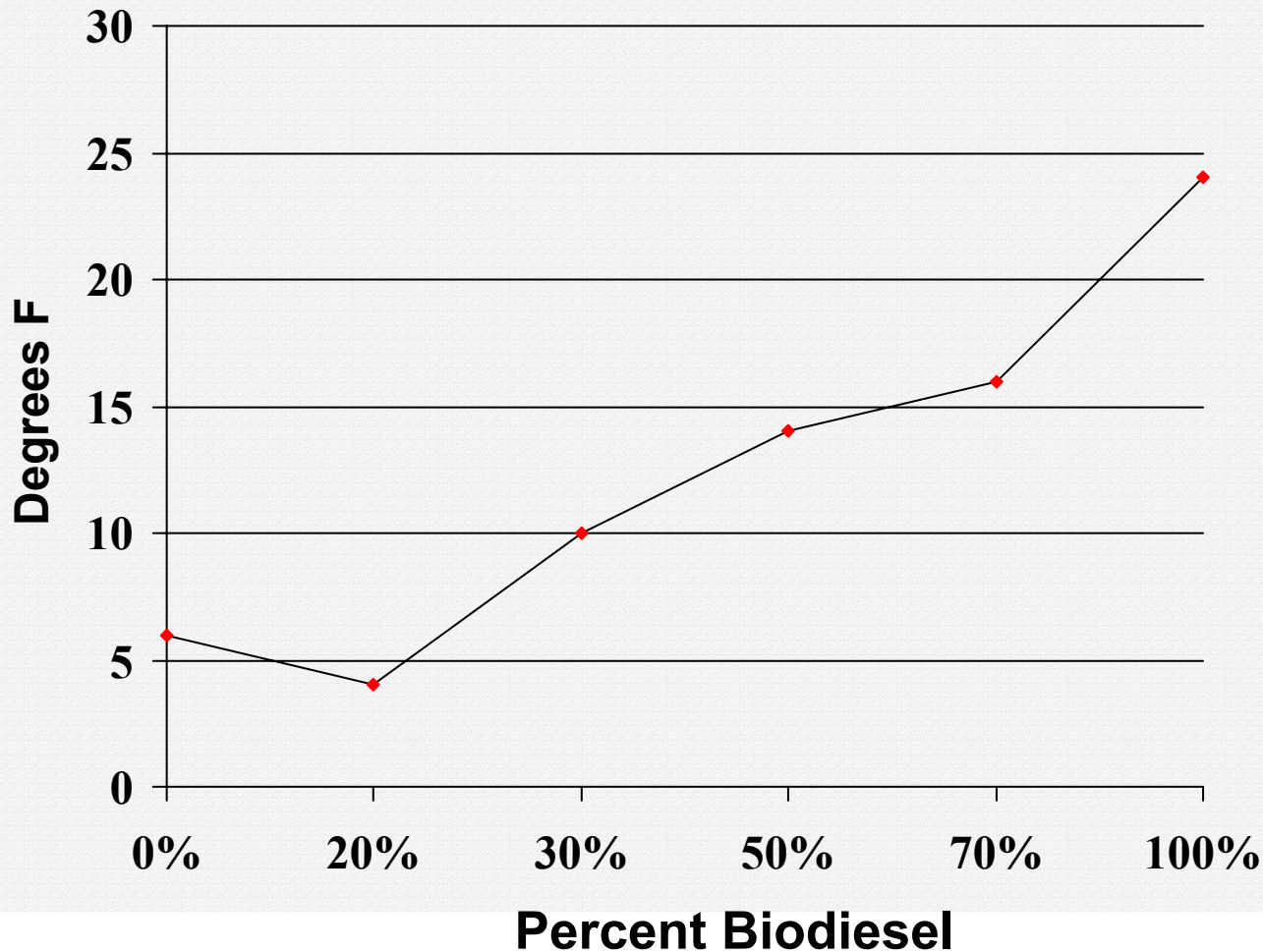
*Very little!*

- Biodiesel has outstanding cleaning properties, and will clean your fuel lines. About 2% of fleet vehicles require a fuel filter change after the first tank.
- Biodiesel can also clean out a diesel storage tank.
- Biodiesel must be handled differently in cold weather. B100 will begin to gel at relatively high temperatures. B20 should be blended to meet ASTM D975 or fleet operational guidelines.
- Additives generally do not work well on B100. They treat the diesel portion on B20
- We have handled fleets down to -26 degrees on B20!
- Biodiesel can degrade natural rubber (pre-1990 engines)

**ASTM D6751 will insure quality biodiesel!**

# Cold Filter Plug Point

varies tremendously with B100 or diesel properties



# Biodiesel Emissions

Regulated	B100	B20
Total Unburned Hydro Carbons	-67%	-20%
Carbon Monoxide	-47%	-12%
Particulate Matter	-48%	-12%
Nox (Transportation only)	+10%	+2%
<b>Non Regulated</b>		
Sulfates	-100%	-20%
PAH (Polycyclic Aromatic Hydrocarbons)	- 80%	-13%
nPah (nitrated PAH)	-90%	-50%
Ozone Potential of speciated HC	-50%	-10%
Mutagenicity	-80%-90%	-20%

The US EPA recently completed an extensive review of over 80 published studies on biodiesel fuel results were consolidated to create one comprehensive study on the overall effects of biodiesel fuel. This is an important step in standardizing reports.

- **Biodiesel is the first and only alternative fuel to have a complete evaluation of emissions results and potential health effects submitted to the US EPA under the Clean Air Act 211 (b) Both Tier I and Tier II have been completed as per the attached package.**

# The environment is critical...

## ...but the focus is shifting!



### ■ Yale University Study

Children who ride diesel buses exposed to far more particulates

### CARB

Particulates “probable carcinogen”

### American Heart

Particulates can disrupt normal heart function

### American Lung

Diesel exhaust can exacerbate existing Asthma conditions

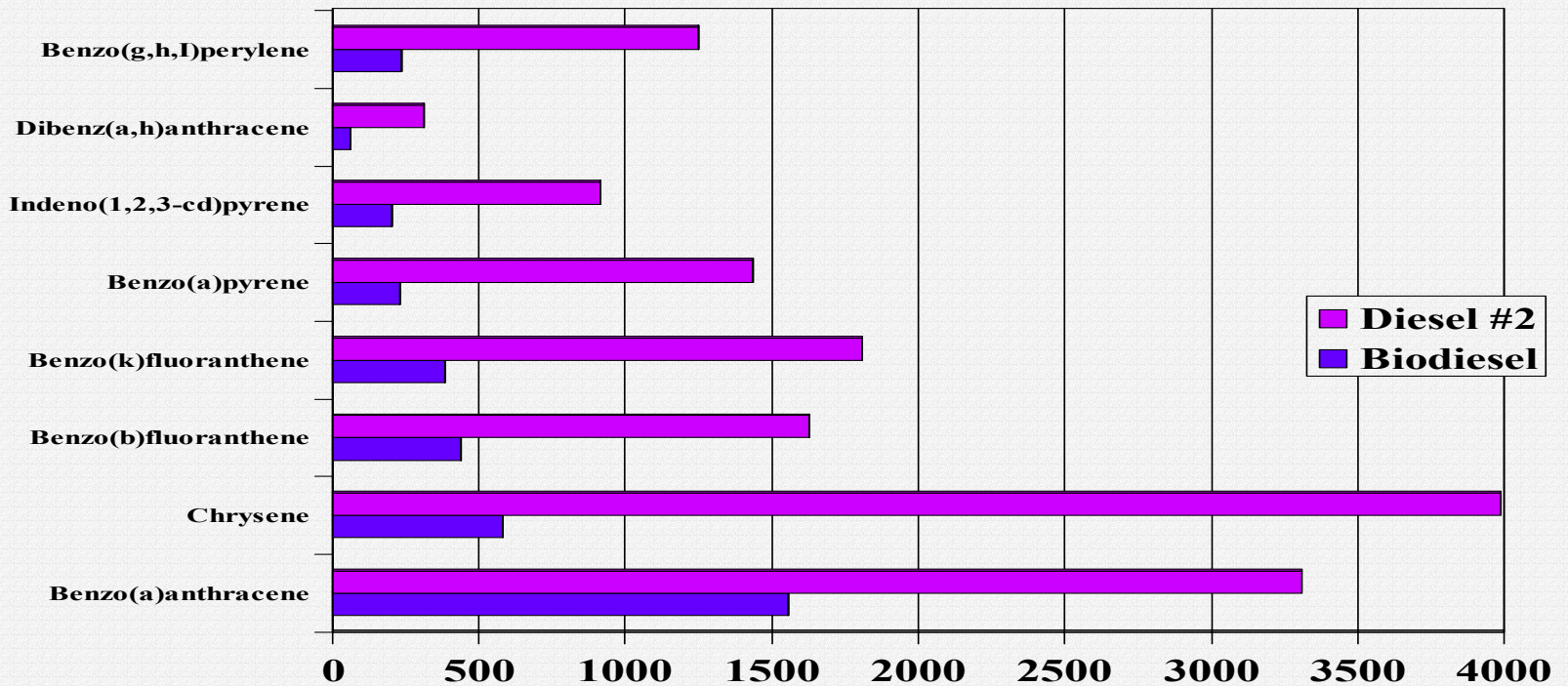
**They outlawed smoking in restaurants for the same reasons!**

# The Lovelace Respiratory Institute Confirmed

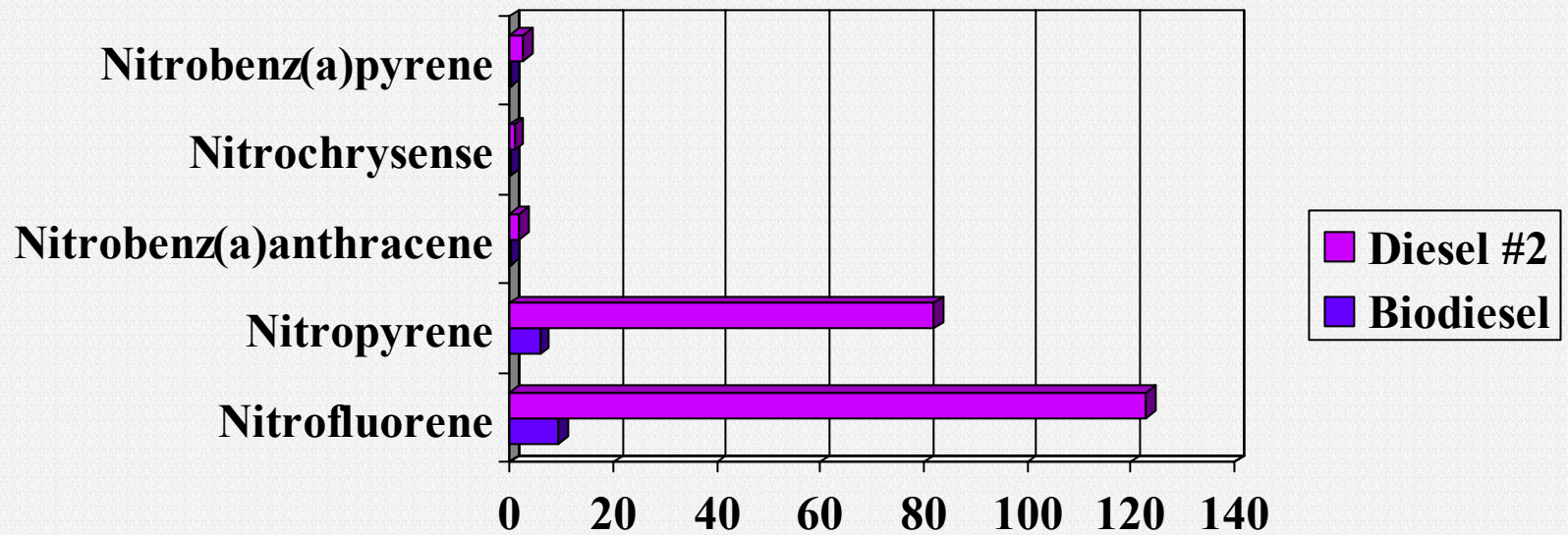
- **NO pronounced toxicity at any level**
- **NO mortality or clinical abnormality**
- **NO neurotoxic or internal pathologic response**
- **NO adverse effect on fertility and reproductive systems**
- **Corroboration of Tier I findings concerning decreased mutagenicity activity in living organisms**
  
- **Taking Action Today will positively impact both the environment and the overall health of your community!**



# What reductions did Southwest Research Institute find in PAH emissions from biodiesel? (in ng/hp-hr.)



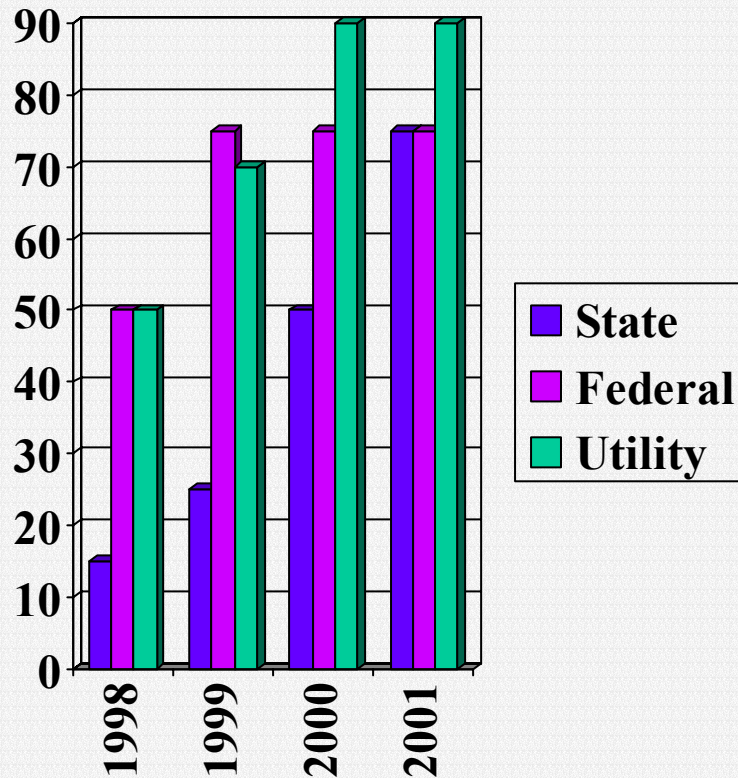
# What did Southwest Research Institute Find RE: nPAH emissions? (ng/hp-hr nPAH)



# The Markets

- Many plans for plants have greatly over-estimated the current market
- The industry is in a massive over-capacity situation for today's market.
- Transportation is generally less expensive than idle plants
- While Growing, currently about 10 million gallons annually (<500,000 NE and NY combined)
- It is growing and does show great promise

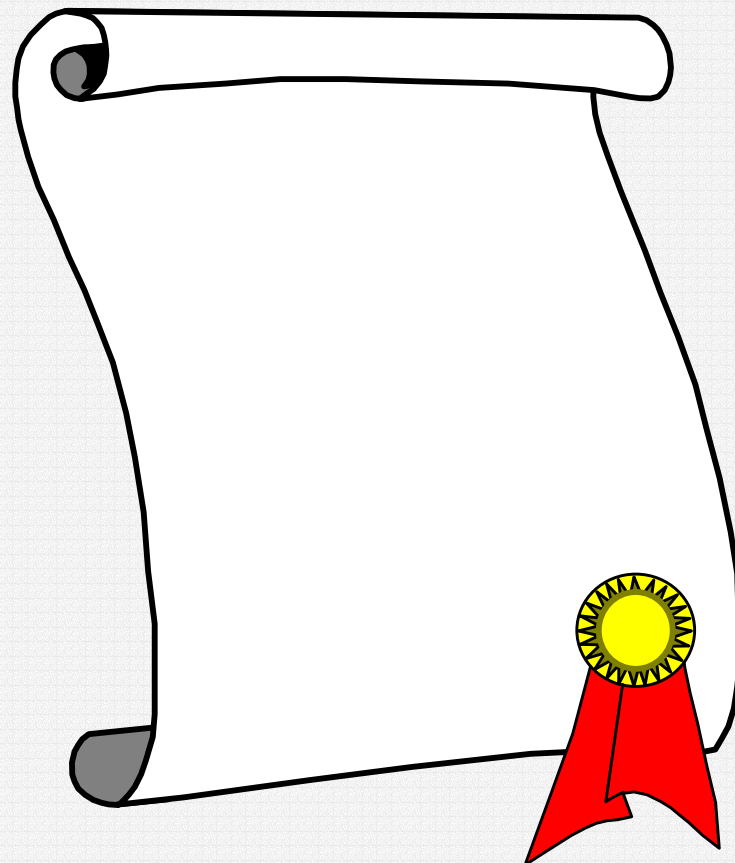
# EPAct – Energy Policy Act



- Written after the Gulf war (round 1) to reduce our dependence on Foreign petroleum.
- Amended in 1998
- Utility Fleets are now at 90% compliance levels. State and Federal are at 75%.
- For Every 450 Gallons of B100, or 2,250 gallons of blended B20, You earn one LDV credit.
- You can use biodiesel for up to 50% of your obligation
- Biodiesel credits may not be banked or traded
- Biodiesel requires no new refueling infrastructure.

# Executive Order 13149

- In April 2000 President Clinton issued an executive order to cut petroleum use in Federal fleets by 20% (EO 13149)
- All fleets had to file a plan with the DOE
- Covers all Federal Fleets except the US Postal Service
- US Air Force, Marines, and DOI switching over nationally
- Procured through the Defense Energy Supply Center



# Low Blends - Lubricity

- Biodiesel makes a great lubricity agent – *sort of!*
- ULSD requires an lubricity additive – but does meet spec.
- B2 and B5 becoming very popular in the farm belt. Generally soy based product.
- Seeing some state mandates (Minnesota)

# Home Heating Oil/Boilers

- Warwick Rhode Island  
4 schools running on  
biodiesel blends (Bob  
Cerio/NREL)
- Abbott & Mills Home Heating  
Oil Project (NREL/BNL)
- Favorable performance and  
Nox readings
- Harder to build incentives for  
use
- Regional consumer interest



# Future Markets- Legislation

- State level – currently 52 bills filed in 24 states including 3 in Connecticut.

- Federal Bills

Biodiesel Tax Incentive (S.355)

EPAct Reform (S. 356, HR 316)

CMAQ (S. 318)

Renewable Fuel Standard (S. 385)

# Final Thoughts

- Plants do not create demand – demand creates plants
- Consider scale in your plans – Fuel has generally been about scale.
- Look past the hype and do your homework!
- Do not underestimate the wrath of the IRS!!
- Quality (both fuel and handling) problems can kill an industry quickly – strong support for standards
- This is a global revolution!

# World Energy Contact Info

- 90 Everett Ave  
Chelsea, MA, 02150  
Ph:(617) 889-7300  
Fax:(617) 887-2411



**[WWW.WORLDENERGY.NET](http://WWW.WORLDENERGY.NET)**

Fleet manager references available upon request for winter or summer operation.