Reducing Diesel Emissions Workshop

March 28, 2008

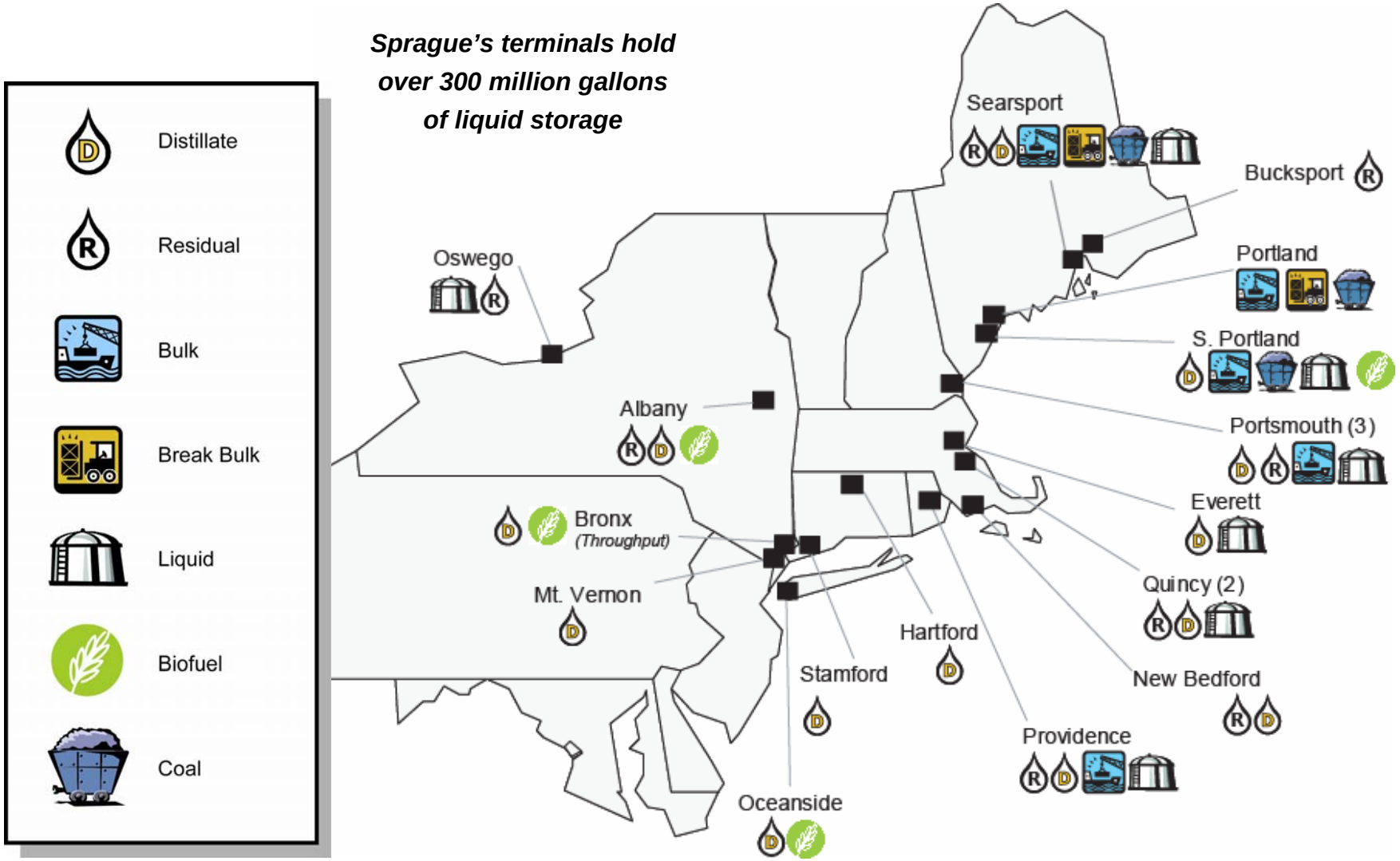
Retrofits and Cleaner Fuels 101

Sprague
DEMAND MORE THAN SUPPLY

AXEL JOHNSON INC.

Sprague Owned Terminal Network

Sprague's terminals hold over 300 million gallons of liquid storage

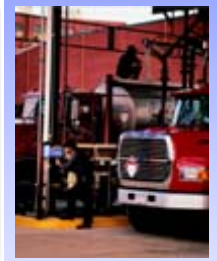


Sprague
DEMAND MORE THAN SUPPLY

Our Products and Services

End Users

Natural Gas



Fuel Oils

Coal

Clean fuels

Motor fuels

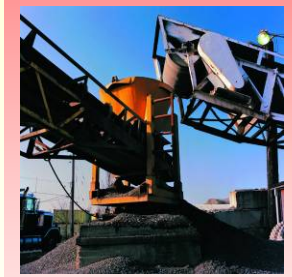
Resellers

Home Heating Fuels

Motor Fuels

Risk Management

Materials Handling



Bulk

Break Bulk

Lumber

Liquid

Sprague
DEMAND MORE THAN SUPPLY

What's the driving force behind lower sulfur fuels and emission control devices?

Immediate health benefits by reducing emissions over 90%

Why ULSD?

- ULSD enables new advanced emission control technology to work effectively to dramatically reduce diesel emissions

- Dramatic emissions benefits can be realized **today** without needing to wait 20 years for post 2007 engines to become the norm.

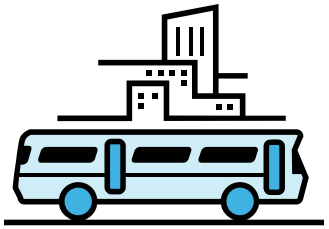
ULSD Today

- Supply readily available
- Unlike other alternative fuel options, ULSD has no infrastructure or fleet changes/modifications
- Already meets/exceeds OEM fuel specifications
- Engines run cleaner
- Immediate emission reductions
- Lowest overall fuel cost option to reduce emissions

ULSD Applications

ULSD Typical

Applications



Countries Around the World are Reducing Sulfur Levels

Current and Proposed Sulfur levels in Diesel in Asia, EU and USA

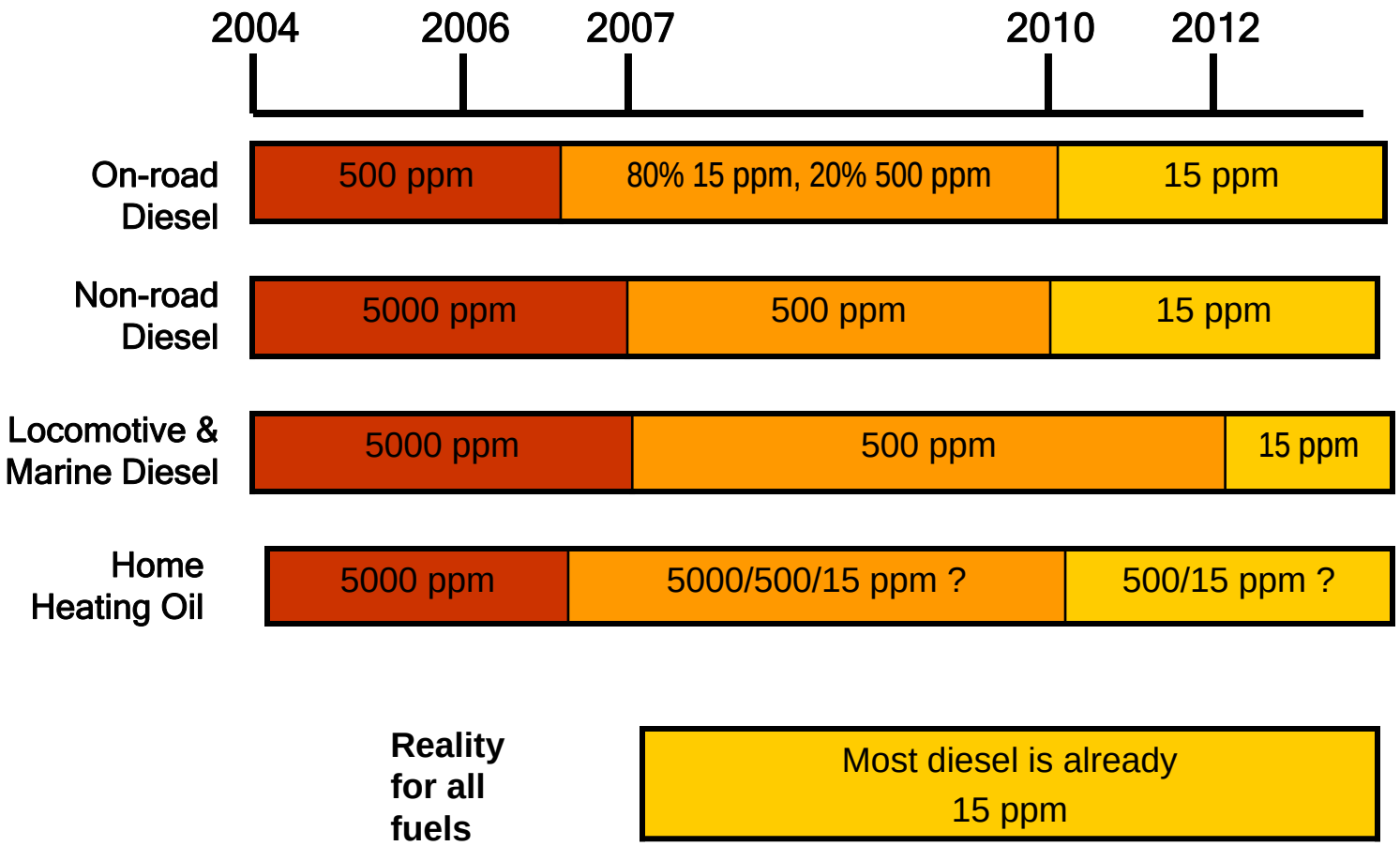
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bangladesh							5000									
Cambodia					2000											
Hong Kong, China		500					50					*10 - under consideration*				
India (nationwide)	5000				2500					500					350	
India (metros)	5000				2500	500				*350*					*50*	
Indonesia	5000															
Japan[a]	500				100					50		10				
Malaysia	5000		3000				*500 - marketed*			500					*50*	
Pakistan	10000						5000									
Philippines	5000					2000			500							
PRC (nationwide)	5000						2000			*500 - widely used*						
PRC - Beijing	5000						2000		500	350						
Republic of Korea	500							430			30				10	
Singapore	3000		500								50					
Sri Lanka	10000							5000	3000/ 500			500				
Taipei,China	3000			500			350			50						
Thailand	2500			500					350						50	
Viet Nam	10000							2500			500					
European Union					500					50/ 10			10			
United States	500										15					

> 500 ppm | 51 – 500 ppm | < 50 ppm

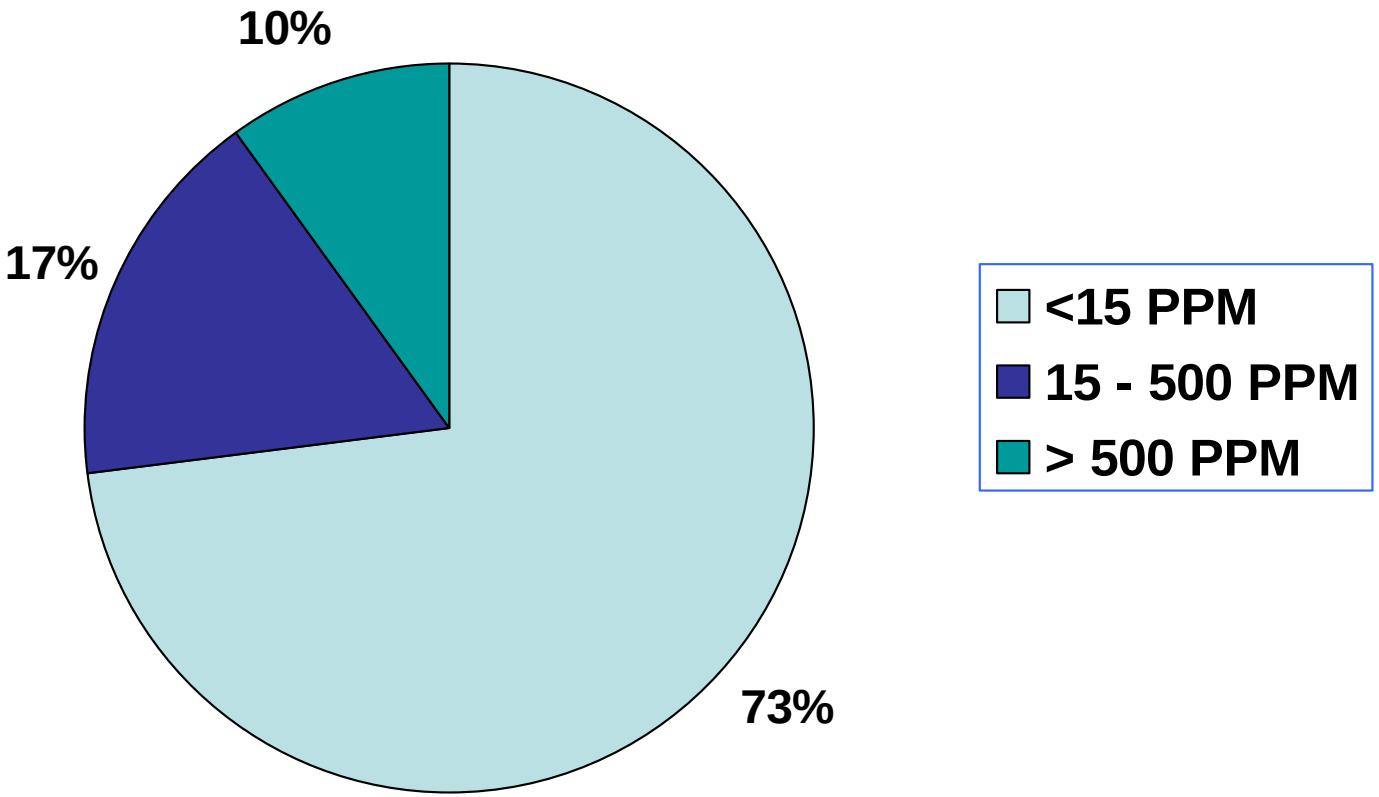
Notes:
a – nationwide supply of 50 ppm commenced in 2003 and for 10 ppm in 2005 due to voluntary goals set by the oil industry

Source: CAI-Asia, 2006

Ultra Low Sulfur Diesel Regulations



US Distillate Fuel Oil Production, Sulfur Content (PPM)



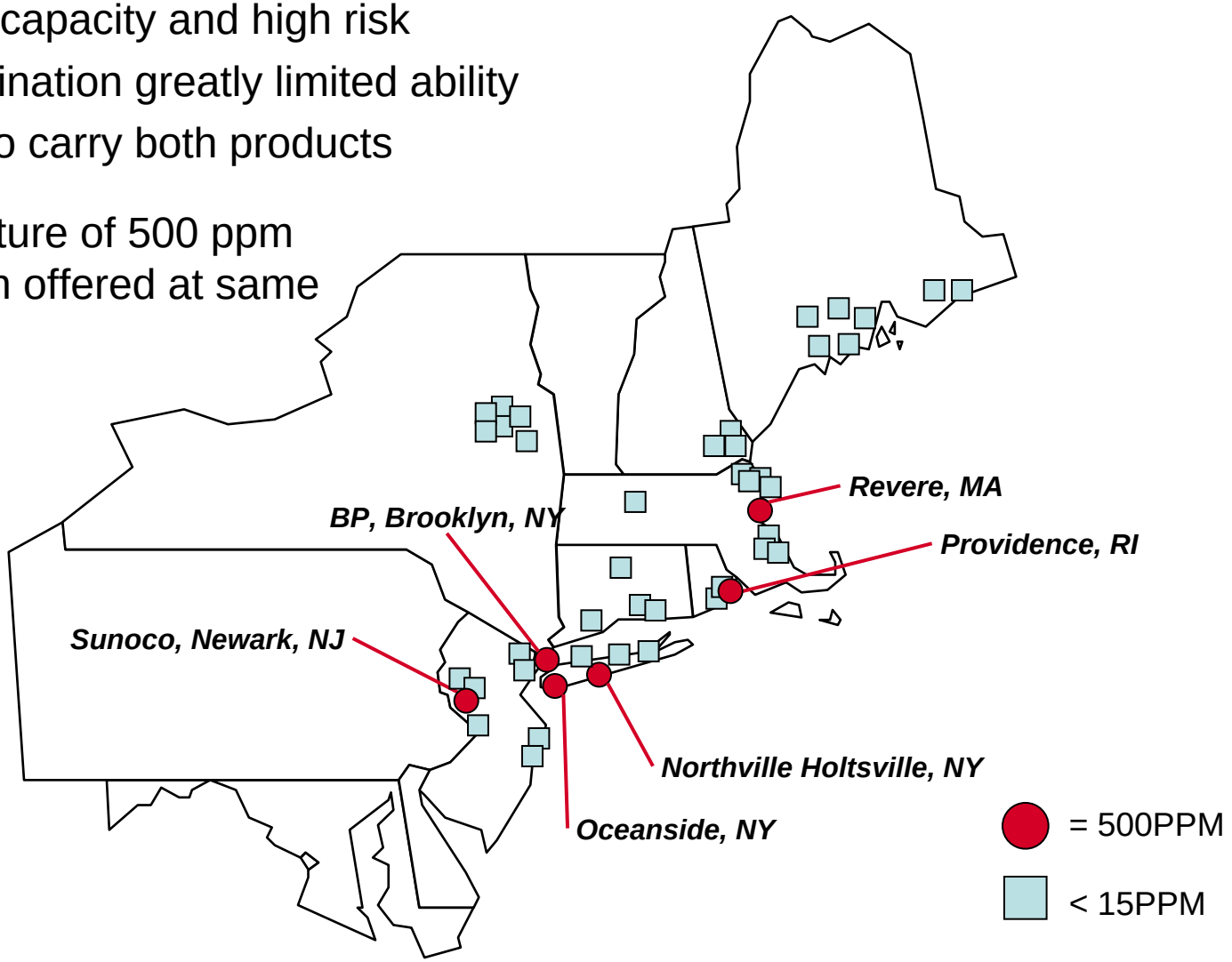
Total US Production ~ 4 million bbls/day

Source: US Energy Information Administration

500 PPM Diesel Availability Today

Limited storage capacity and high risk of cross contamination greatly limited ability of wholesalers to carry both products

Due to niche nature of 500 ppm it has often been offered at same price as 15 ppm



Construction at World Trade Center Site – real world example

DANGER
PC200LC
KOMATSU

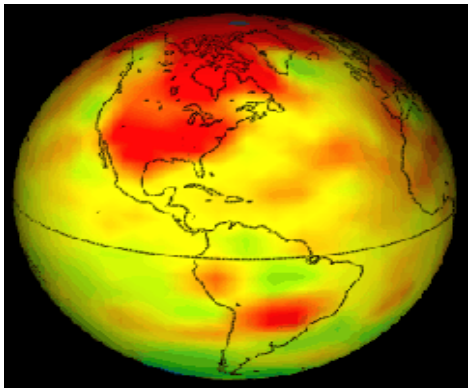
ULSD vs Conventional Diesel

15 ppm with after treatment
(yes – it is running)

Conventional diesel without
after treatment

Why Biodiesel?

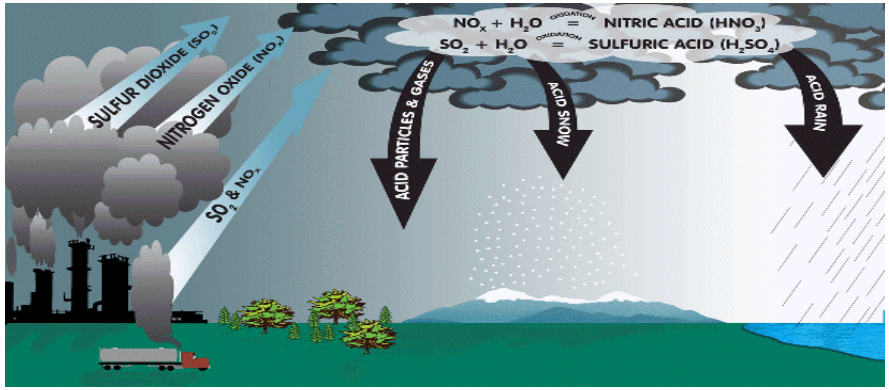
Climate Change



Particulate Emissions (PM 2.5)

Smog

Acid Rain

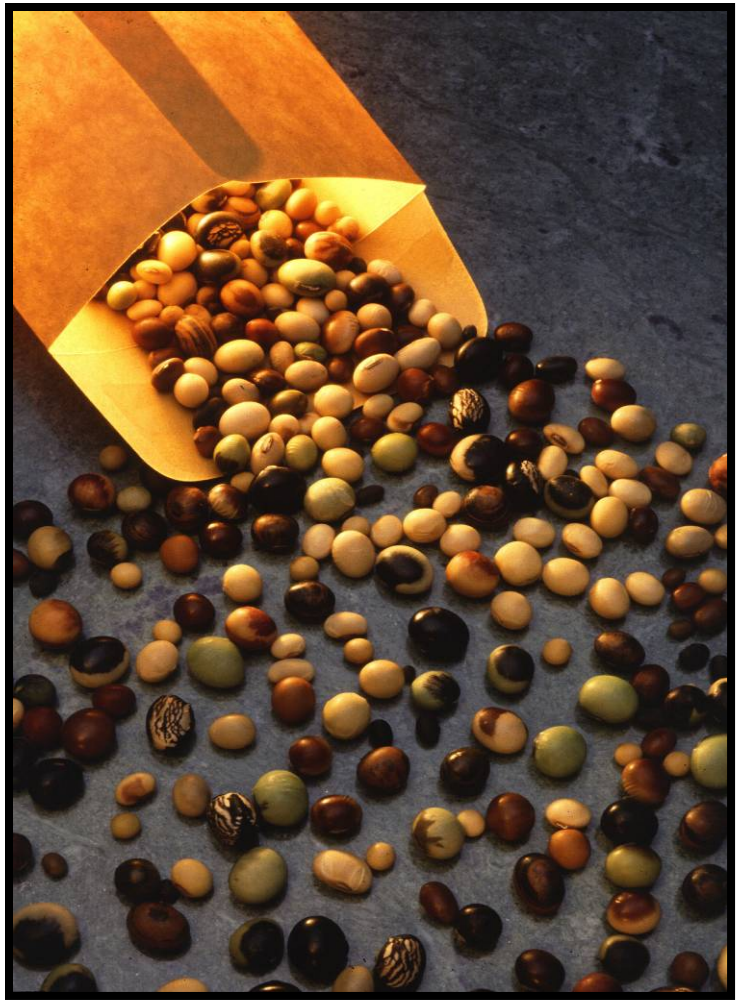


Benefits - Energy Balance & Environment

- Highest energy balance of any fuel
  - For every unit of fossil energy needed to make biodiesel, 3.2 units of energy are gained
    - USDA/DOE study
  - This takes into account the planting, harvesting, fuel production, transport...
- Biodegrades as fast as sugar
- Nontoxic
- Decreases EPA-targeted emissions
- Virtually free of sulfur & aromatics
- B20: helps diesel portion degrade twice as fast
- Soy B100 reduces lifecycle CO2 by 78%

Common Feedstocks

- Soybean – most widely used in the U.S.
- Canola
- Cottonseed
- Sunflower
- Beef tallow
- Pork lard
- Recycled or used cooking oils
- Trap grease



Why Biodiesel and BioHeat?

- A User's View
  - Little or no fueling infrastructure modifications
  - Little or no diesel engine or heating system modifications
  - Reduced equipment maintenance
  - Enhanced lubricity
  - Biodiesel has the highest BTU value of any alternative energy source
  - Biodiesel will compete economically with fossil fuels as the price of energy rises

Purchasing Biodiesel

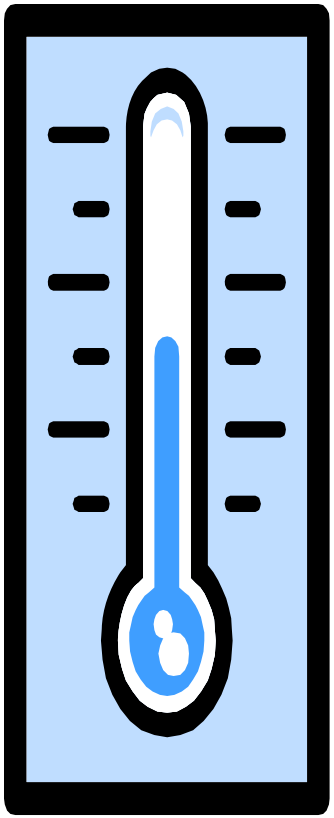
- BQ-9000 Certification Program
- Financial responsibility of supplier
- ASTM D 6751 / ASTM D 975
- 15 ppm sulfur maximum
- Virgin soy base
- Rack injection blending
- Rack blending of multiple grades of distillates
- Multiple supply points to store and blend B100
- Cold weather

Who and What are Accredited

- Two accreditations possible for companies:
  - BQ-9000 Accredited Producer
  - BQ-9000 Certified Marketer

- BQ-9000 accredits companies, not fuel
  - There is no such thing as 'BQ-9000 Biodiesel'
  - BQ-9000 does, however, help ensure that biodiesel produced and sold will meet D 6751

Biodiesel Cold Weather Characteristics



Common Cold Weather Problems	Solution: Sprague Ratio Blending
B100 congeals in cold weather storage	B100 stored in heated environment at temp >10 ° above cloud point
Loading B100 into a cold tank truck	Warm B100 introduced into a continuous stream of distillate creating miscible biodiesel recipe
Switch loading in order to create a homogeneous cold weather blend	One rack, ratio blended. Fast, easy, efficient, on spec

B100 must be stored at least 10° above cloud point to successfully blend with diesel fuel.

- *NBB, Cold Weather Blending study, 2005*

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