

Washington State
Department of Transportation
Biodiesel Performance Workshop

“Managing the Supply Chain”

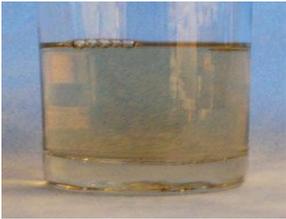


Overview

- Introduction
- Product and Processes
- Supply Chain Management
- Fuel Tank Maintenance
- Purchasing
- Quality Assurance
- Conclusion



Finished Fuels



Bulk Fuel Transmission



Bulk Fuel Storage



Local Terminals



Fueling



Utilities



The heavy reliance of diesel or biodiesel blended fuel is not just for on-highway use but falls across the entire spectrum of industries that rely on compression ignition, turbine and open combustion produced energy for non-critical and critical power and heating applications.

Telecommunications



Emergency Systems



Agriculture



Aviation



Ground



Industrial



Rail



Marine

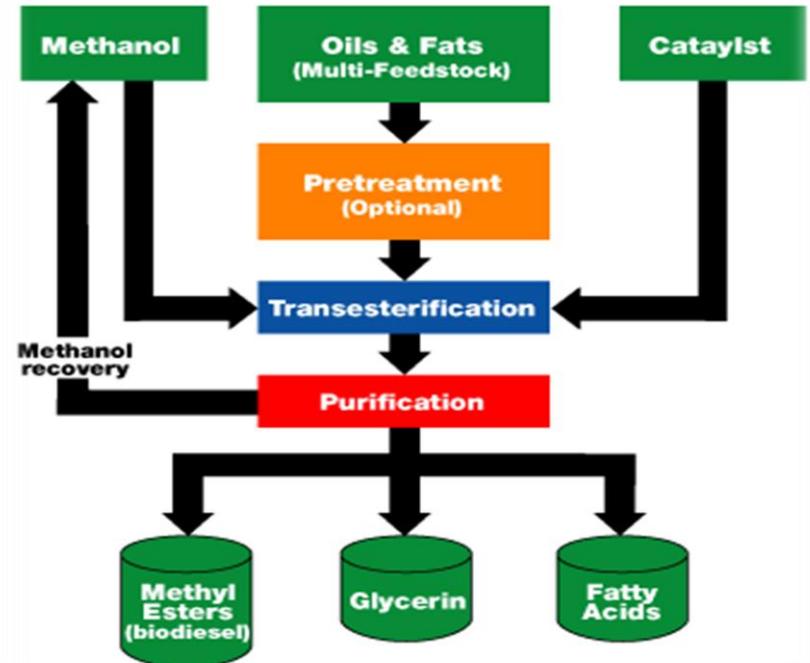
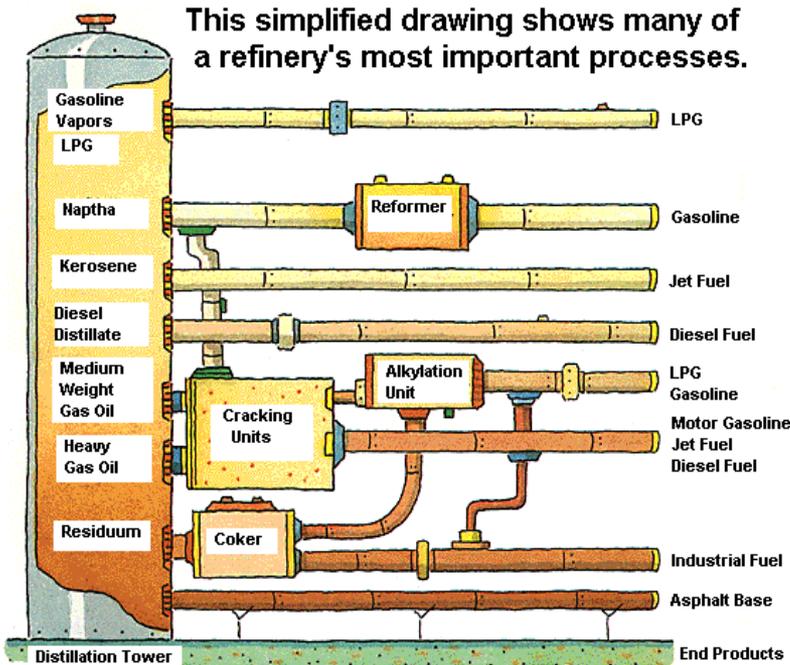


Production Process Comparison

Petroleum Diesel
Distillation Process

vs.

Biodiesel
Transesterification Process



Source: Energy Information Agency

Source: Understanding Biodiesel Fuel Quality and Performance

Maintaining Biodiesel Quality Throughout the Supply Chain

1 Before Receiving Product

- ▶ Specify the respective ASTM certification for the fuel being purchased
- ▶ Consider purchasing from a BQ-9000 certified marketer¹
- ▶ Use of a fuel stabilizer is recommended for storing fuel beyond six months
- ▶ Discuss your fuel's application and cold flow expectations with your supplier
- ▶ Ensure storage tanks are clean and dry



2 Upon Receipt of the Product

- ▶ Request a Bill of Lading or Certificate of Analysis on fuel delivery
- ▶ Stick storage tanks with paste, before and after delivery, for water
- ▶ Perform ASTM haze rating evaluation to identify water and sediment
- ▶ Retain two quart samples of your delivery for analysis should problems arise



3 Blending & Testing Strategies

- ▶ Be sure D975 diesel, D396 heating oil and D6751 biodiesel meet their independent specifications prior to blending
- ▶ Blends must be clear in appearance and free of water and sediment
- ▶ B100 should be stored and blended at 15F above cloud point²
- ▶ Adhere to BQ-9000 quality protocols—for more details, www.bq-9000.org



4 Storage & Dispenser Strategies

- ▶ Fuel tanks should be kept as full as possible to minimize water contamination
- ▶ Monitor hoses, fills, vents and gaskets for leaks
- ▶ Check tanks monthly for water by obtaining a tank bottom sample, remove water when required to prevent microbial contamination
- ▶ Handle all blends of biodiesel as you would any diesel or heating oil²



5 If Problems Occur...

- ▶ Contact your supplier, report your problem and ask for their assistance
- ▶ Share your retained samples with your supplier for analysis
- ▶ If an acceptable resolution is not reached, contact the National Biodiesel Troubleshooting Hotline (800-929-3437)



ASTM Specs

B100 (Neat biodiesel)

▶ ASTM D6751

Diesel Fuel

▶ ASTM D975

Heating Oil

▶ ASTM D396

Biodiesel Blends

6-20%

▶ ASTM D7467

Blends 5% or under

▶ D396 & D975

Footnotes

¹ If purchasing B100, consider a BQ-9000 Producer

² B100 "Neat", biodiesel handling requires knowledge of cloud point



Supply Chain Management

Production

- ASTM D975 (Bulk Diesel Fuel)
- ASTM D6751 & BQ 9000 (Bulk B100)

Storage and Distribution

- ASTM D975
- ASTM D6751 & BQ 9000
- ASTM D7467 & BQ 9000

Retail

- Short term critical storage
 - Long term storage with critical implication (ASTM D975)
-

Supply Chain Management Production

Petroleum Diesel

ASTM D975, product standard for No. 1, No.2 diesel, and B5 blend while “in commerce” to the retail level.

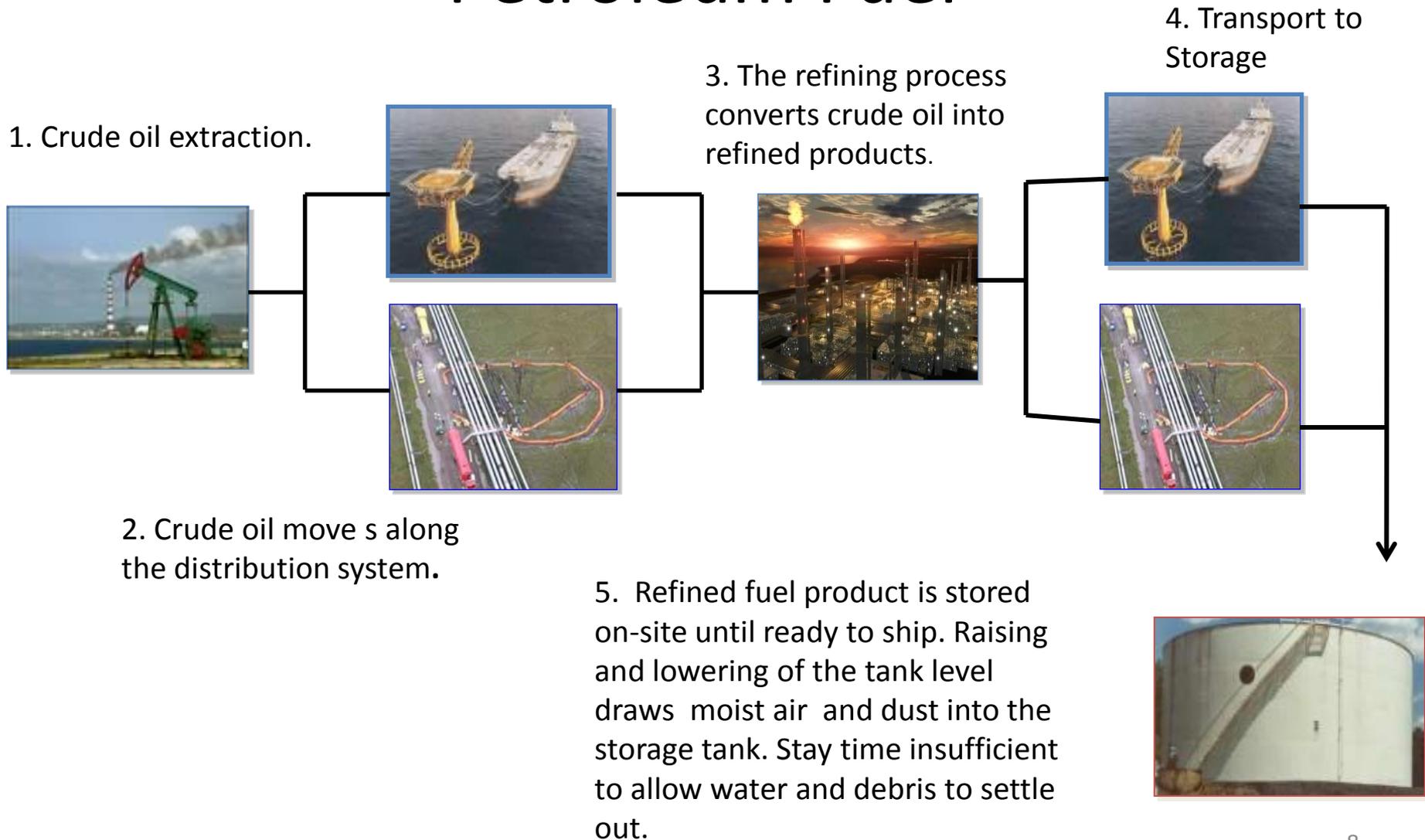
Biodiesel

ASTM D6751, product standard B100
ASTM D7467, product standard B6 to20 while “in commerce”.

BQ 9000 - is a combination of ASTM D6751, D7467 and a quality system program where the producer develops a program for:

- Proper sampling
 - Testing
 - Storage
 - Sample retention
 - Shipping protocols
 - Certificate of Analysis (COA)
 - Audits
-

Storage, Distribution and Contamination Petroleum Fuel



Storage, Distribution and Contamination Petroleum Fuel

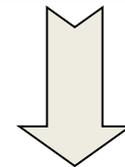


6. Refined fuel cools along the distribution system condensing water and microorganisms to form active pools/bio-films distributing microorganisms and their corrosive metabolites downstream to ASTs and USTs



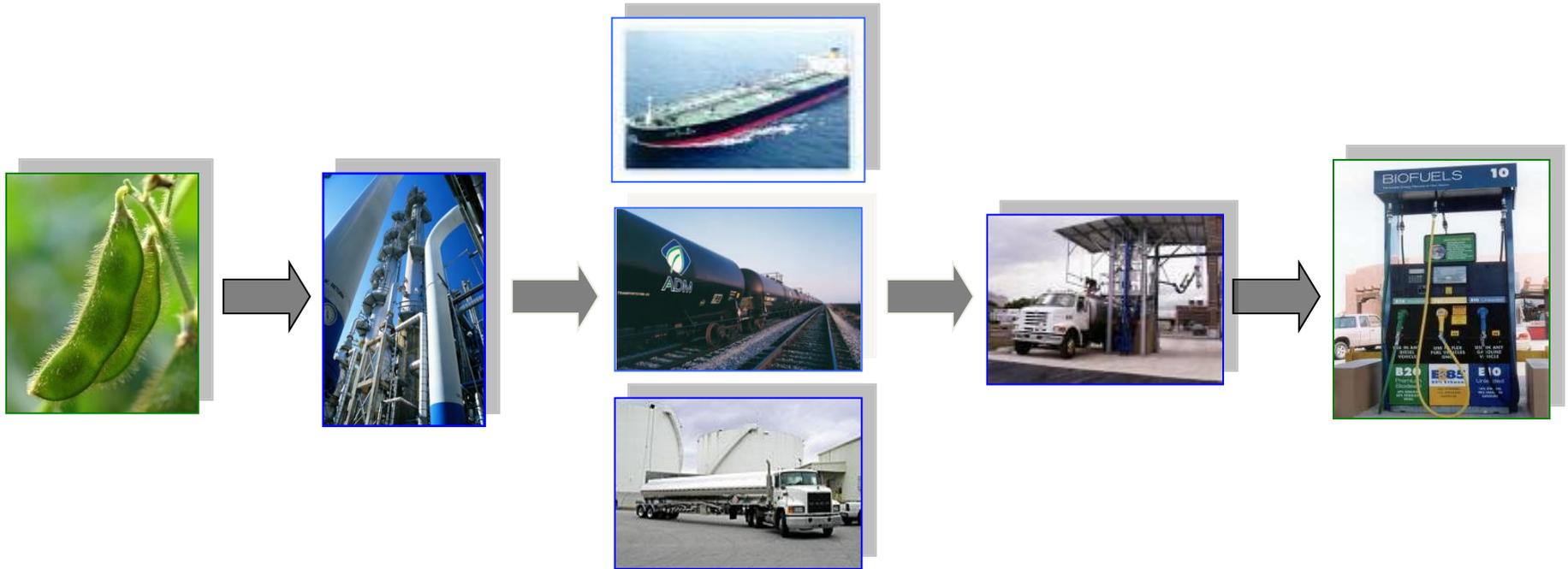
7. Poor ballast stripping sends water and microbes with offloaded fuel.

8. Pipelines and storage tanks are contaminated from upstream product tenders



Downstream Retail Market

Storage, Distribution and Contamination Biodiesel



Production

Manufacturing

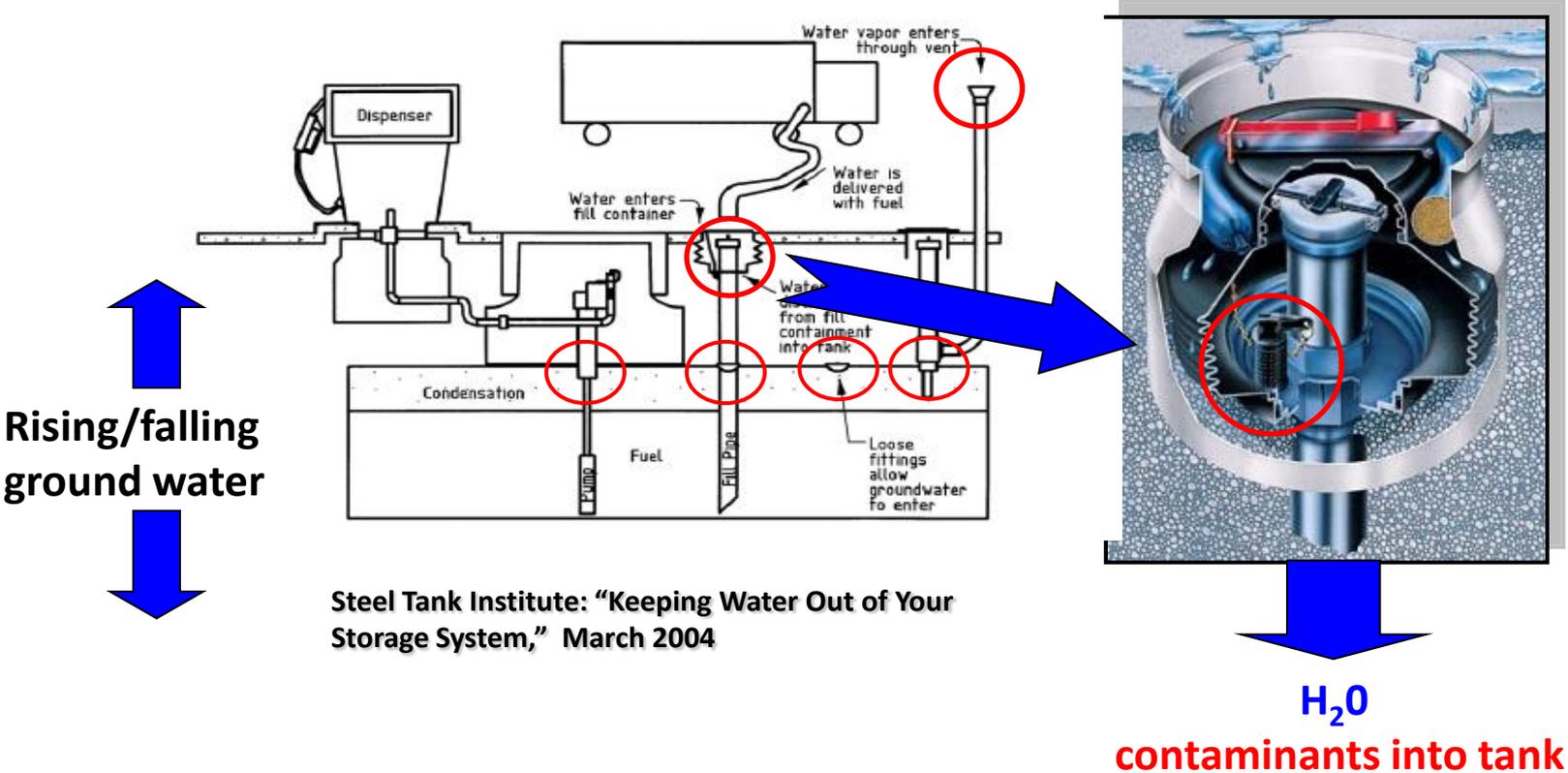
Bulk Shipping

Terminal Loading

Retail Sale

Sources of UST Water and Contamination Petro-diesel & Biodiesel

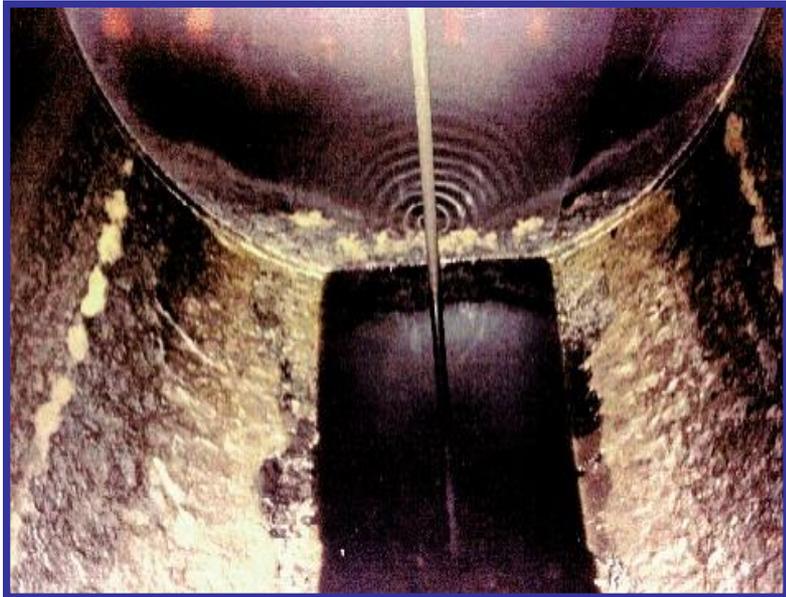
Water, Microbes and Debris



Fuel Storage and Distribution

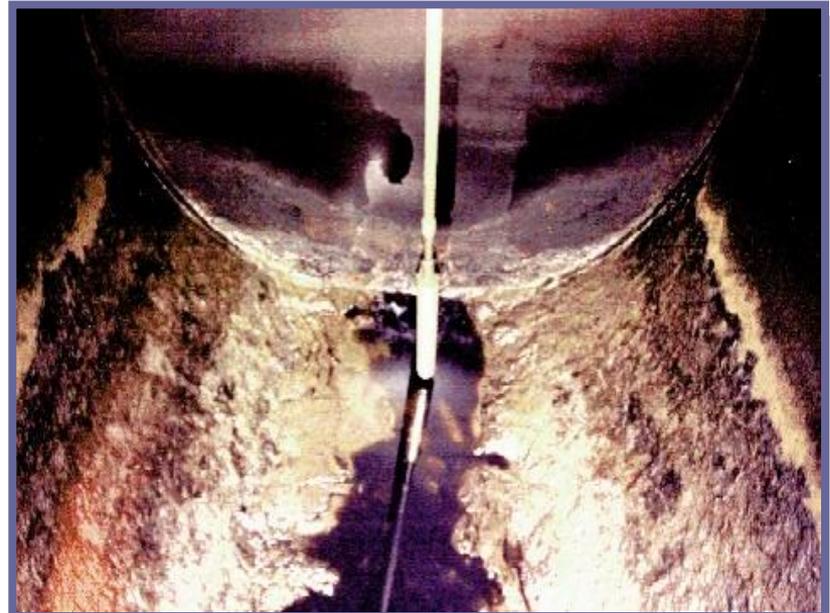
UST Microbial Contamination

Petro-diesel & Biodiesel



Fill End

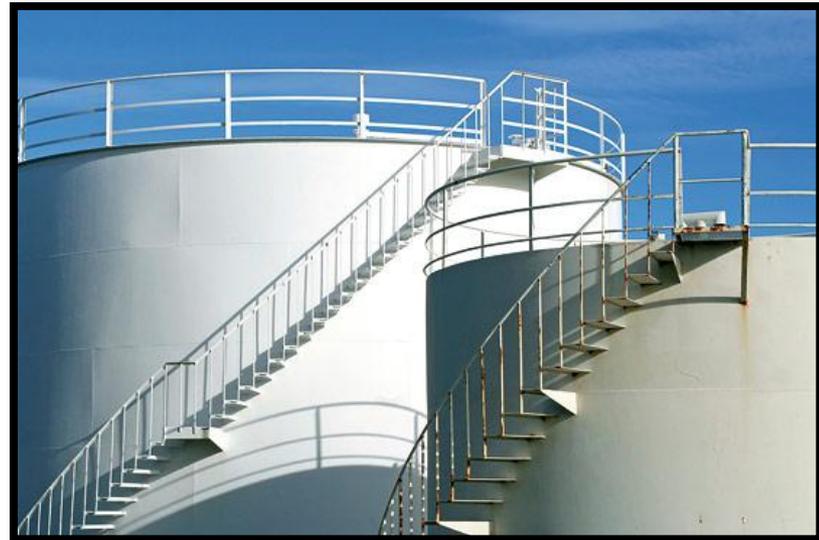
Pump End



Storage Tank Challenges

Petro-diesel & Biodiesel

- Distribution chain storage tanks create a challenging maintenance process
- Improper placement of water draw off
- Lack of attention to water evaluation



Consumption and Storage Diesel Fuel

- Generally diesel fuel is consumed 90-120 days following refining.
- Generally accepted shelf life of diesel fuel ≤ 12 months.
- Diesel fuel stored >12 months is classified by ASTM D975 as long term stored fuel.
- Biodiesel shelf life is generally 6 months.
- Storage of diesel or biodiesel blends beyond their recommended shelf life increases probability of fuel quality degradation and must be monitored.

Extended Biodiesel Storage

- It is best to store B100 pre-blended with some kind of distillate as soon as possible regardless of the season in small scale bulk plants if no heat exists
- Keep retains
- When blending, Biodiesel B100 should be a minimum of 10 to 15° F above its respective cloud point to avoid temperature shock
- Consider stabilizing fuels being stored in excess of six months
- In above ground tank environments remember the rules shown above and protect all lines, pumps and dispensers from cold

Purchasing Biodiesel Blend Fuel

Additional Guidance Considerations

If necessary, establish a contractual agreement with supplier to ensure product quality on a consistent basis:

- Especially for short term critical application or long term storage with critical application.

General Considerations:

- Ensure purchased fuel complies with ASTM 6751 (B100) , ASTM D975 (ULSD), D975 (B5) and D7467 (B6-B20)
- Encourage “in-line” mixing by blender to make BXX and ULSD homogeneous
- If possible, visually confirm delivery truck bays are free and clear of water and sediment.
- Obtain a quart retain sample of delivered fuel. Sample should be “Clear and Bright”. Save retain sample until next delivery and verify clear and bright.
- If applicable, make sure BXX meets cold flow requirements for winter storage.
- Be sure the storage tank is clean and free of water at all times
- For added surety, purchase BXX from BQ 9000 accredited producers and marketers

Assessing Transportation Alternatives for Biodiesel



Truck 3000 - 10,000 gallons



Rail 23,000 – 28,000 gallons



Barge 400,000 gallons |



Pipeline 2.0 M gallons or more

Biodiesel: Stringent ASTM Specifications

- Biodiesel is the ONLY renewable fuel for distillate blending with approved ASTM specifications:
 - D6751: B100 prior to blending
 - D975: On/off road blends up to 5% biodiesel
 - D396: Home heating oil up to 5% biodiesel (Bioheat®)
 - D7467: On/off road blends B6 to B20



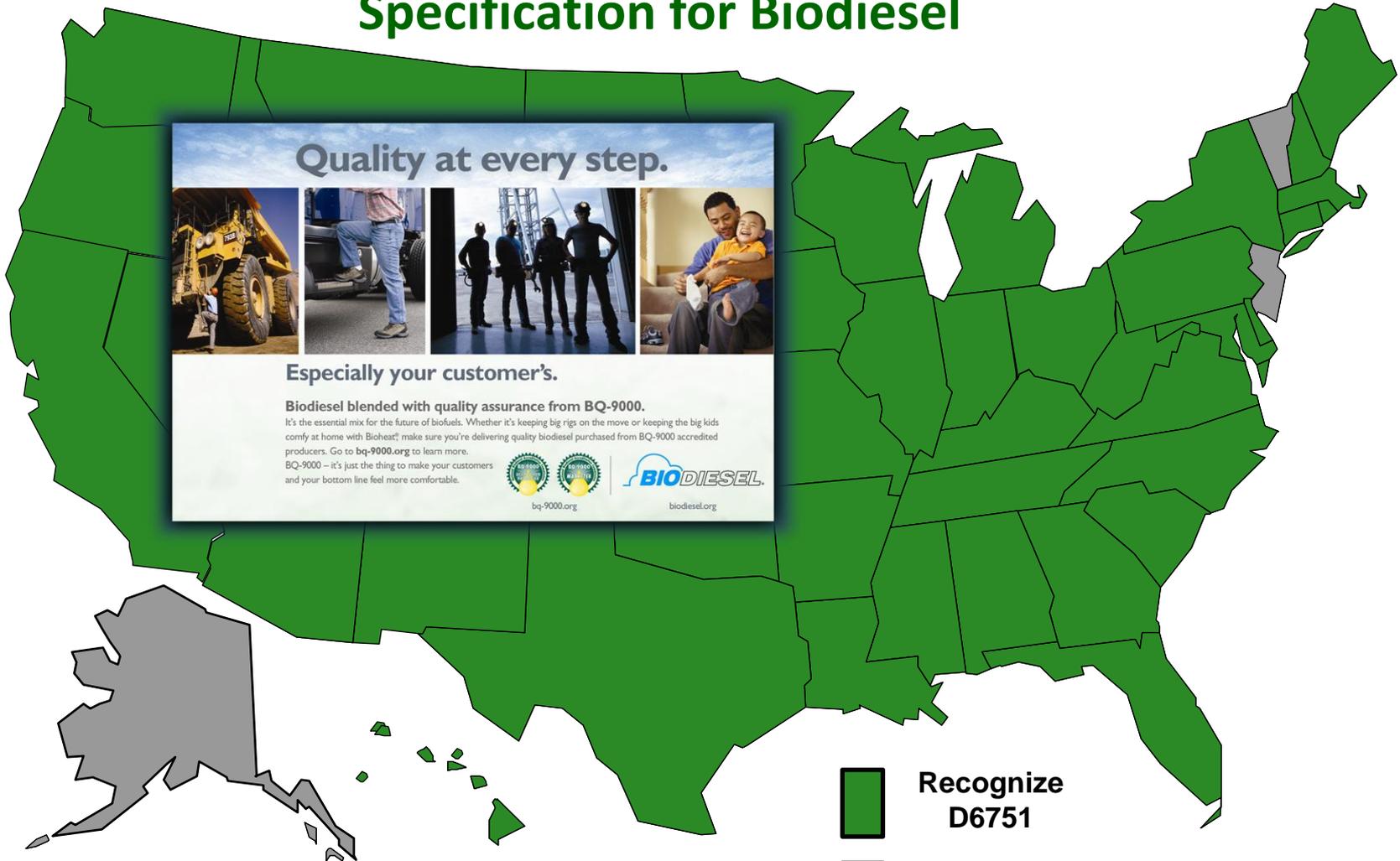
SPECIFICATION FOR BIODIESEL (B100) – ASTM 6751-10

*Biodiesel (B100) and the petroleum diesel must meet their respective ASTM specifications before blending.

Property	ASTM Method	Limits	Units
Calcium & Magnesium, combined	EN 14538	5 maximum	ppm (µg/g)
Flash Point (closed cup)	D 93	93 minimum	°C
Alcohol Control (one to be met)			
1. Methanol Content	EN 14110	0.2 maximum	mass %
2. Flash Point	D93	130 minimum	°C
Water & Sediment	D 2709	0.05 maximum	% vol.
Kinematic Viscosity, 40 C	D 445	1.9 – 4.1	mm ² /sec.
Sulfated Ash	D 874	0.02 maximum	% mass
Sulfur			
S 15 Grade	D 5453	0.0015 max. (15)	% mass (ppm)
S 500 Grade	D 5453	0.05 max. (500)	% mass (ppm)
Copper Strip Corrosion	D 130	No. 3 maximum	
Cetane	D 613	47 minimum	
Cloud Point	D 2500	report	°C
Carbon Residue 100% sample	D 4530*	0.05 maximum	% mass
Acid Number	D 664	0.5 maximum	mg KOH/g
Free Glycerin	D 6584	0.020 maximum	% mass
Total Glycerin	D 6584	0.240 maximum	% mass
Phosphorus Content	D 4951	0.001 maximum	% mass
Distillation	D 1160	360 maximum	°C
Sodium/Potassium, combined	EN 14538	5 maximum	ppm (µg/g)
Oxidation Stability	EN 15751	3 minimum	hours
Cold Soak Filtration	Annex to D 6751	360 maximum	seconds
For use in temperatures below -12 °C	Annex to D 6751	200 maximum	seconds

48/20 (States Managing Quality)

Specification for Biodiesel



-  Recognize D6751
-  No Reference to D6751

BQ-9000 Testing

- Certified producers must perform Full ASTM testing on the first 7 consecutive production lots and every 6 months.
- Critical Specification Testing on every production lot includes:
 - Alcohol Control
 - Water and Sediment
 - Cloud Point
 - Acid Number
 - Free Glycerin
 - Total Glycerin
 - Sulfur
 - Oxidation Stability
 - Visual Appearance
 - Cold Soak Filterability

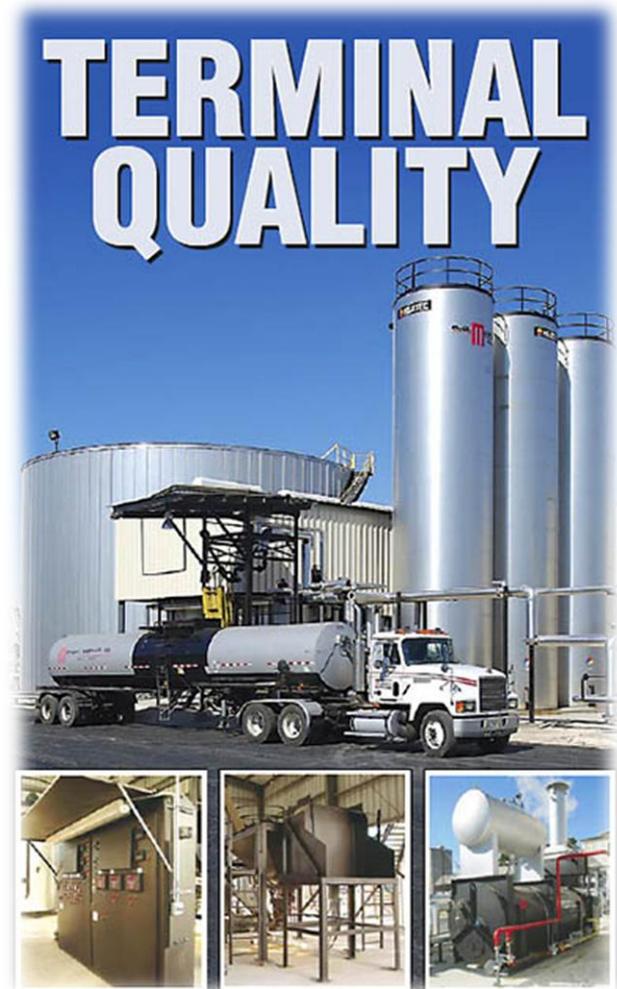
Biodiesel Availability



- Available through direct shipment from over 1,956 petroleum distributors nationwide
- Approximately 1,234 retail filling stations nationwide, 648 locations are semi-truck accessible
- Movement towards biodiesel at the terminal – 224 terminals nationwide, 93 automated

Preparation starts with...

- Analysis of infrastructure, (storage, blending & distribution operations).
- Establishing & enforcement of quality assurance protocols
- Securing biodiesel supply, (ratable, competitive, variable feedstock's)
- Import/Export considerations
- State Line Issues
- Industry & Consumer Education
- Pipeline – Barge Issues

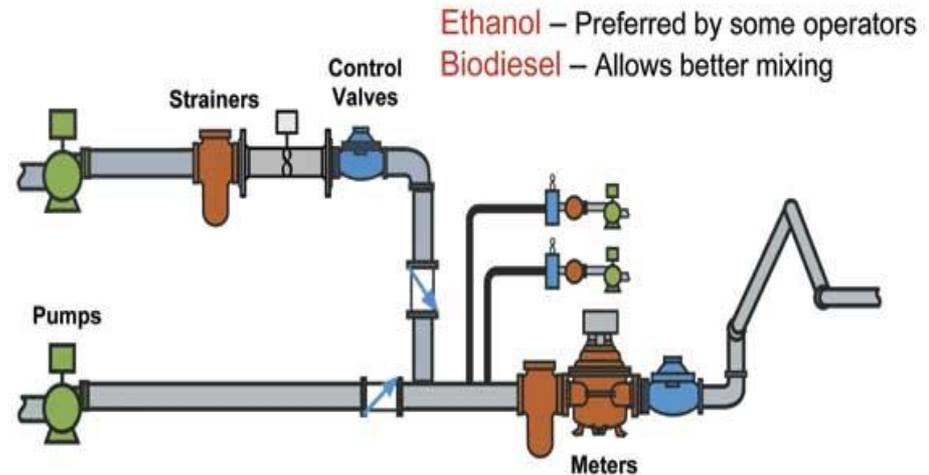


Preparing Terminals For Biodiesel

- Evaluate logistics of terminal, supply, and market opportunities
- Evaluate your existing assets prior to upgrades, (asset reutilization)
- Blending and additive applications need to be considered at this time.



Supply Chain Management



- The industry is transitioning from splash blending to electronic metered systems.
- Optimize blend ratio, eliminate guess work.
- Preserve the quality of the finished fuel.

Our Journey Through the Supply Chain



Additional Resources

- Paul Nazzaro, Petroleum Liaison, National Biodiesel Board, 978-664-5923, paulsr@yourfuelsolution.com
- NBB, 605 Clark Avenue, Jefferson City, MO. 65101, 573-635-3892, info@biodiesel.org
www.biodiesel.org, www.bioheatonline.com,
www.bq-9000.org, www.biodieselsustainability.com
- Robert S. Cerio, CEM, BOC, BPI
Consultant to the National Biodiesel Board
401-738-9009, RSCerio@cox.net