



Pipelines: *The Underground Pathway to National Supply Assurance?*

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Agenda

- ◆ Buckeye Background
- ◆ Logistics of the Northeast
- ◆ Pipeline Concerns
- ◆ Trial Movements
- ◆ ASTM D975 vs. Pipeline Specs
- ◆ Biodiesel vs. Ethanol
- ◆ Path to Overcome
- ◆ Past Success Stories



Who is Buckeye?

- ◆ One of Largest Independent Pipeline Systems in United States (Volumes Delivered)
- ◆ Owns & Operates:
 - 5,400 miles of pipeline
 - 51 product terminals
 - 21.0 million barrels of aggregate storage
- ◆ Operates:
 - 2,700 miles of pipeline for oil and chemical companies



Buckeye Logistics

◆ Major Receipt Locations

- Linden, NJ (New York Harbor)
- Boothwyn, PA (Philadelphia)
- New Haven, CT
- Toledo & Lima, OH
- Detroit, MI
- East Chicago, Hammond & Hartsdale, IN
- St. Louis, MO



Buckeye System

- ◆ Multi-Product Systems
 - Gasoline
 - Diesel Fuel
 - Jet Fuel
 - LPG's
- ◆ Fungible System
 - Product commingles with other like product
 - Maximizes tank utilization
 - Intense product scrutiny
 - Must protect other product in tankage



Northeast Logistics

- ◆ Supplied from Local Refining, Barge Movements into NY Harbor, and Other Pipelines
 - Colonial, Explorer, Sunoco Logistics, Teppco,
- ◆ Deliveries to Terminals and Other Pipelines
 - BP Inland, Marathon, Sunoco Logistics, Teppco, West Shore, Wolverine
- ◆ Multiple Handoffs Requires Coordination Between All Parties Involved



Pipeline Transportation Concerns



Pipeline Transportation Concern: *Trailback into Jet Fuel*

- ◆ Multi-Product Systems
 - Impact on other products, specifically jet fuel
- ◆ Biodiesel is Surface Active
 - Propensity to adhere to surfaces, including pipe walls
- ◆ Product Sequencing – Segregation of Jet Fuel from Biodiesel Batches
 - Some systems only move diesel and jet fuel
 - Limits flexibility of pipeline, which limits capacity



Pipeline Transportation Concern: *Trailback into Jet Fuel*

- ◆ Definition of “0” FAME
 - Will determine what is considered contamination
 - Lowest detectable limit?
 - JIG 11/07 Bulletin – up to 5 ppm considered no-FAME
- ◆ Allowable FAME Levels in Jet Fuel
 - Aero-engine OEM Approval of higher concentrations
 - JIG P.Q. Committee – formal report to OEM’s
 - Data Shared with OEM’s at IASH 10/7/07 Meeting
 - FAME levels up to 400 ppm - properties unaffected
 - Even if properties unaffected, fuel must be “Fit For Purpose”



Pipeline Transportation Concern: *Increased Interface Generation*

- ◆ Volume Settlement Process
 - Customers made whole for interface downgrades
 - When jet fuel is cut short, pipeline compensates those customers for shortfall
 - Increased shortages means increased payments to customers
- ◆ Settlement Process Would Change for Biodiesel
 - Biodiesel shippers would be responsible for the additional downgrades
- ◆ Alternative – Non-Biodiesel Buffer Material
 - Limits Flexibility/Capacity

Batch Sequencing - Interface

NO BIODIESEL



Flow 

WITH BIODIESEL



Larger Interface Due to FAME Contamination

Buffer Material

NO BIODIESEL



Flow 

WITH BIODIESEL (USING BUFFER)





Pipeline Transportation Concern: *Lack of Additional Tankage*

- ◆ Already Multiple Grades of Diesel
 - ULSD (<15 ppm)
 - Low Sulfur Diesel (<500 ppm)
 - High Sulfur Diesel (>500 ppm)
- ◆ Tankage Constraints
 - Incapable of moving multiple blend percentages
 - Move one biodiesel blend AT MOST
 - Blending at rack if additional biodiesel required
 - May have to commingle with non-blended product



Pipeline Transportation Concern: *Tracking Biodiesel Content*

- ◆ Scenario #1: All Product is 5% Blend
 - Downstream customers all get 5% biodiesel
 - Additional blending at the rack based on 5%
- ◆ Scenario #2: Mixture of Blends & Non-Blends
 - Segregation of blends & non-blends requires tankage
 - Commingling of blends & non-blends likely
 - Biodiesel content uncertain after commingling
 - Affects additional rack blending, as well as additives
 - Requires downstream testing to determine blend content



Pipeline Transportation Concern: *Lack of Low-Level FAME Test*

- ◆ Test for Identifying Contamination
 - Must be capable of testing to the maximum allowable limit in jet fuel
- ◆ Must be Applicable in Field Environment
 - Can't send samples to lab during batch change
 - Require fast, accurate results



Pipeline Transportation Concern: *Cold Flow in Pipeline*

- ◆ Concern with Pure Biodiesel (B100)
 - Higher pour point than refined petroleum products
 - Low-level blends should have sufficient cold flow properties to avoid gelling
- ◆ Underground Exposure
 - Long transit times
 - Cooling effects
- ◆ Dependent on Biodiesel Source
 - Rape seed, tallow, soy, palm, etc.
 - Varying cold flow properties
 - Monitoring biodiesel source is not feasible for pipeline



Pipeline Trial



Test Movement – Trapil, France

- ◆ Test Protocol
 - 150 km (93 mile) transfer through 20” pipeline
 - Two pipeline runs
 - Referee Case – Jet Following Non-Biodiesel
 - Test Case – Jet Following 10% Bio-blend
 - Jet Fuel for referee and test case from same batch
- ◆ Results
 - Interface Increased by 20%
 - Detected FAME in the Jet
 - Performance Properties of the Jet Not Affected

Info from presentation to IASH Conference, Oct. '07



Pipeline Specifications



Specification Comparisons: *ASTM vs. States vs. Pipeline*

- ◆ Pipeline Specifications Developed Based On ASTM and State Requirements
 - Some additional specs for pipeline (ex.: corrosion)
- ◆ Not All Specs are Identical
 - States typically adopt ASTM standards
 - Pipelines must ensure that product meets ASTM and state specifications at point of retail
- ◆ Inclusion of Biodiesel Blends in D975 Does NOT Guarantee Pipeline Acceptance
 - Must be capable of moving safely without impact to other products

Pipeline Comparison: *Biodiesel vs. Ethanol*

	Biodiesel	Ethanol
Metallurgical Issues	None	Stress Corrosion Cracking (SCC)
Operational Concerns	Trailback	System Cleanliness
Solvency	Stronger solvency than typical diesel fuel	Pick up <i>all</i> dirt and contaminants in pipeline
Water	Accelerates degradation and corrosion	Miscible in water – separation difficult
Air Interaction	Stability Issues	Component of SCC



Additional Concerns

- ◆ Phase Separation
 - Product will sit in breakout tankage
 - One tank will likely supply multiple customers
 - Can't rely on product mixing at delivery
- ◆ Compatibility of Drag Reducing Agent (DRA)
 - DRA is essential in many systems for additional capacity
 - Movement of products without DRA slows the line
 - Pure Biodiesel – will DRA work?



Where Do We Go From Here?



Path to Overcome

- ◆ More Pipeline Trials
 - Additional information to make better decisions
- ◆ Better Testing Capabilities
 - Testing at low levels is imperative to identifying contamination
- ◆ Get Jet Fuel Experts Involved
 - Express desire to move biodiesel via pipelines
 - If no reason to investigate higher levels of FAME in jet fuel, it will never be approved
 - Establish acceptable FAME levels
 - Must come from OEM's



Path to Overcome

- ◆ Discuss Changing Pipeline Logistics
 - Modified Interface Cutting
 - Downgrades will be at the expense of the biodiesel shipper
 - Controlled Product Sequencing
 - Jet fuel moving around gasoline or other non-bio blends
 - Non-FAME Buffers
 - Buffer size sufficient enough to remove FAME from pipe
 - Minimum Jet Fuel Batch Sizes
 - Dilution of FAME impact
 - *Assuming FAME is acceptable at some concentration*



Success Story



Past Challenges – Red Dye

- ◆ Concerns When Dye Introduced in Pipeline Movements
 - Trailback concern with jet fuel
- ◆ Changes to Product Movements
 - Product sequencing (where available)
 - Changed product cut criteria
 - Testing equipment
- ◆ Minimal Red Dye Issues with Jet Fuel
 - Contamination easily identified visually and quantified with field equipment



Other Sources of Information...

- IASH Conference – Trapil Trial April 2007
October 2007
<http://iash.net>
- IATA Aviation Fuel Forum
Istanbul, Turkey 11/5/07-11/8/07
www.iata.org
- JIG Bulletin No. 15
November 2007
www.jointinspectiongroup.org



Questions???
