

Hot Topics: Alternative Fuels: Ethanol & Bio Diesel

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The Problem

- January 2009 (RFA Statistics)
 - 10.6 Billion Gallons
 - 170 Plants in 26 states
 - 24 Plants under construction
- January 2004
 - 3.1 Billion Gallons
- #1 Haz Mat Transported by rail



Fixed Facility & Transportation Issues

- Refineries have added large haz mat issues
 - Corrosives, peroxides, poison/corrosive gases, flammables, monomers
- Current transport is by rail and highway
 - Numerous Transportation incidents
 - DOT 111 and MC 306/ DOT 406;MC 307/DOT407



Current Trends

- #1 NAR haz mat for rail. (FRA)
- E15 and E20
 - Pending passage by EPA
 - Auto industry adapting engines for the future
- Pipelines
 - Plans for Magellan Pipeline: Midwest to NE
 - Kinder Morgan Local Pipelines in Florida, Texas



Release Information

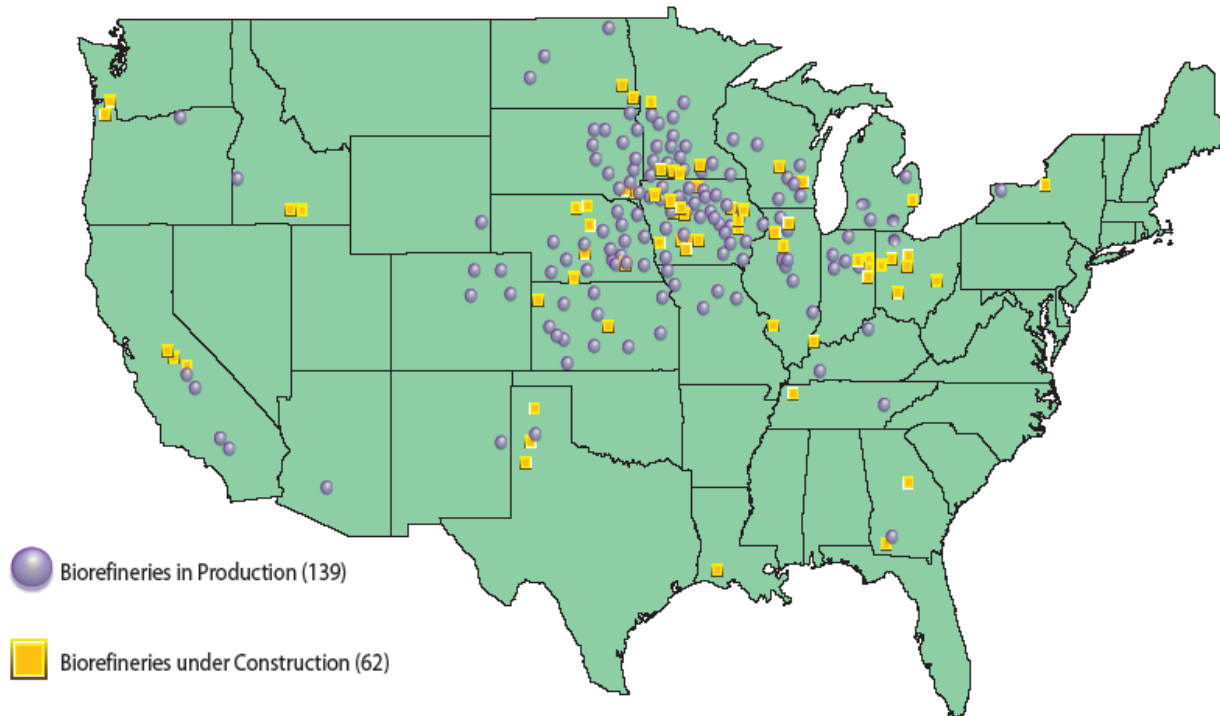
- Ethanol is now **12% of all rail releases**
- Other materials release numbers are going down
- Ethanol is replacing the void left by the reduction in other commodities
- This increases the notoriety of fuel ethanol as a source of public and environmental danger



	2001	2002	2003	2004	2005	2006	2007
All	899	870	802	765	745	704	709
Ethanol	17	40	54	60	67	87	86
% of Total	1.9	4.6	6.7	7.8	9.0	12.4	12.1



Refinery Locations



Source: Renewable Fuels Association

Response Issues

- Alcohol Resistant Foam
 - How does it work?
 - Application techniques.
 - How application equipment works?
- Properties = HAZARDS
- Placards



Ethanol



Ethanol Properties

- Ethanol (Ethyl Alcohol)
- Denatured Alcohol (98%/2%)
- E-85
- E10



Ethanol Hazards

- Ethanol
 - **Flammable/Toxic**
 - CGI
 - PID
 - FID
 - Temp Gun
 - Tube/CHIP
 - Turn Out/SCBA
 - 10% LEL Red Light



Ethyl alcohol		Formula: CH ₃ CH ₂ OH	CAS#: 64-17-5	RTECS#: KQ6300000	IDLH: 3300 ppm [10%LEL]
Conversion: 1 ppm = 1.89 mg/m ³		DOT: 1170 127			
Synonyms/Trade Names: Alcohol, Cologne spirit, Ethanol, EtOH, Grain alcohol					
Exposure Limits: NIOSH REL: TWA 1000 ppm (1900 mg/m ³) OSHA PEL: TWA 1000 ppm (1900 mg/m ³)				Measurement Methods (see Table 1): NIOSH 1400 OSHA 100	
Physical Description: Clear, colorless liquid with a weak, ethereal, vinous odor.					
Chemical & Physical Properties: MW: 46.1 BP: 173°F Sol: Miscible FI.P: 55°F ← Flash Point IP: 10.47 eV ← PID-PPM Sp.Gr: 0.79 VP: 44 mmHg FRZ: -173°F UEL: 19% LEL: 3.3% Class IB Flammable Liquid		Personal Protection/Sanitation (see Table 2): Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contam Remove: When wet (flamm) Change: N.R.		Respirator Recommendations (see Tables 3 and 4): NIOSH/OSHA 3300 ppm: Sa/ScbaF §: ScbaF:Pd,Pp/SaF:Pd,Pp:AScba Escape: ScbaE	
Incompatibilities and Reactivities: Strong oxidizers, potassium dioxide, bromine pentafluoride, acetyl bromide, acetyl chloride, platinum, sodium					
Exposure Routes, Symptoms, Target Organs (see Table 5): ER: Inh, Ing, Con SY: Irrit eyes, skin, nose; head, drow, lass, narco; cough; liver damage; anemia; repro, terato effects TO: Eyes, skin, resp sys, CNS, liver, blood, repro sys			First Aid (see Table 6): Eye: Irr immed Skin: Water flush prompt Breath: Fresh air Swallow: Medical attention immed		

Denatured Ethanol 5% MSDS

Poet Biofuels

- **SECTION IV – Fire and Explosion**
Hazard Data

- **Flash Point (Method Used):**49 degrees F

- (Tag Open Cup ASTM D-1310)

- **Flammable Limits** LEL UEL

- (For Ethyl alcohol) 3.3% 19.0%

- **Class IB Flammable liquid**



Flash Point of Denatured ETOH



Table 2.1: Gasoline – Ethanol Blended Fuels – Pure Ethanol

	Gasoline	E-10 Blended Fuel	E-85 Blended Fuel	E-95 / E – 98 Fuel Grade Ethanol / Denatured Ethanol	E-100 Pure Ethanol
Flash Point	-45°F	-45°F	-20° - -5°F	-5°F	54°F
Auto Ignition Temperature	Highly Variable; >530°F	Highly Variable; >530°F	>790°F	>689°F	685°F
Specific Gravity @ 60°F	0.70 – 0.78	0.70 – 0.78	0.79	0.79	0.79
Vapor Density Air = 1	3.0 – 4.0	3.0 – 4.0	2.0 - 4.0	1.6	1.6
Vapor Pressure	275 – 475 mmHg @ 68°F	275 – 475 mmHg @ 68°F	340 – 560 mmHg @ 68°F	181 mmHg @ 32°F	44mmHg @ 68°F
Boiling Point	85 - 437°F	85 - 437°F	96 - 170°F	165 - 175°F	173°F
Flammable Range (LEL-UEL)	1.4% - 7.6%	1.4% – 7.6%	1.4% - 19.0%	3.3% – 19.0%	3.3% – 19.0%
Conductivity	None	No Information Found (Consider as Possible)	No Information Found (Consider as Possible)	Yes	Yes
Smoke Character	Black	Black	Slight to None	Slight to None	None
Solubility (In Water)	Immiscible	Partially miscible (gasoline immiscible)	Highly miscible (gasoline immiscible)	Highly miscible (gasoline immiscible)	Totally miscible



AR - AFFF

- Application techniques/rates.
 - NFPA 11 or 1,000 sq' = 200 gpm solution
 - Roll On or Bank Down
- How does it work?
 - Polar Solvent – Polymer film
- How application equipment works?
 - Eductors
 - On Board Systems



Treat It Like Latex Paint



CO Sensor Cross Interference

- Sensors currently do have some filters on them, but the ethanol quickly saturates these and once that happens the sensors begin to respond to ethanol. (Raymond Berg, Technical Support Specialist Industrial Scientific Corporation)
- False CO readings are not immediate
 - Length of detection time
 - Age of sensor



Derailment Jan 2006



Old placard
UN 1993

Regulatory Change

HM-218D-Final Rule – January 28, 2008

- Effective Date – October 1, 2008
- Effective Date for Ethanol changes delayed Until October 1, 2010
- Voluntary Compliance – January 28, 2008

Ethanol Concentration	Preferred Proper Shipping Name and Identification Number
E1 - E10	Gasohol, NA1203 <i>or</i> Gasoline, UN1203
E11 - E94	Ethanol and gasoline mixture, UN 3475
E95 - E99	Denatured alcohol, NA1987 <i>or</i> Alcohols, n.o.s., UN 1987
E100	Ethanol, <i>or</i> Ethyl alcohol, UN 1170



Current DOT Placards

E10



E85



E95



OR



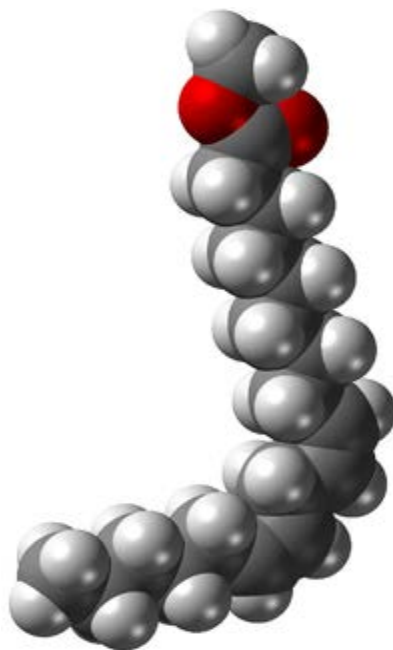
E100



Biodiesel

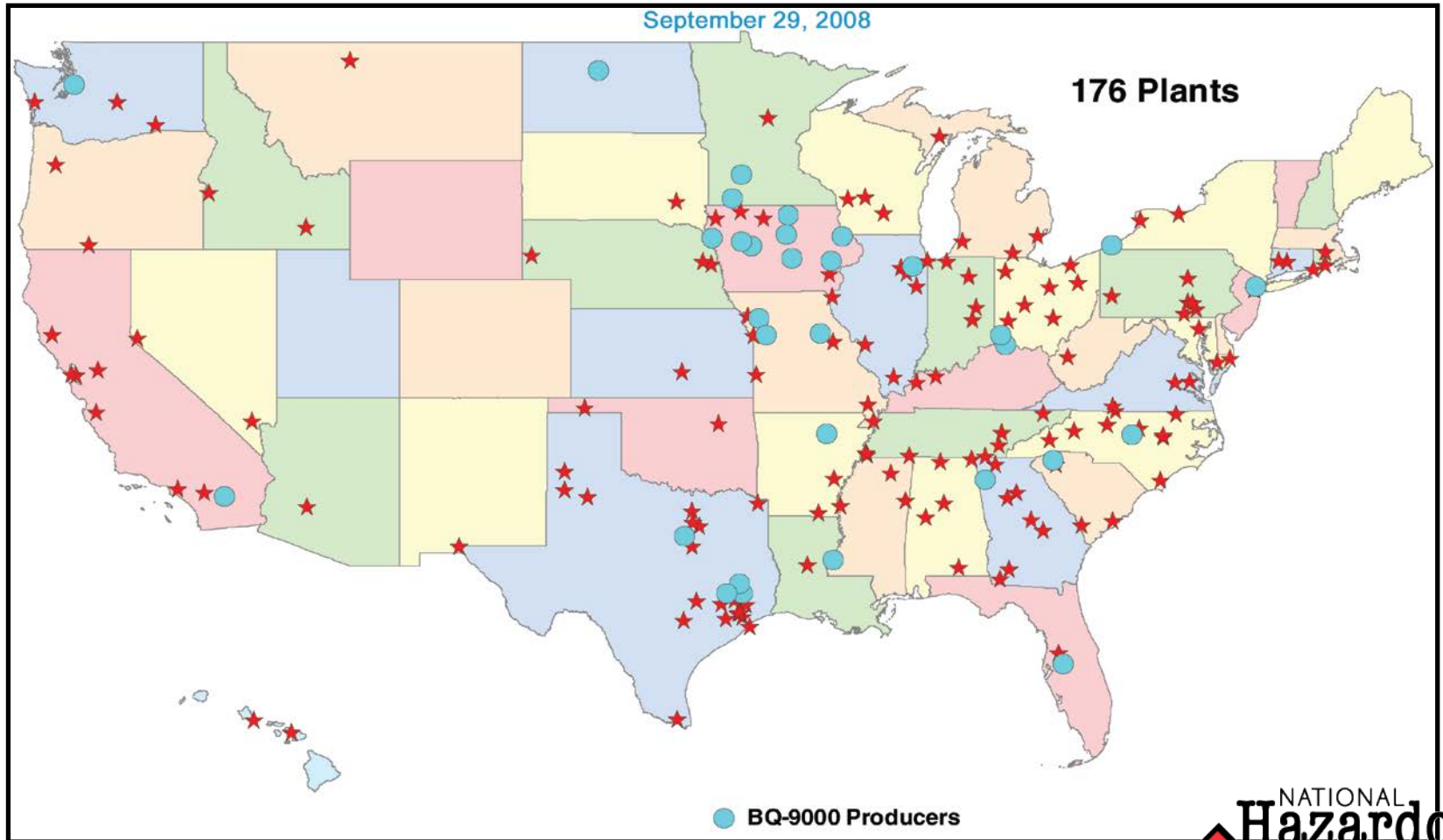


- A vegetable oil- or animal fat-based diesel fuel consisting of high M.W. esters ($C_{18}H_{32}CO_2C_6H_{14}$). Biodiesel is typically made by chemically reacting lipids with an alcohol.



A common methyl ester produced from soybean or canola oil and methanol.

Bio Diesel Continuous Flow Plants



Home and CO-OP Production



Home/CO-OP Issues

- Residential locations
- Lack of codes and ordinances
- Safety Issues
 - Lack of complete understanding of the hazards
 - Non intrinsically safe equipment
 - Lack of ventilation
 - Lack of PPE



Hazards From Production Materials

- Methanol
 - Flammable/Toxic
 - CGI; PID (10.84eV); FID; Temp Gun; Tube; Turn Out/SCBA
 - 150'; 10% LEL
- Sodium or Potassium Hydroxide
 - Strong Corrosive/Toxic
 - 150'; pH; TO-Rescue; Plastic-Plumbing
- Hydrochloric Acid
 - Corrosive/Toxic
 - 150'; pH (Red Light); TO/SCBA-Rescue; Plastic-Plumbing

Blends

- B10 – B100
- Bio diesel blended with petroleum diesel



Biodiesel Training

- **Cooperative agreement with the National Biodiesel Board**
- **Biodiesel Emergency Response training package**
 - **Basics of Biodiesel**
 - **Hazards at biodiesel manufacturing facilities**
 - **Response techniques for biodiesel incidents**



Ethanol Training

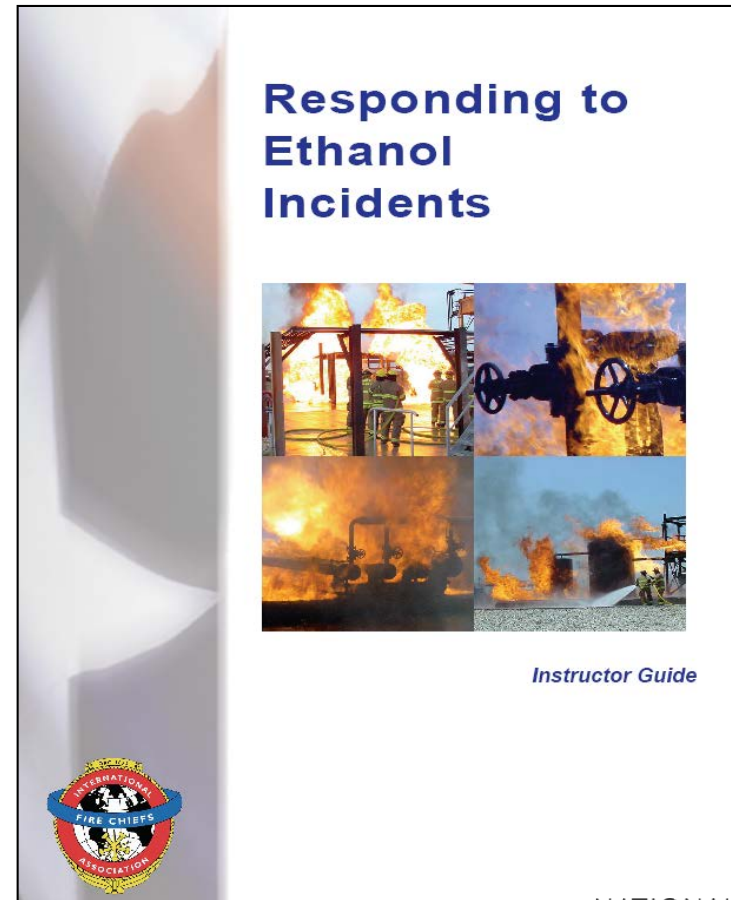
USFA

Partnership

- Response to Ethanol Incidents training package
- Ethanol Fixed Facilities: Assessment & Guide

PHMSA

Partnership



Contact Information

National Hazardous Materials Fusion Center

www.hazmatfc.com

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IAFC – www.iafc.org/hazmatfusion

