



## Biodiesel Use and Experience Among State DoT Agencies



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### *Presentation Content*

- Politics ... and the need to understand biodiesel
- A research need and plan
- Survey objectives and methods
- Findings
- Summary

### *SDDOT Research Need*

- Legislature discussing biodiesel
- Potential for Agency Mandated use
- Need for better understanding of impacts on operations

### *Research Project Tasks*

- Fleet trial using 25+ road maintenance trucks
  - Maintenance records analysis
  - Oil sample analyses
  - Logs of daily operations, fuel, mileage, etc
- Fuel quality monitoring, including tests in infrequently driven vehicles
- Analysis of fleet engine types and ages
- Polymer tests/cold flow tests
- Economic analysis and implementation recommendations
- Survey of other state DoT experiences

### *Objective*

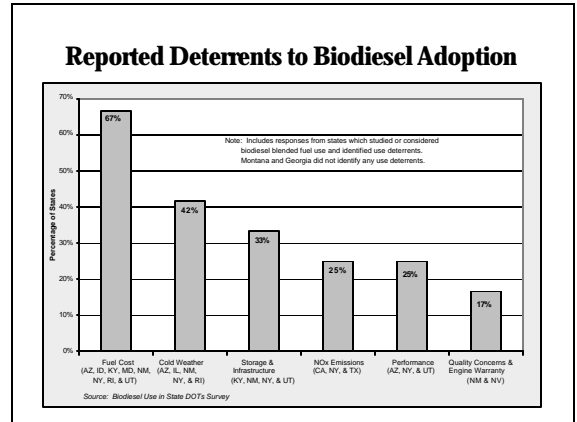
- Survey all state DoT agencies and aggregate their collective experiences with biodiesel blends in the following areas
  - Policies and Mandates
  - Pilot programs and test use of biodiesel
  - Biodiesel blend composition and implementation
  - Fuel storage and filtering issues
  - Maintenance, performance, and cost issues

### *Methods*

- E-Mail survey approach
- Locked Word survey document
  - Toggles for answers
  - Comment boxes for additional input
- Cover letter with request to forward to appropriate individuals
- Follow up E-Mails and some phone calls



State	Gallons of Blended Fuel Used*	Blend Composition	Price Differential
NC	3,100,000	B20**	\$0.12
KS	2,011,705	B2	\$0.03
NE	1,000,000	B20	\$0.03
MO	1,000,000	B20	\$0.12
OH	564,600	B20	\$0.11
MN ***	397,000	B2	\$0.05
SC	226,000	B20	\$0.22
AZ	180,000	B20	\$0.20
CT	145,000	B20	\$0.30
DE	100,000	B10	\$0.10
IA	63,610	B20	\$0.11
MI	50,000	B20	Not reported
ND	47,000	B20	\$0.12
SD	28,000	B5	\$0.13
ID	4,000	B20	\$0.15
PA	3,157	B20	-\$0.07
OR	2,000	B20	\$0.26
ME	400	B20	\$0.24
Total	8,925,172		Weighted average \$0.0925



### Fuel Blending Protocols

Method	States
Blended at a terminal and delivered by pipeline	Delaware and Nebraska
Blended at a terminal & "Splash Mixed" in delivery vehicle	
Biodiesel added atop Petroleum	Arizona, Connecticut, Michigan, North Carolina, & South Dakota
Petroleum added atop Biodiesel	Nebraska & South Carolina
Inconsistent procedure reported	Iowa
Unsure of order added	North Dakota, Ohio, & Pennsylvania
Blended in storage tank	Kansas, Minnesota, Nebraska, & Ohio
Unsure of fuel blending procedure	Illinois, Maine, Missouri, & Oregon

### Performance Monitoring Procedures

State	Tracking Procedure
Arizona	Operator observations of mileage and performance
Connecticut	Operator observations of performance
Delaware	Did not specify procedure, but minimal differences were noted
Maine	Fuel system observations
Minnesota	Fuel economy observations and oil sampling
Ohio	Snap idle tests Maintenance and fuel economy observations
Oregon	Engine oil analysis
Pennsylvania	Engine tests on Dyno before and after biodiesel blended fuel use EPA emissions tests before and after biodiesel blended fuel use
South Carolina	Observations of fuel economy and power
South Dakota	Maintenance and fuel economy records Fuel quality analyses Operator observations of performance

- ### Findings - Performance
- Fuel Economy
    - Five states reported reduced fuel economy
    - Six states reported no measured difference
    - Seven states using biodiesel did not monitor this
  - Engine Power
    - Two states reported reductions in engine power

- ### Findings - Performance
- No reports of changes in injector or fuel pump durability or life when using biodiesel blends
  - Engine oil analyses indicate no noticeable changes when compared to petroleum fuel
  - No other vehicle maintenance problems were reported that were associated with biodiesel blended fuel use

### *Fuel Filter Plugging*

- Nine states reported no filter plugging issues
- Eight states reported filter plugging in excess of that encountered with diesel fuel
  - Note: All eight states indicated that filter issues resolved with filter changes and were not recurring
- No one brand of filter was singled out as having specific issues with biodiesel blends
- Filter residue descriptions varied widely

### *Cold Flow Issues*

- Two states (Iowa and Ohio) indicated fuel filter plugging only under cold weather conditions
- South Dakota reported one instance of fuel flow problems in an above ground tank after blending new fuel on-site after very cold weather
- North Dakota and Pennsylvania discontinue biodiesel blend use in cold months as a policy

### *Summary*

- Biodiesel blends are under recent widespread assessment by state DoT agencies. (Only three states reported testing prior to 2000)
- Very few actual problems reported over 8.9 million gallons of blended fuel use
- Cost differential remains a primary barrier
- Study of cold flow questions and optimum blending procedures could hasten adoption of this renewable component fuel in South Dakota



**Questions?**