



CANMET Mining and Mineral Sciences Laboratories





MDEC 2009 Roundtable Forum Summary: Lubricants and Fuels

Brent Rubeli – CANMET-MMSL
October 2010



Natural Resources Canada Ressources naturelles Canada




CANMET Mining and Mineral Sciences Laboratories


Diesel Fuels For Mining


- CGSB Diesel Fuels In Canada
 - CAN/CGSB-3.16-99 (Mines Diesel)
 - CAN/CGSB-3.517 A-LS (Hwy fuel)
- Regulatory Framework
 - Three provinces require mines fuel.
 - Two allow mines or highway fuel.
 - Six specify flash and sulphur only.
 - One does not specify fuel at all.
- More information
 - CANMET Divisional Report MMSL 02-043

2




Natural Resources Canada Ressources naturelles Canada






CANMET Mining and Mineral Sciences Laboratories

Fuel Feedstock Quality


- Fuel quality has diminished in recent years due to cost-cutting measures.
- Coincident with demands for higher quality fuel for HP diesel injection.
- Oil reserves of sweet light crude are in decline forcing use of harder-to-process sour (higher sulphur) stocks.
- Cetane numbers are varying from 55 in summer to 45 in winter due to heating oil influence – watch for this!


Natural Resources
Canada

Ressources naturelles
Canada






3



CANMET Mining and Mineral Sciences Laboratories

Fuel Cleanliness

- Engine manufactures are starting to use the ISO4406 particle system for qualification of fuel delivered to the injection system.
- This likely will mean bypass filtration.


Natural Resources
Canada

Ressources naturelles
Canada


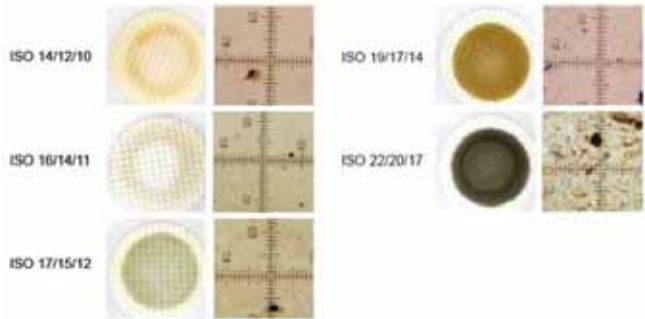


4

CANMET Mining and Mineral Sciences Laboratories

ISO 4406


- Become familiar with this system and have fuel supplied to the dock baselined.



| ISO Code | Visual Appearance | Microscopic View |
|--------------|------------------------------|---|
| ISO 14/12/10 | Light yellow, fine particles | Microscopic view showing fine particles |
| ISO 19/17/14 | Yellowish, medium particles | Microscopic view showing medium particles |
| ISO 16/14/11 | Light green, fine particles | Microscopic view showing fine particles |
| ISO 22/20/17 | Dark grey, coarse particles | Microscopic view showing coarse particles |
| ISO 17/15/12 | Light green, fine particles | Microscopic view showing fine particles |

5

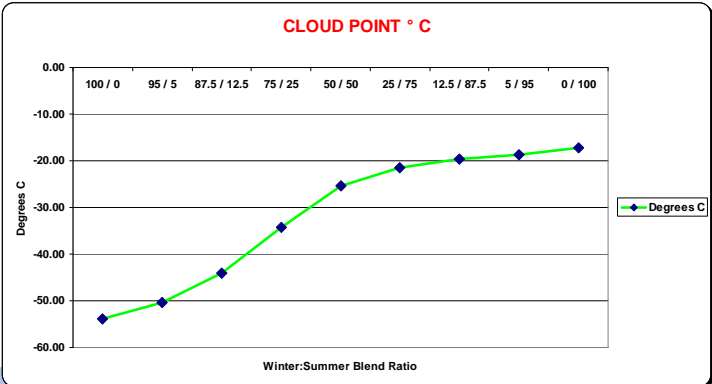
Natural Resources Canada / Ressources naturelles Canada



CANMET Mining and Mineral Sciences Laboratories

Cold Weather Operability

- Watch for delays in winter fuel availability.
- It is possible to blend winter and summer to obtain some operability.




CLOUD POINT ° C

| Winter:Summer Blend Ratio | Cloud Point (°C) |
|---------------------------|------------------|
| 100 / 0 | -55.00 |
| 95 / 5 | -50.00 |
| 87.5 / 12.5 | -45.00 |
| 75 / 25 | -35.00 |
| 50 / 50 | -25.00 |
| 25 / 75 | -22.00 |
| 12.5 / 87.5 | -20.00 |
| 5 / 95 | -19.00 |
| 0 / 100 | -18.00 |

6

Natural Resources Canada / Ressources naturelles Canada



CANMET Mining and Mineral Sciences Laboratories

Fuel Tanks

- Tank breathers are a source of contamination – use filters.
- In-tank desiccants for water control.
- Prevent contamination through “clean” refuelling procedures.

7

Natural Resources Canada / Ressources naturelles Canada

Canada

CANMET Mining and Mineral Sciences Laboratories

Fuel Additives

- Lots of additives out there!
- Usually not needed with good quality fuel - however they may have some benefit for specific problems.
- Use carefully!
- Lab testing of additive performance is recommended.

8

Natural Resources Canada / Ressources naturelles Canada

Canada

CANMET Mining and Mineral Sciences Laboratories

Fuel economy additives

- Ask for proof!
- There are established SAE standards for in-use fuel economy determination:
 - J1321, J1264, J1326, J1526

| Lubricant | Test Truck Number | % Improvement |
|-------------|-------------------|---------------|
| Lubricant A | 801617 | 0.47% |
| | 801619 | 1.99% |
| | 801622 | 0.42% |
| | Average | 0.96% |
| Lubricant B | 801617 | 1.14% |
| | 801619 | 1.16% |
| | 801622 | 0.18% |
| | Average | 0.76% |

9

Natural Resources Canada / Ressources naturelles Canada

CANMET Mining and Mineral Sciences Laboratories

Additive Cautions

- Some phosphate additives will damage particulate filters.
- Silicone additives are now restricted by the EPA. This may affect refuelling and aeration of the fuel.
- Avoid burning used oil.
- This will release wear metals into the mine.

10



Natural Resources Canada / Ressources naturelles Canada

CANMET Mining and Mineral Sciences Laboratories

Flashpoint and Safety

- Mines Fuel flashpoint is 52°C
- Highway fuel is ~38°C
- Some concern about suitability of highway fuel for use in very deep mines where ambient temperatures can reach 40°C.
- In addition, modern engines use circulating fuel to cool injection systems. This, combined with longer shifts (lower fuel levels in vehicle tanks), could create a possible risk.

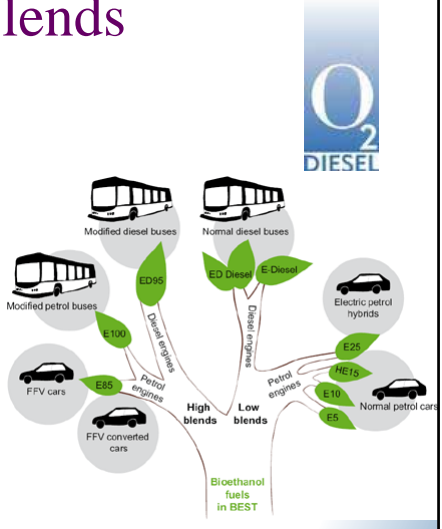
11

 Natural Resources Canada / Ressources naturelles Canada




CANMET Mining and Mineral Sciences Laboratories


Alcohol Fuel Blends

- **DO NOT USE!**
- Ethanol Diesel, E-Diesel, O2Diesel, etc.
- Dangerously lowers the flashpoint even in low blend rates. Less than 12°C !!!
- If you are looking for GHG reductions its much safer to use biodiesel.



12

 Natural Resources Canada / Ressources naturelles Canada






CANMET Mining and Mineral Sciences Laboratories

Questions

- Thank you for your participation in the roundtable sessions!

13

 Natural Resources Canada Ressources naturelles Canada

 Canada