# Fuel Quality

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National Oilheat Research Alliance

NORA Workshop
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# Focus on:

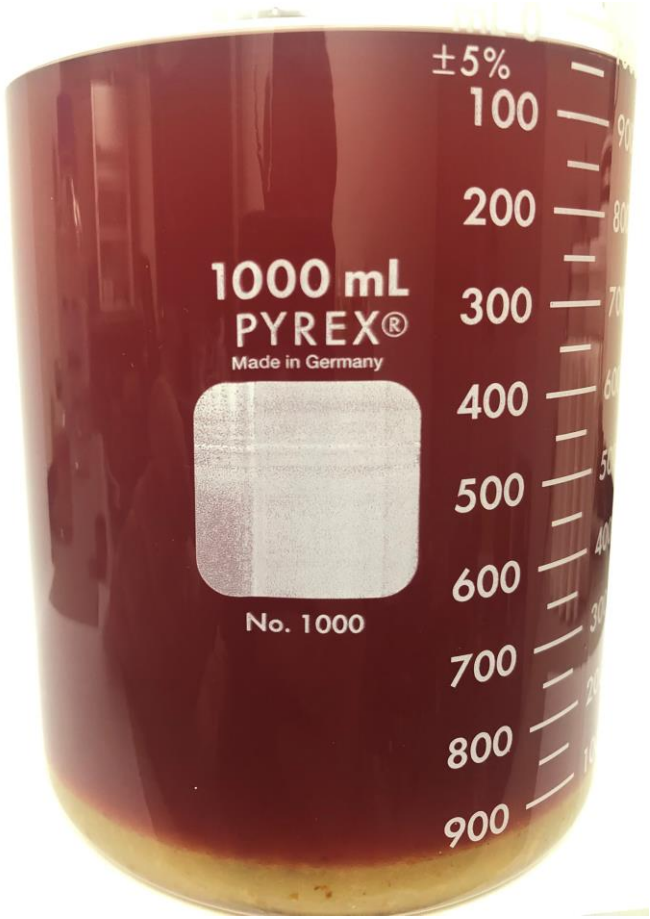
Field sampling – what is the health of the fuels in our tanks?

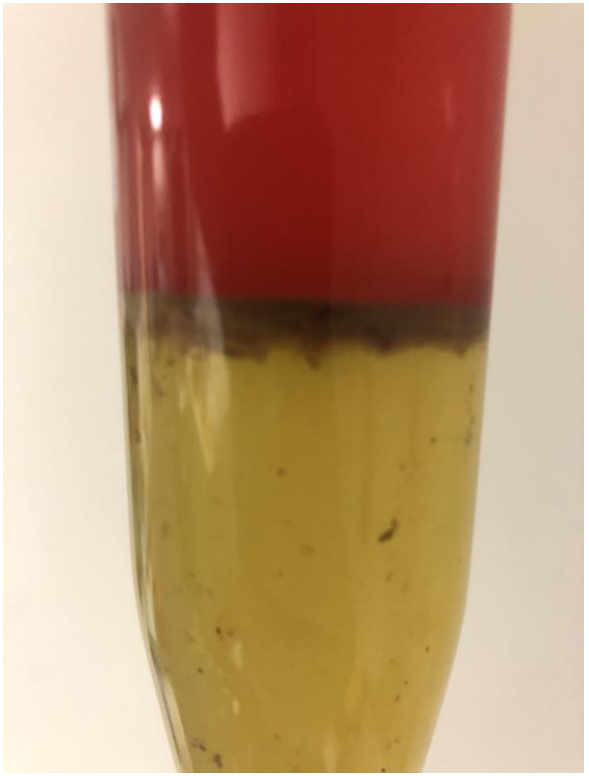
Addressing specific field problems that have been reported with sufficient detail;

Addressing specific technical topics such as copper, filtration, selected additive impacts.

# Addressing Field Problems

At some field sites we have simply observed low quality fuel – high particulates and water;



# Observations from Field Sampling

- Sample set includes B-0 to B20 (or more)
- Fuel samples from pump bleeder often low in Oxidative Reserve
- Fuel samples from pump bleeder often high in filterable particulates

# Testing from Field Sampling

Fuel samples from pump bleeder often low in Oxidative Reserve

- Led to an investigation of the impact of copper on fuel.

# Copper Impacts

When exposed to yellow metals, copper can leach into heating oil.
Elevated copper in heating oil can cause low measured oxidative reserve:

- If a fuel has been exposed to copper, oxidative reserve is not a useful test anymore?
- Long term, standard storage stability tests also show strong impact of copper.
- The copper response is not the same in all fuels.
- Stability additives help.
- Metal deactivators help after removal from the source of copper.

# Copper Impacts – so what?

In a one-pipe system, fuel is exposed to copper, becomes unstable but is quickly burned.
In a two-pipe system fuel is exposed to copper and then returned to the tank, potentially contaminating the tank.  Our tests have not indicated an impact.
Likely due to high volume to surface ratio.
Summer shutdown? Lots of time with copper exposure. – Our tests show fuel stability is greatly reduced but fuel actually does not degrade.  Likely because – in the fuel line there is no oxygen to degrade the fuel.
After fall restart- fuel is quickly burned.
Studies of summer shutdown question continue.

# Testing from Field Sampling

Fuel samples from pump bleeder often high in filterable particulates

- Led to an investigation of the impact of filtration on fuel.

# Would better filtration help?

To date field tests have been encouraging but difficult to get good statistics

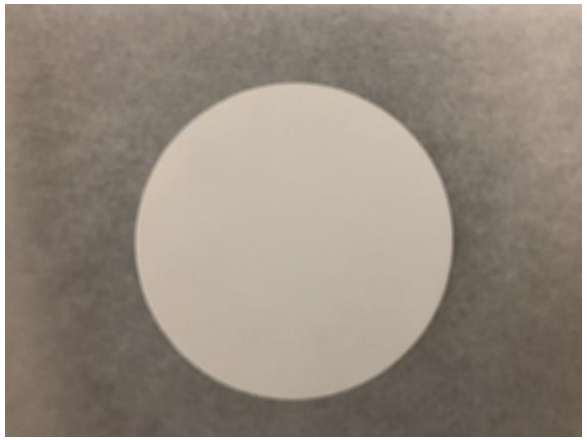
Typical Spin-on Filter – 10 micron

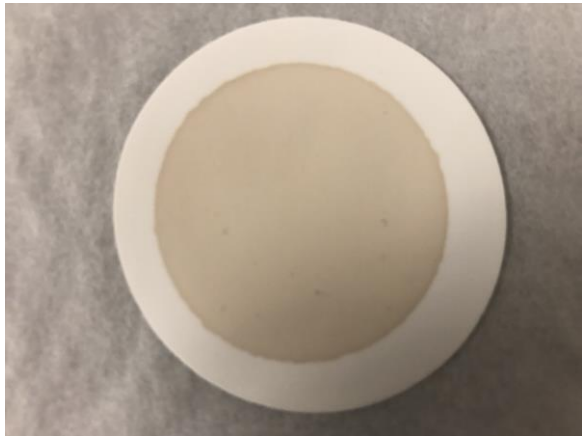
Typical Pump Strainer – 140 micron

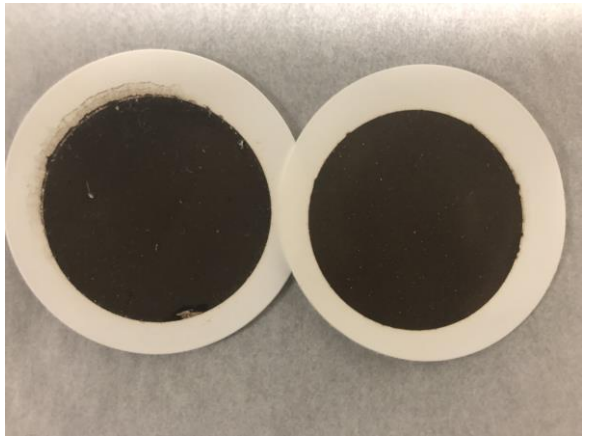
2 micron filter

# Filterable Particulates

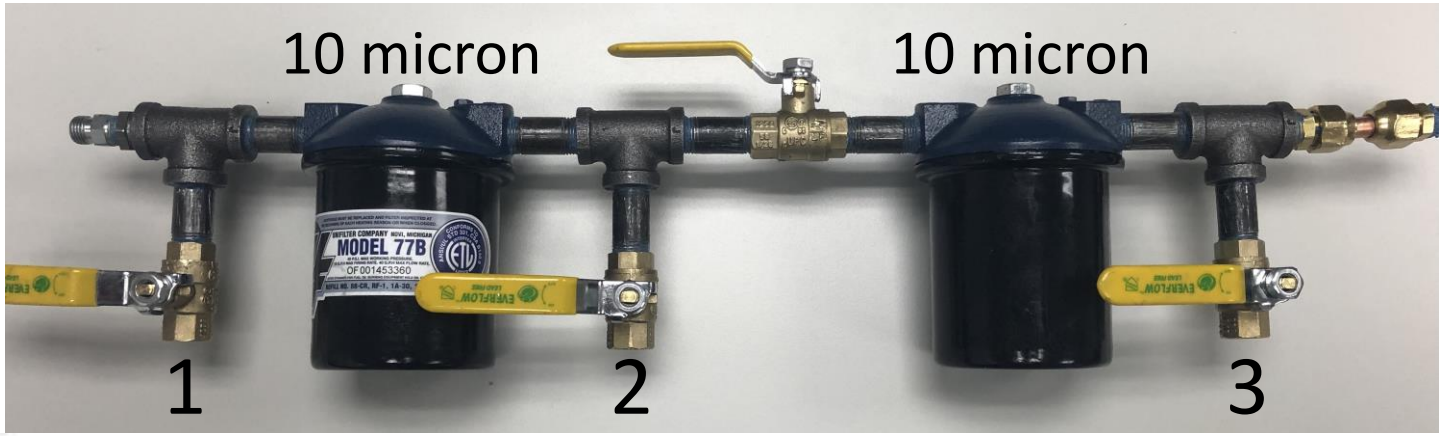
Measured with ASTM D6217, filter through a 0.8 micron filter;
We have no spec limit on filterable particulates – In Germany 24 mg/liter used;
For diesel engines – 10 mg/liter has been used as a limit;
Our field tests, post filter, show filterable particulates ranging from <10 mg/liter to 500+ mg/liter

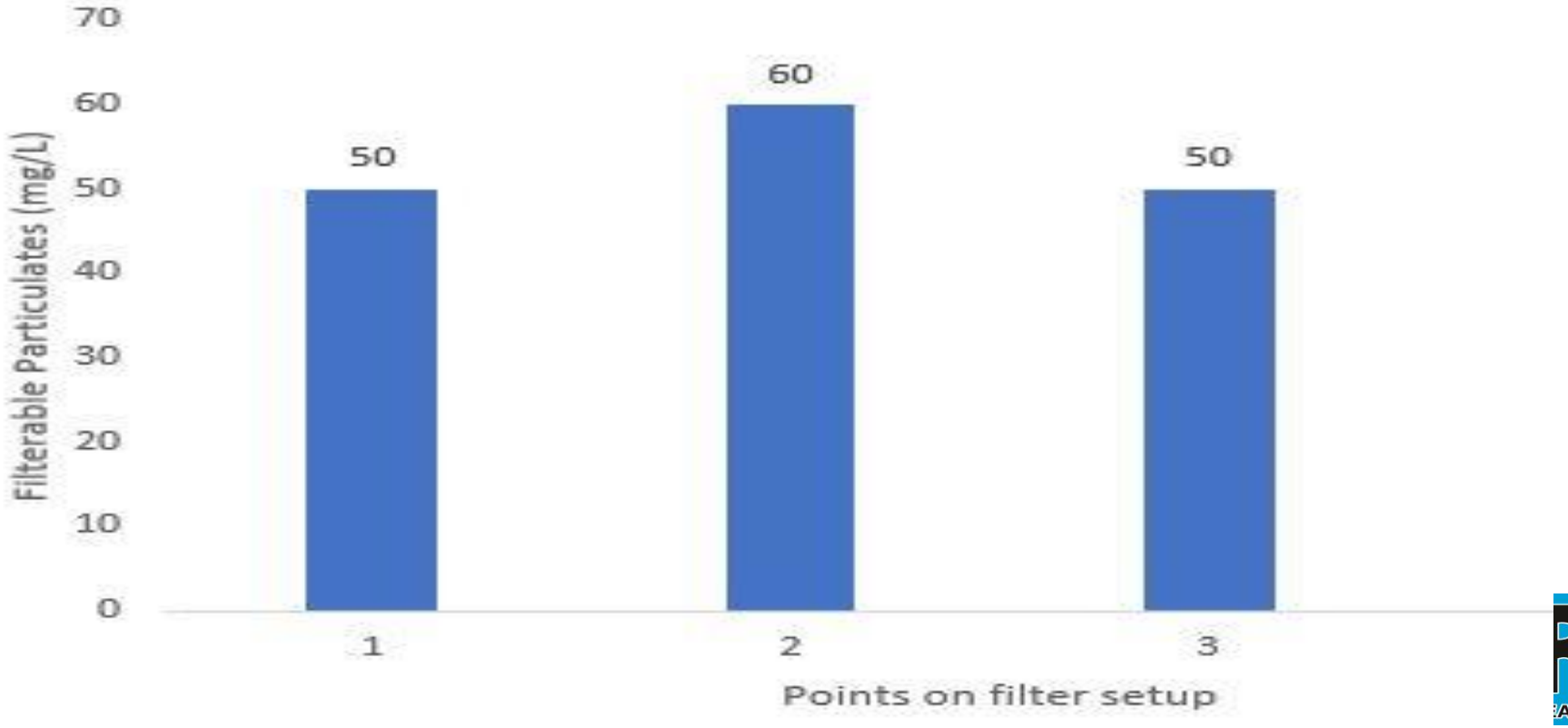




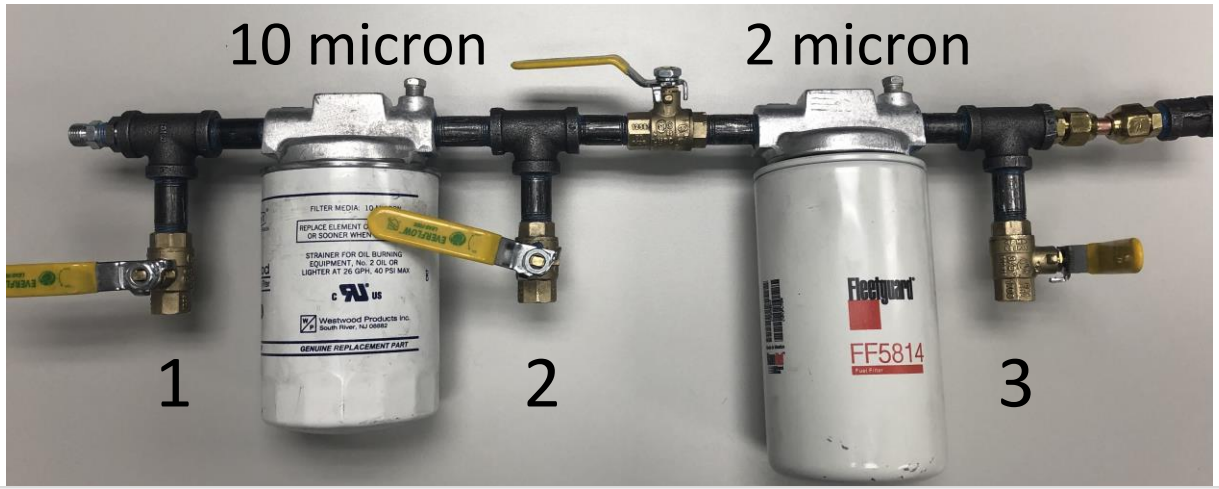


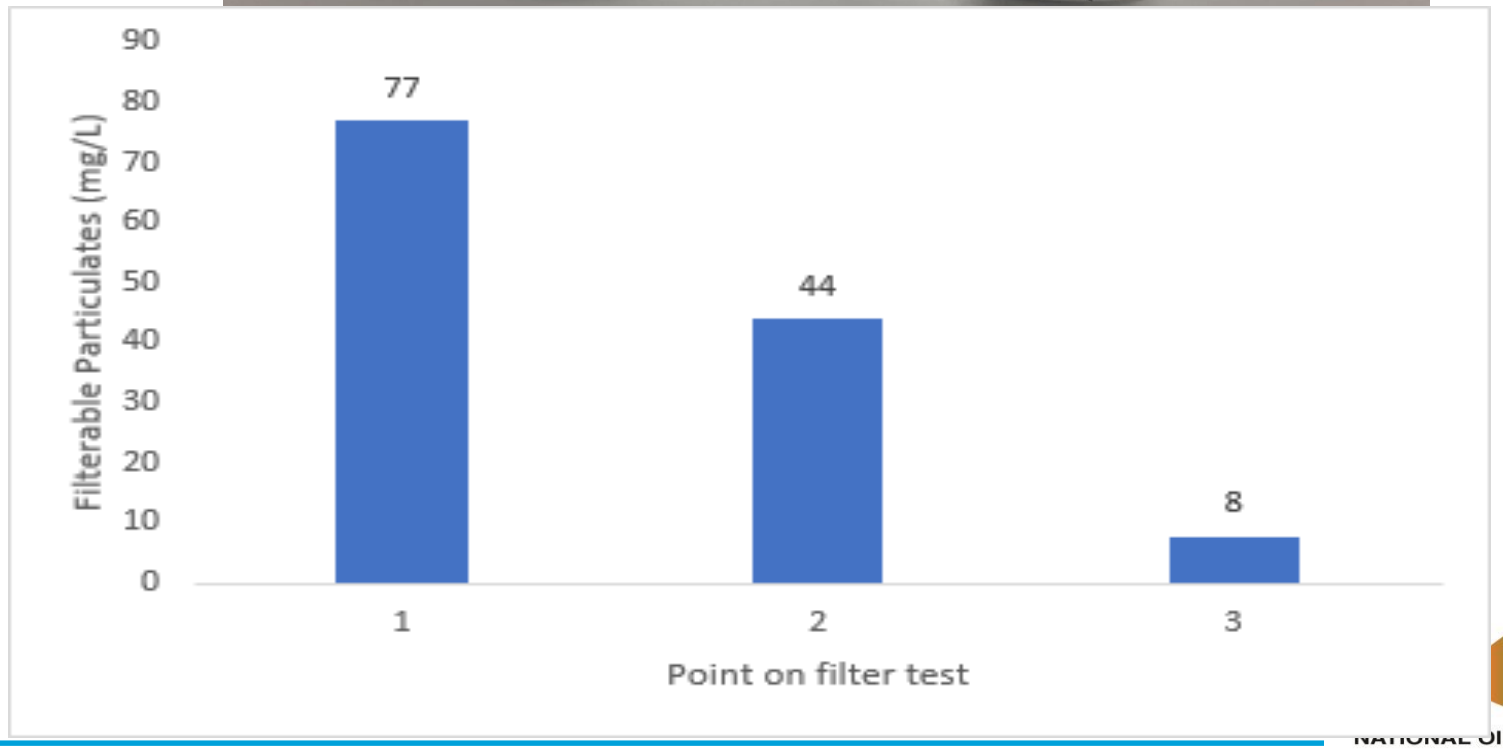
# Dual Filtration Testing: General 1-A



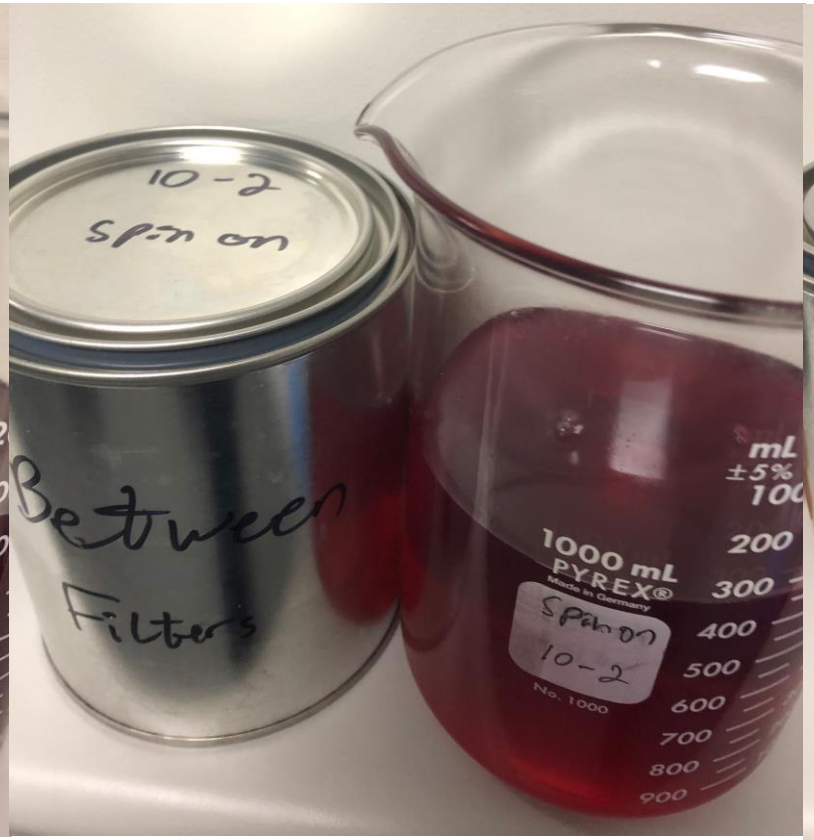



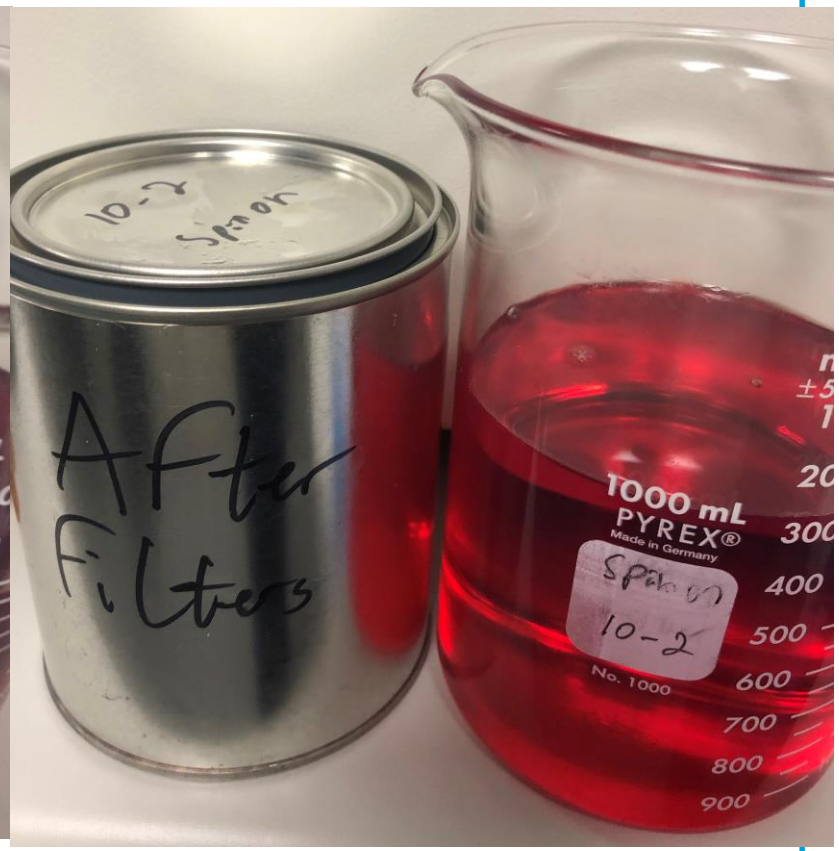
# Dual Filtration Lab Testing



# Dual Filtration Lab Testing: 10 and 2 micron

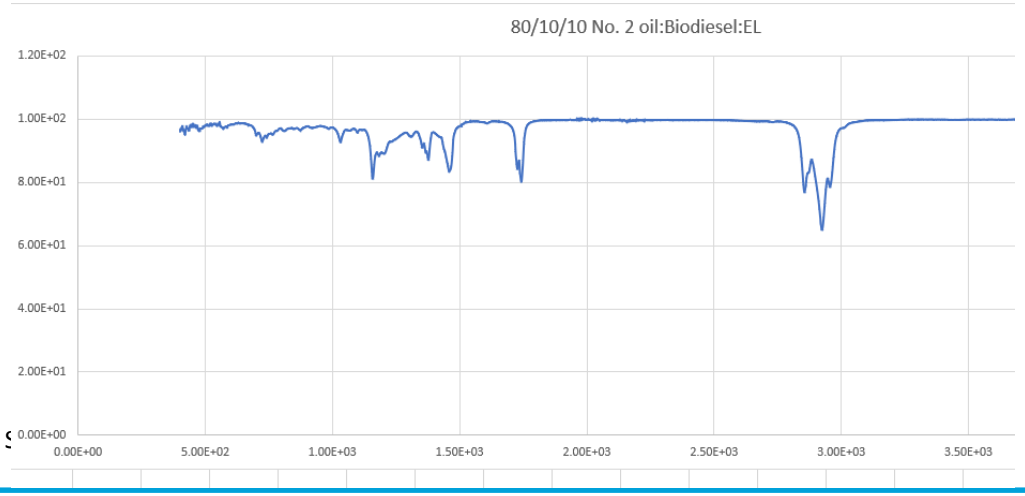



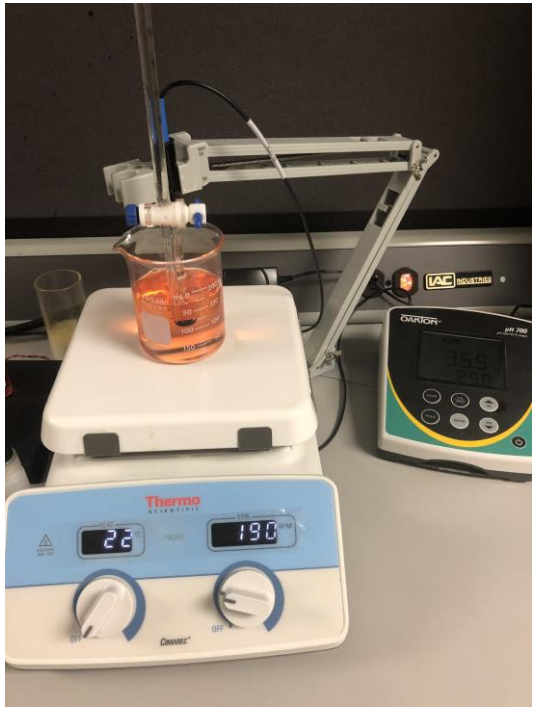



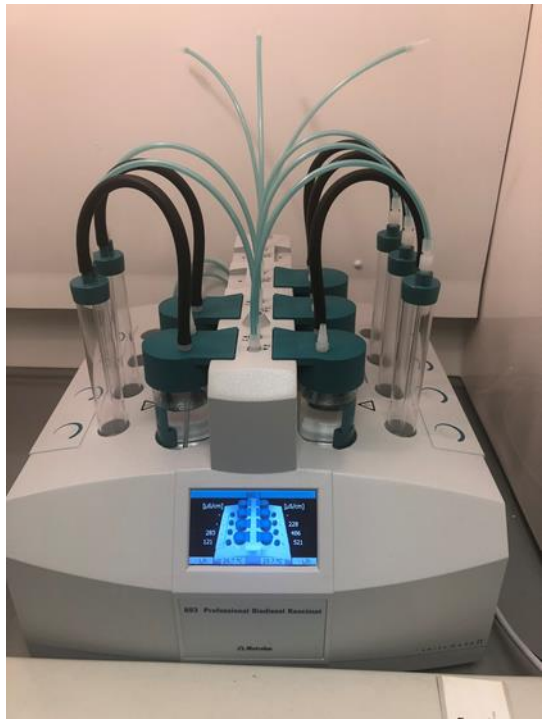
# Stuck Pumps

# NORA Analytical Tools

Biodiesel Blend;
Filterable Particulates;
Acid Number;
Elastomer swell;
Centrifuge (Bottom Sediment and Water)
Oxidative Reserve (Rancimat)
Long Term Oxidative Stability (ASTM D4625)
FTIR – now adding



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