

# Snapshot of Field Fuel Quality; Some Preliminary Results

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# Background / Goal

- In 2002/2004 a fuel quality field study was done. Led to NORA Fuel Quality Guide;
- Since that time fuels have changed – ULS and biodiesel blends are being used increasingly;
- Goal – obtain snapshot of quality of fuels currently in the market place with a focus on biodiesel blends.
- Use the results to guide future technical efforts.

# Sites (planned)

Focus on residential sites:

- B20 or greater market area, S15 (20 sites)
- B20 or greater market area, S500 (10 sites)
- Conventional heating oil market area, S15 (10 sites)

No attempt to control the biodiesel content for deliveries, just snapshot of current market in selected areas



# Sampling / Analysis Plan

Sample from a various locations of home system to the extent possible:

- Bulk home storage tank
- Tank bottom sample of fuel/sediment/water
- Sample of fuel from filter;
- Take entire filter assembly (replaced);
- Sample of fuel from pump bleeder (post filter)

Conduct a variety of analysis, such as:

Biodiesel content

Oxidative Reserve (Rancimat)

Acid No. (TAN)

Sulfur

Copper Corrosion

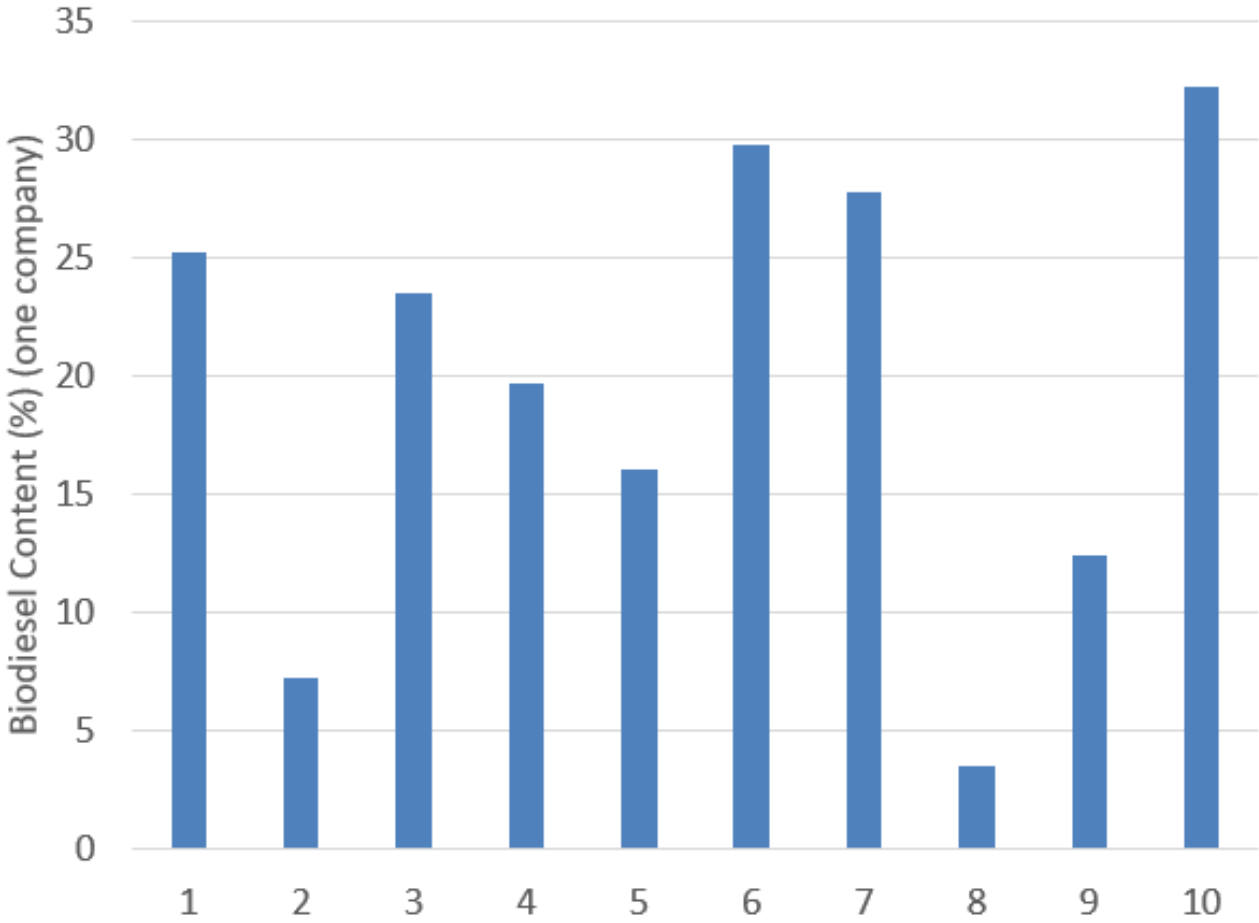
Total Particulates

CFPP

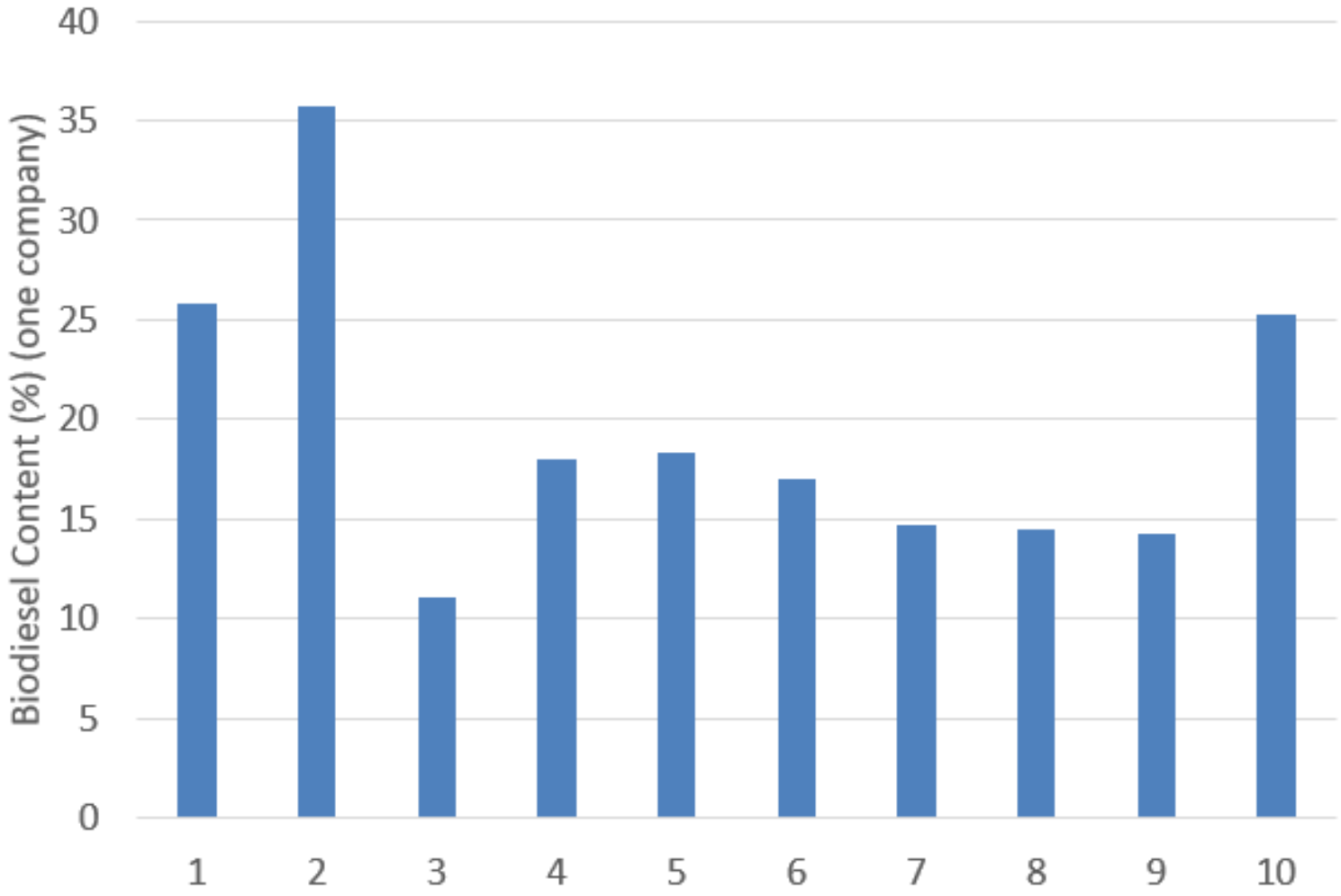
Cloud Point

pH and conductivity of recovered water

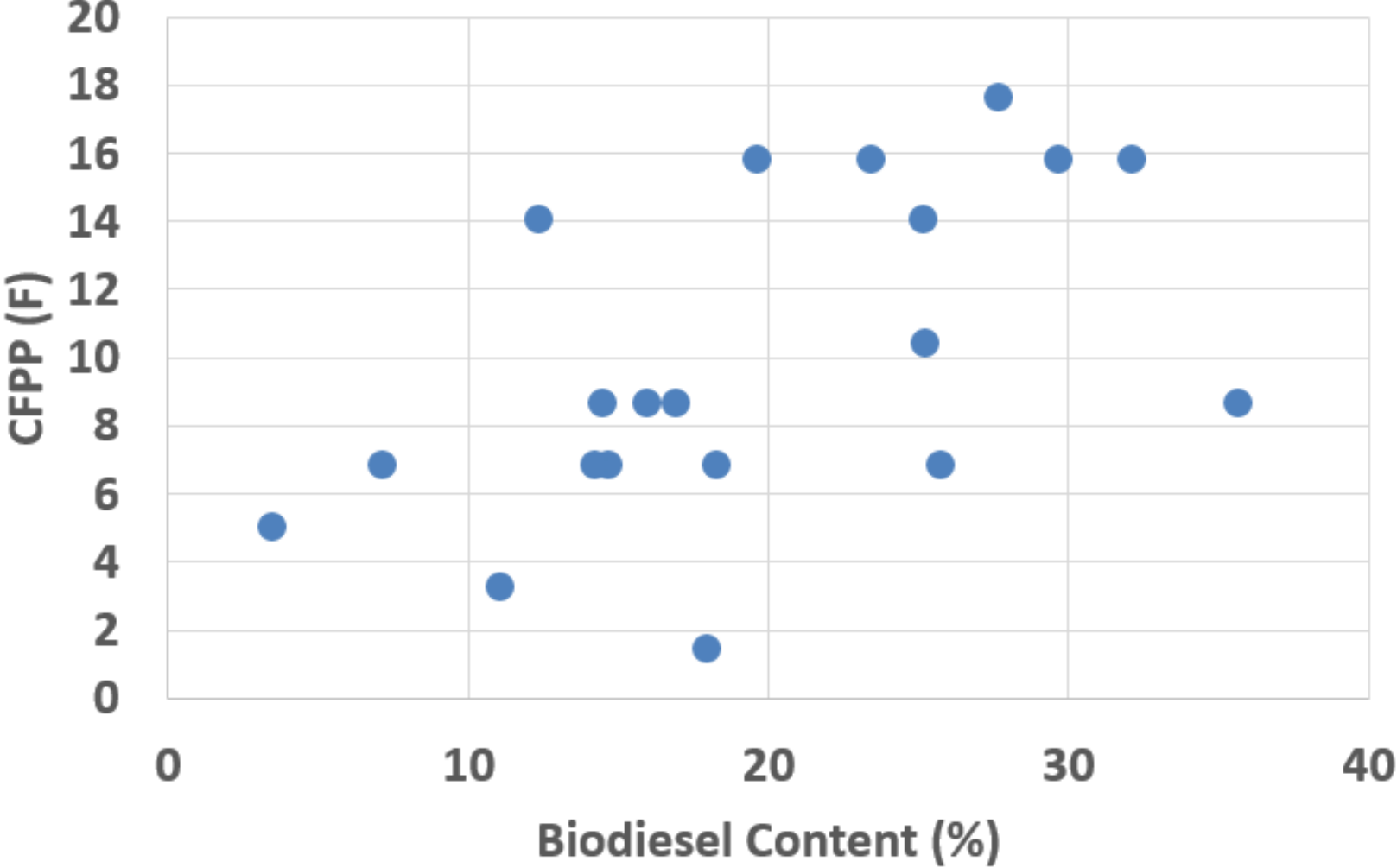
# General B20 Market Area Number 1



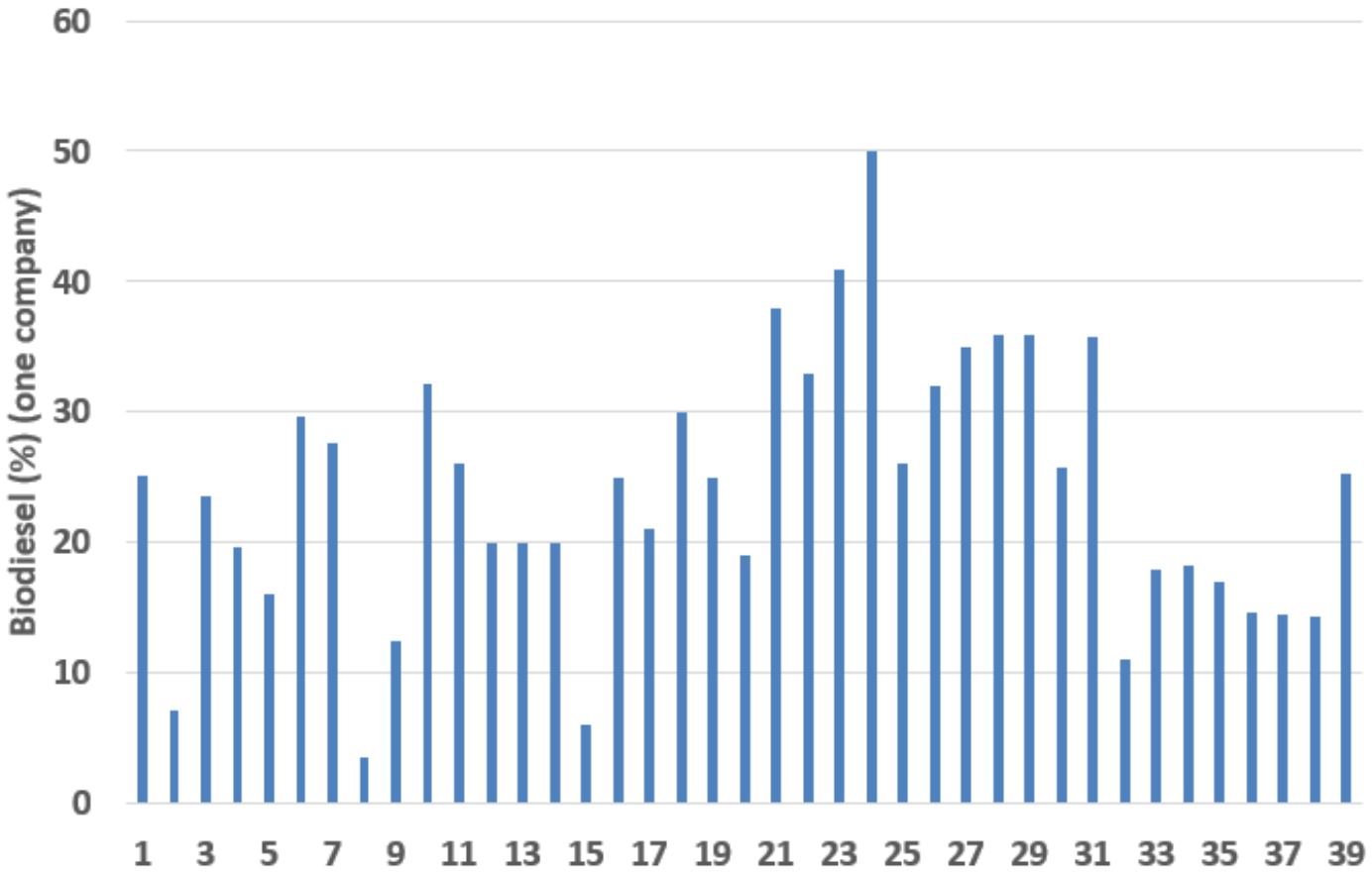
# Commercial General B20 Market Area Number 2



# Combined General B20 Market Areas: Cold Filter Plug Point

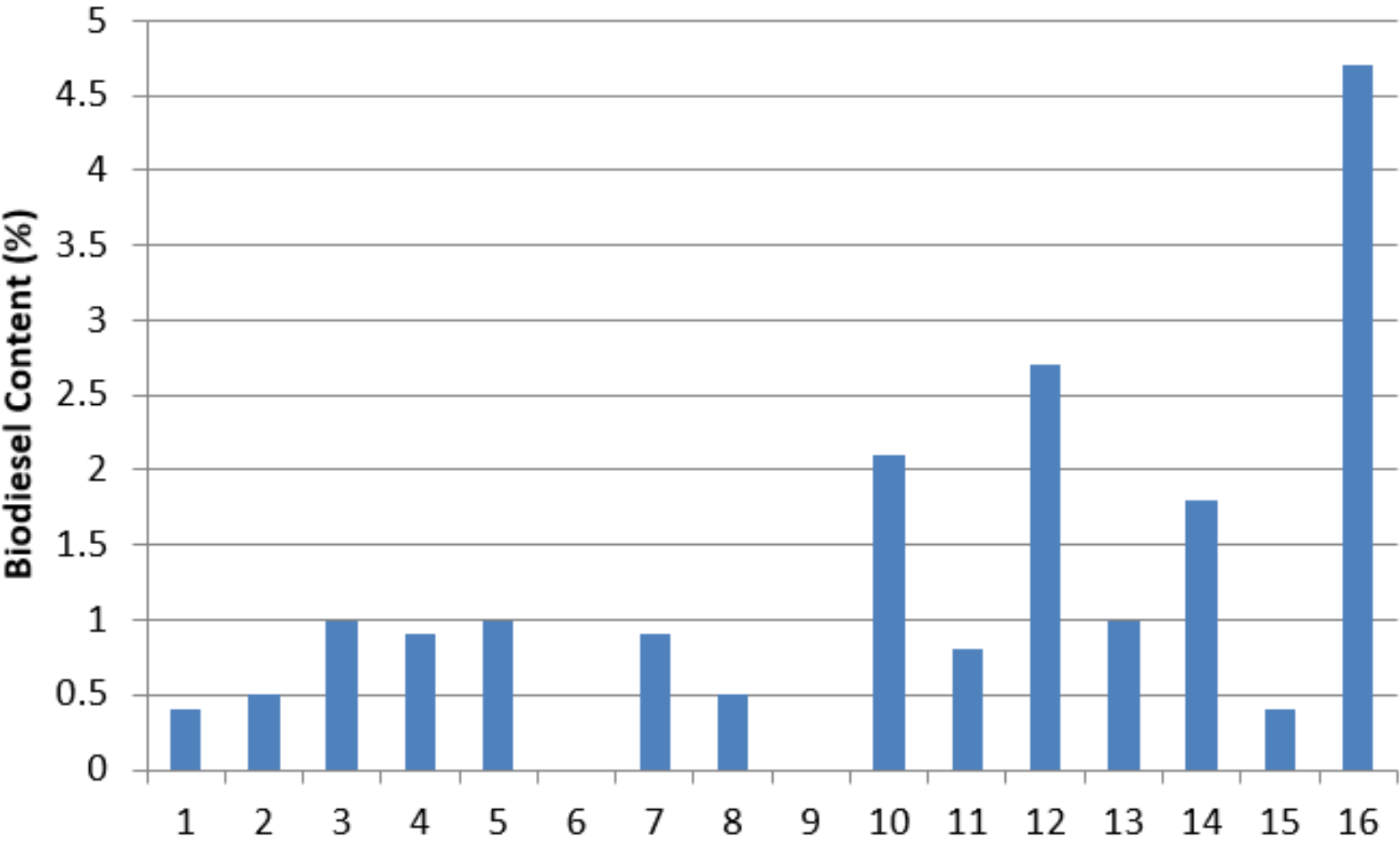


# General B20 Market Areas and High Blend Market Areas



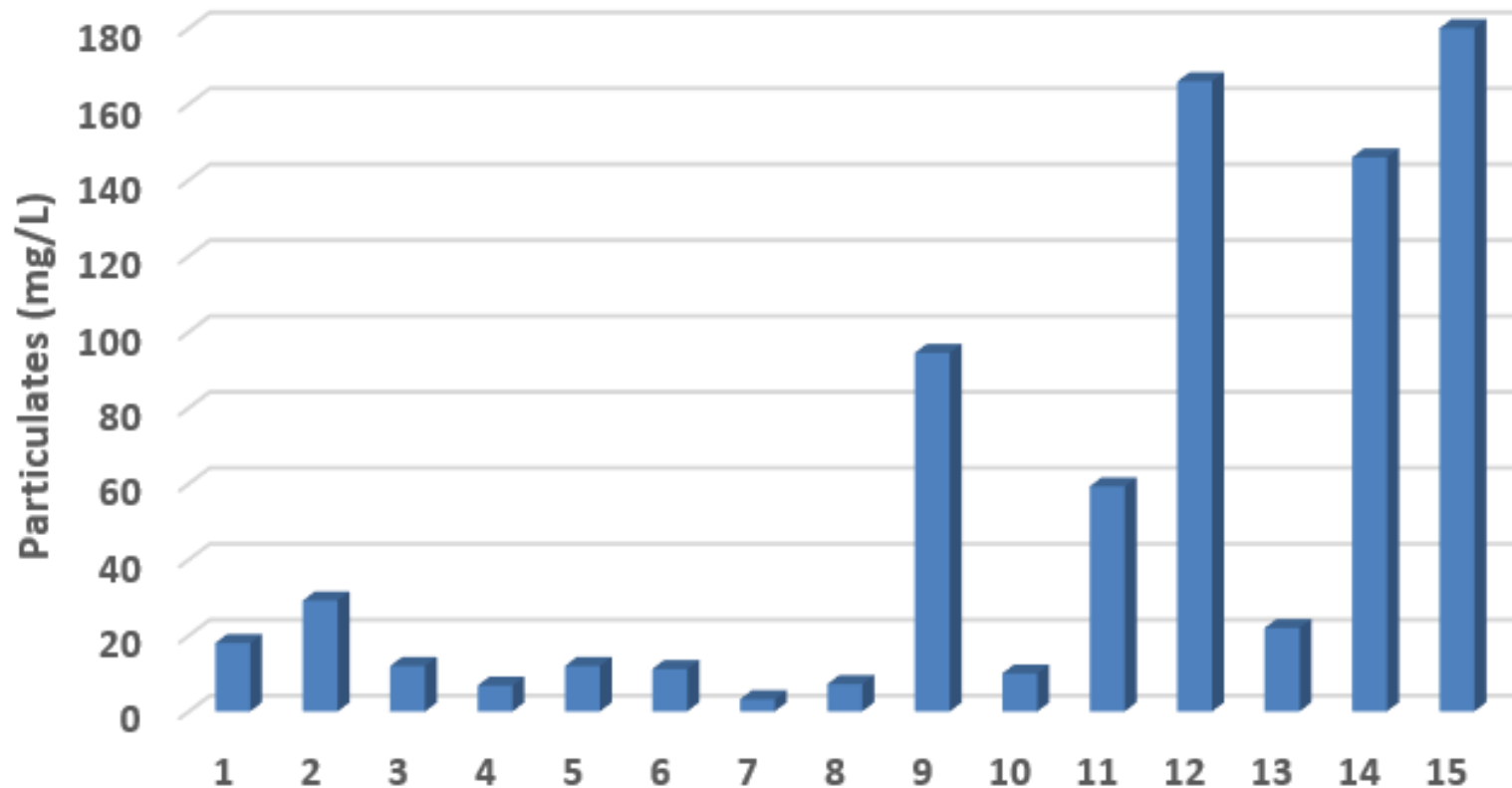


# Conventional Heating Oil Market Area (3 Areas)



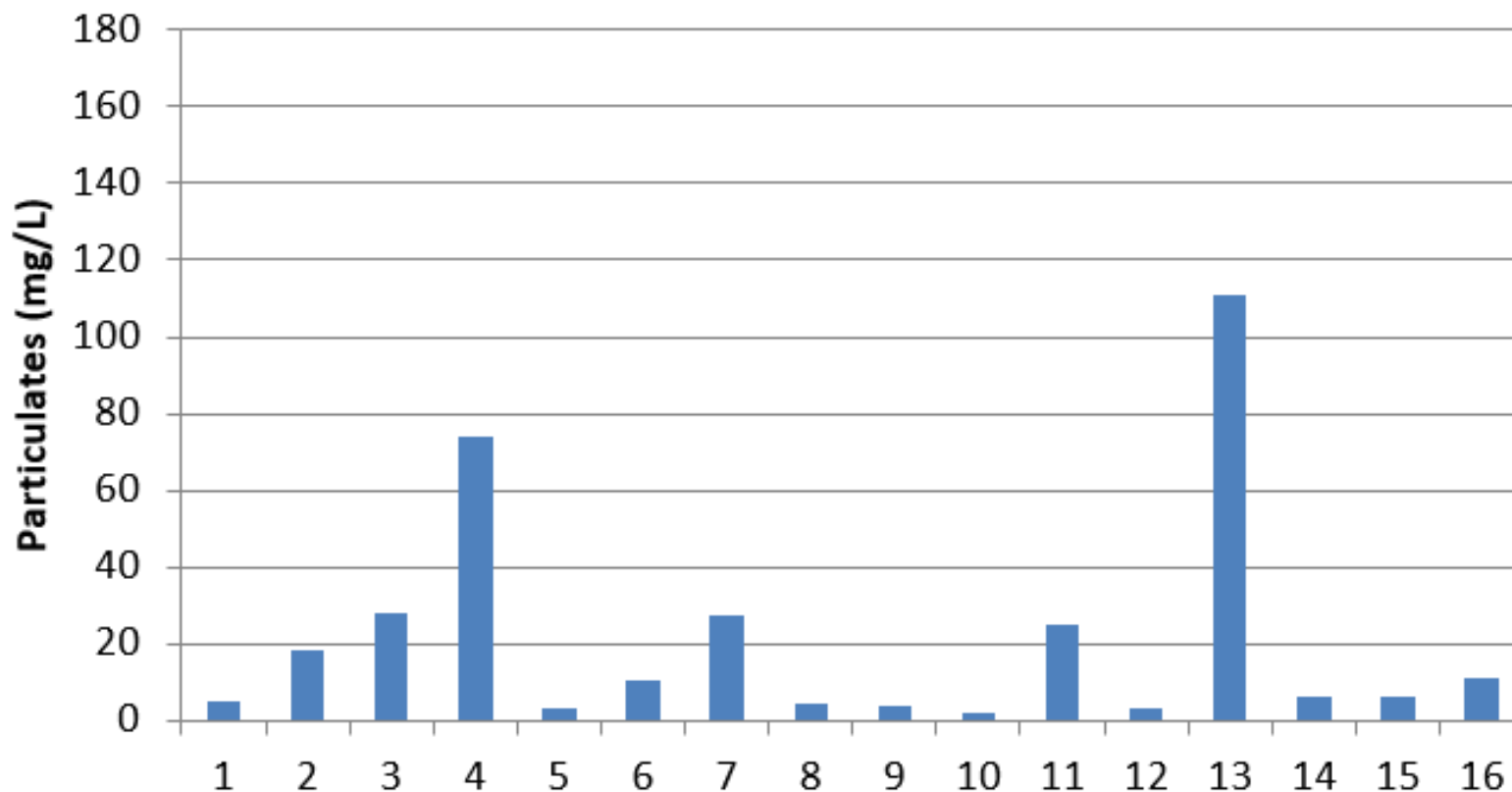
## General B20 Market Areas Partial Data, Filterable Particulates

Note: Filterable particulates in not part of the D396 specification



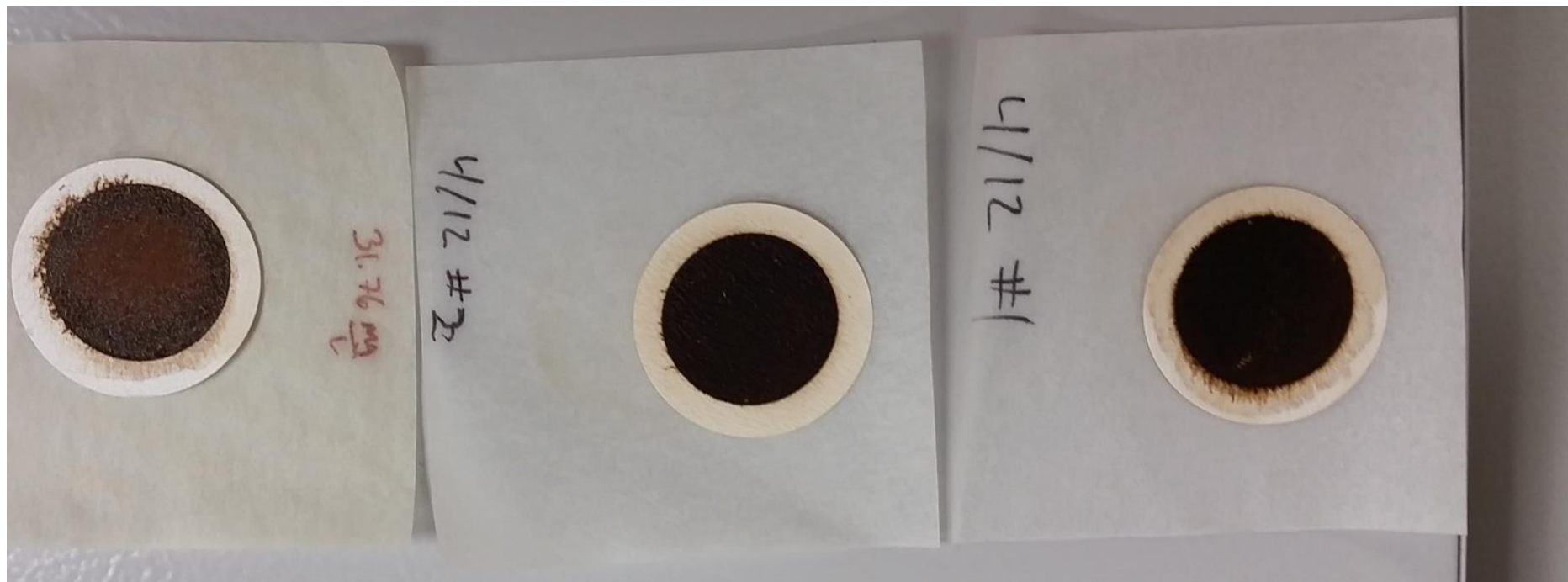
## Conventional Heating Oil Market Areas, Filterable Particulates

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ASTM D6217

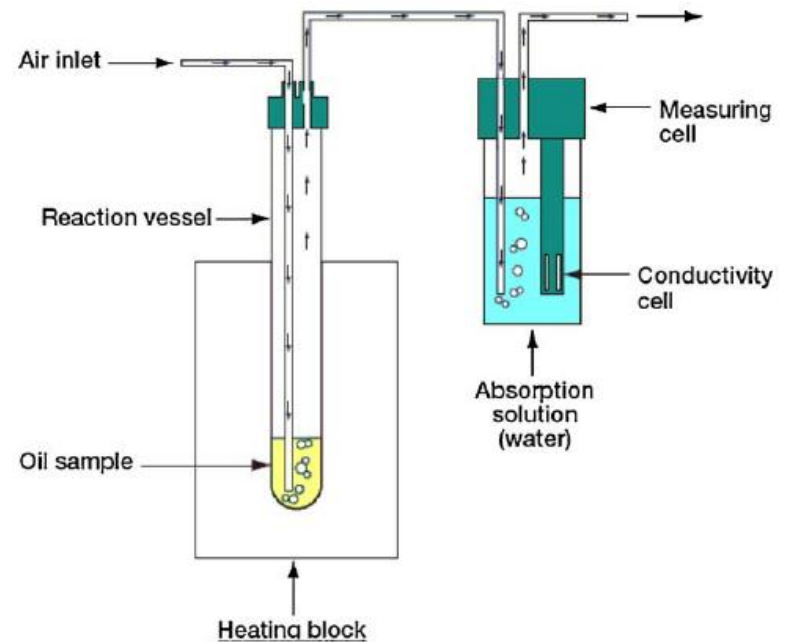
Examples of some lab filters – high filterable particulates



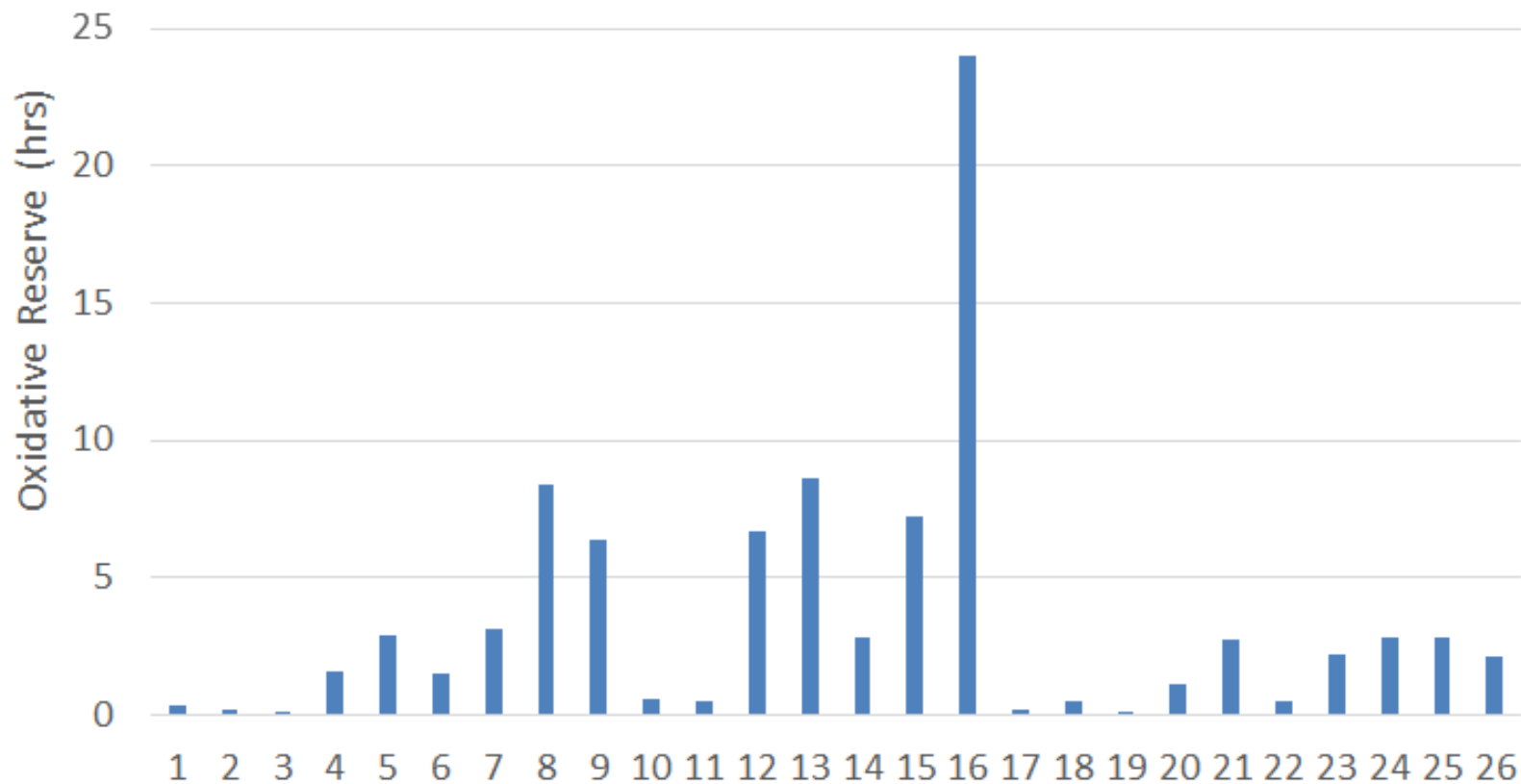
Images from 2 micron filter field study – work in progress



# Rancimat – measurement of oxidative reserve



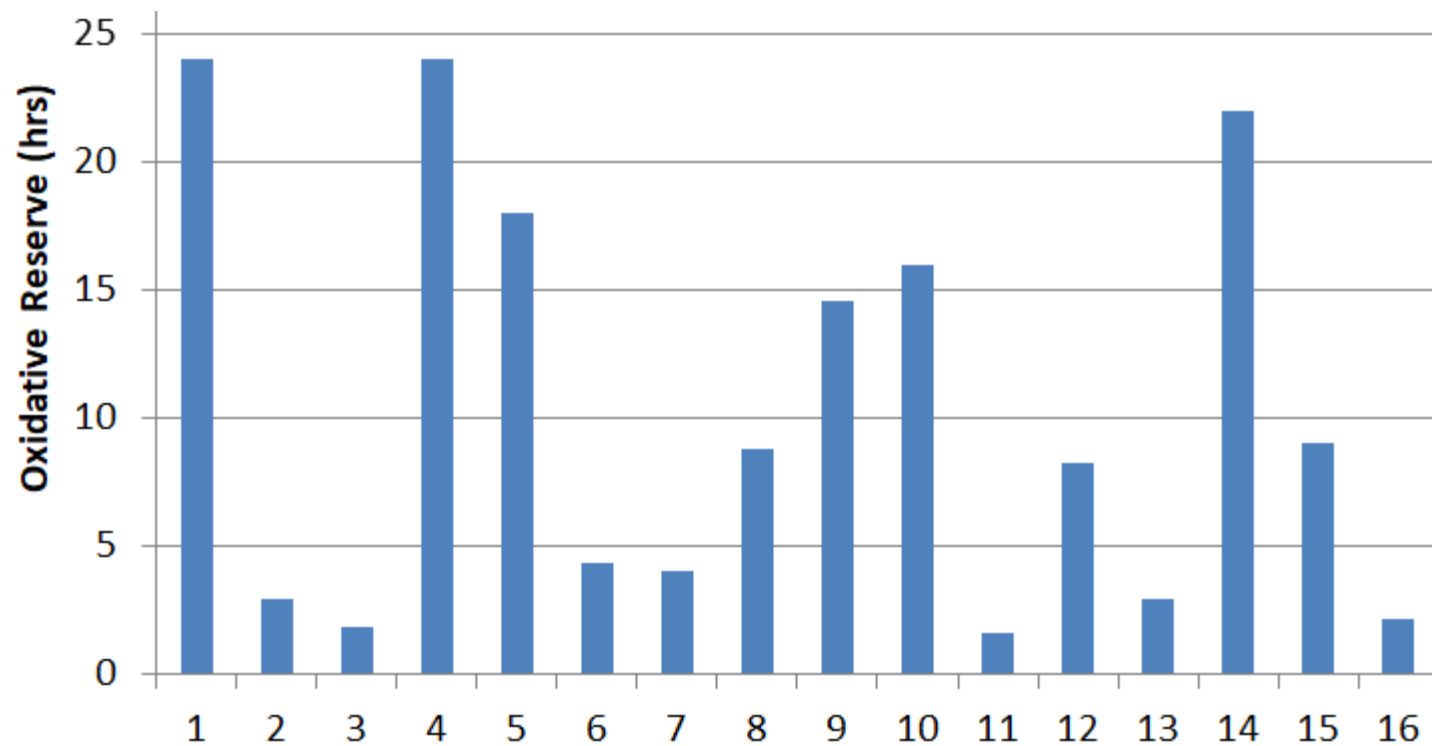
## General B20 and Higher Market Area: Oxidative Reserve, Various Sample Locations



Acid values averaged 0.45 with std. deviation of 0.44

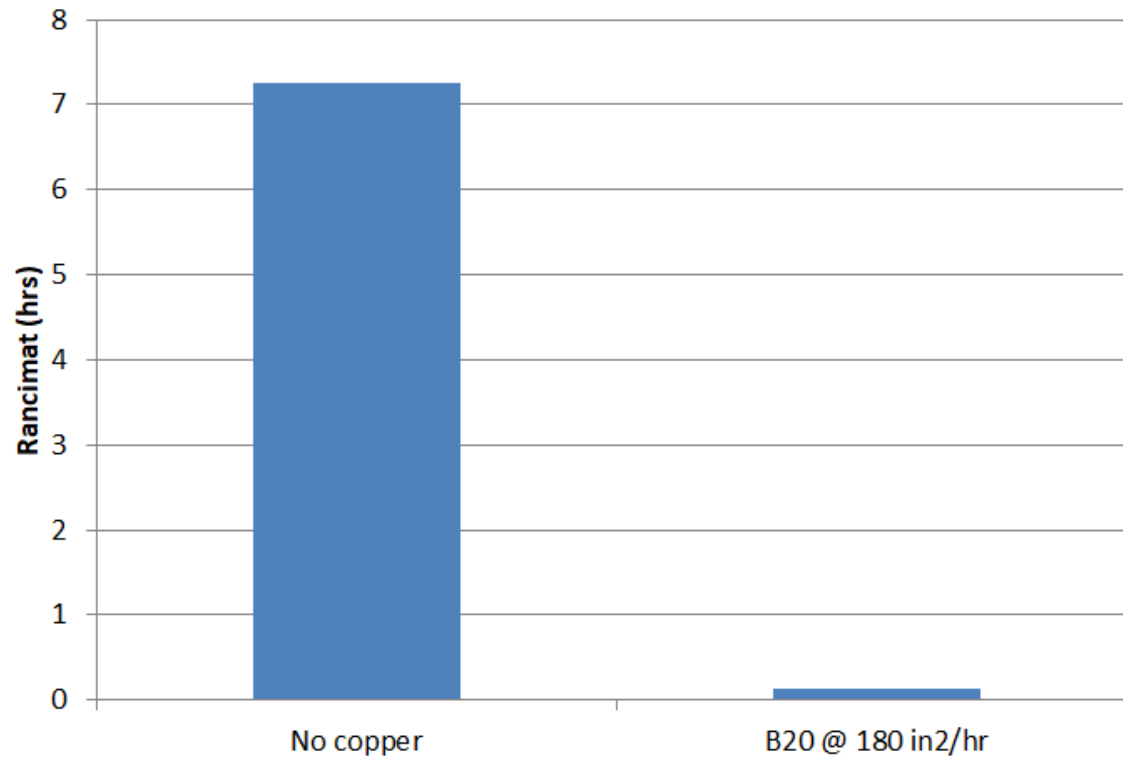
## Conventional Heating Oil Market Areas, Oxidative Reserve Tank Samples

Note: Different base heating oil source than biodiesel blend market area

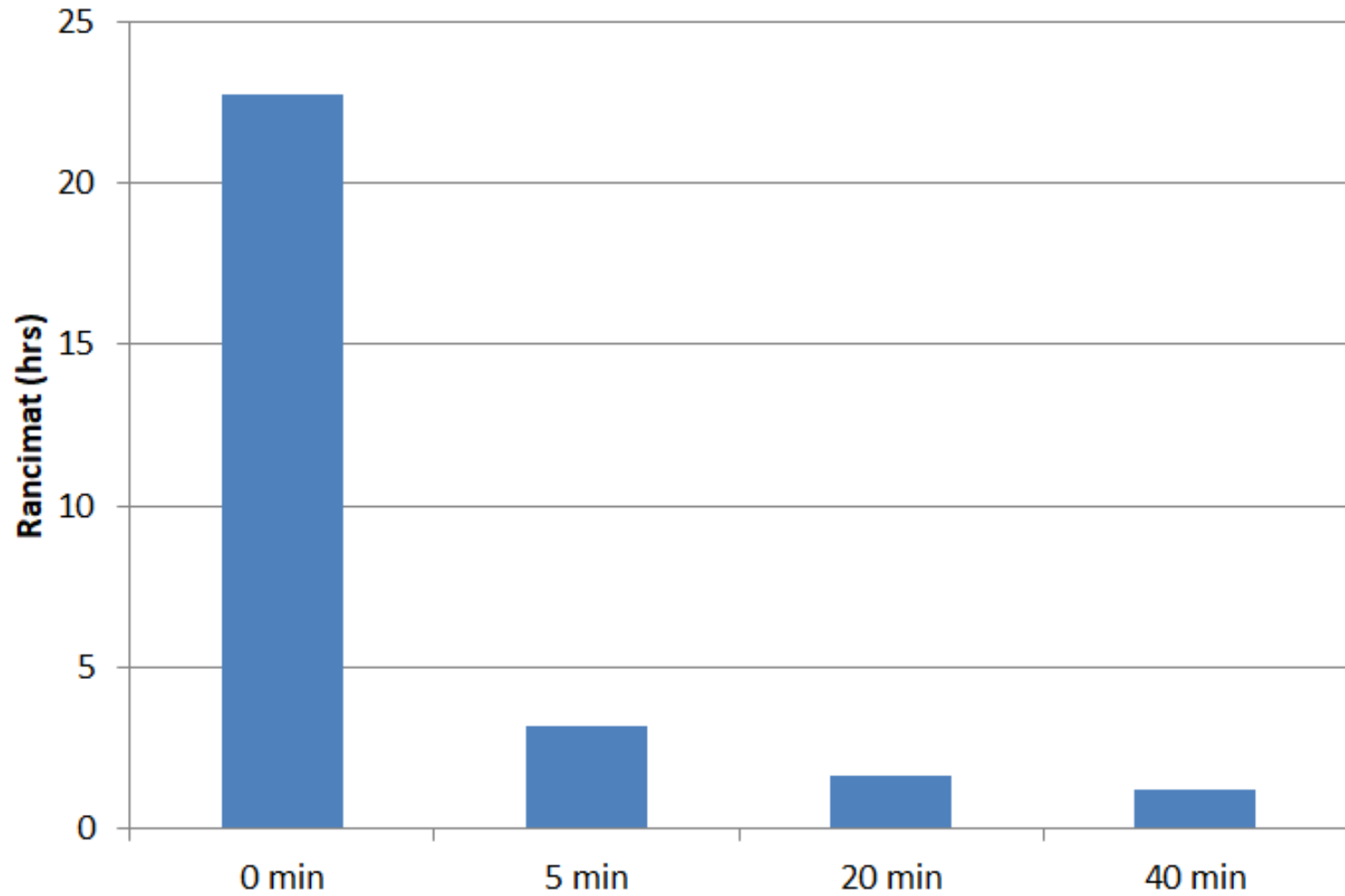




# B20: Exposure to coiled copper wire @ copper exposure of 180 in<sup>2</sup>/gal



# B0: Exposure to coiled copper wire @ copper exposure of 180 in<sup>2</sup>/gal



Prior study at BNL – Storage of blend and neat heating oil in copper tube for 6 months to emulate summer shutdown. No corrosion or elevated acid number observed

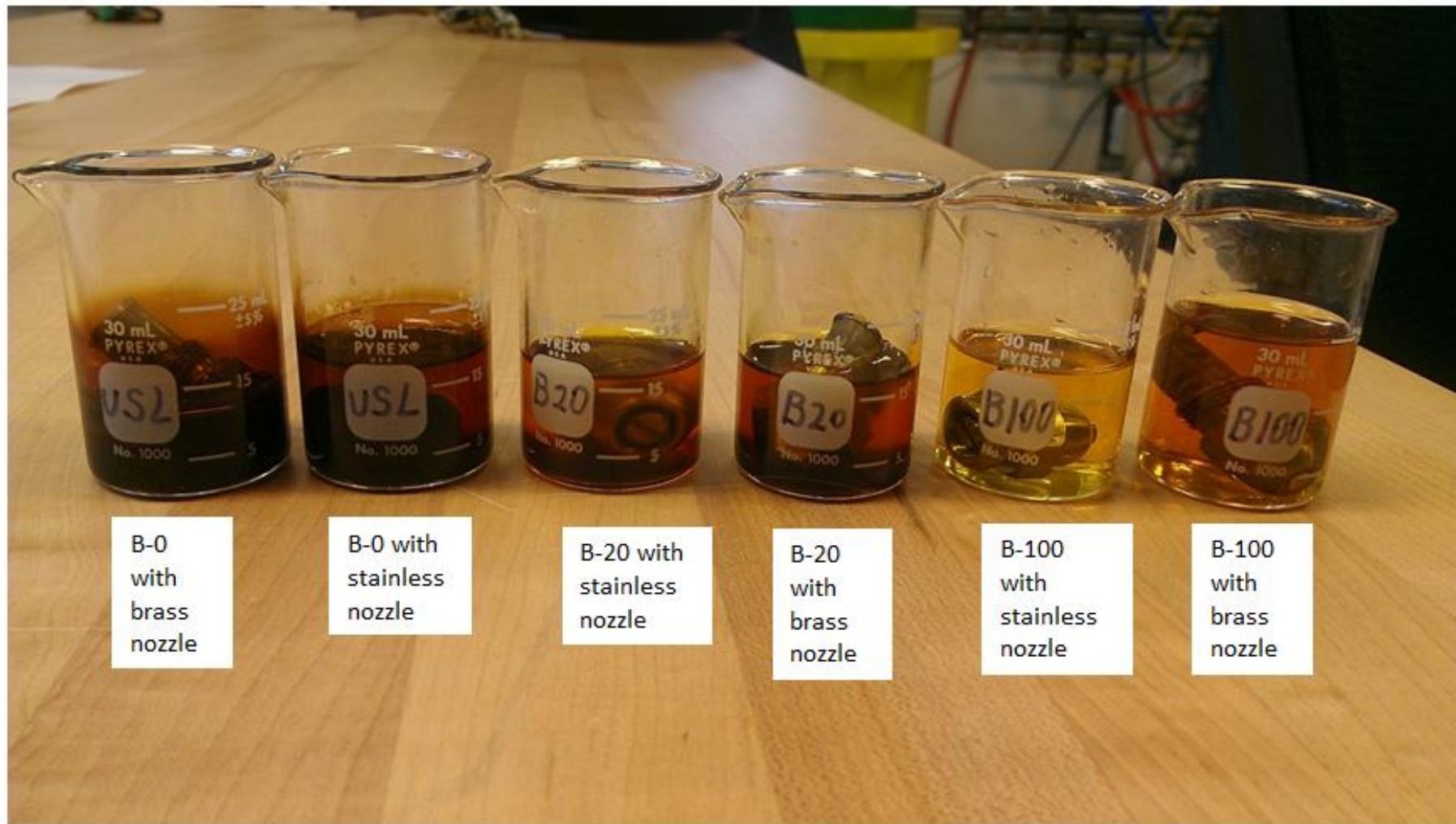


Heating  
oil



B-20  
blend

Prior studies at BNL – 5 weeks of exposure to different metals (nozzles) at high temperature



B-0 with brass nozzle

B-0 with stainless nozzle

B-20 with stainless nozzle

B-20 with brass nozzle

B-100 with stainless nozzle

B-100 with brass nozzle

# Preliminary Thoughts and On-Going Work

- None of the homes that were sampled have experienced major field issues
- Biodiesel content in actual use varies, blends higher than B20 are being used
- Filterable particulates for several samples were higher than expected for both conventional heating oil and B20 biodiesel blends
  - Even though this has not caused reported issues with these samples
- Exposure to copper can dramatically reduce the oxidative reserve value measured with the Rancimat testing unit
- These conditions exist for both conventional heating oil and biodiesel blends
- Additional study is needed on the source and root cause of particulates and potential options investigated for mitigating particulate formation or addressing them via filtration



In progress – long term storage stability tests at 43 °C/ 110 °F (ASTM D4625). Metric is filterable particulates. First tests will be done ~ end November.

Field sampling – post summer, idle units, properties of fuel just in copper lines.



# Ongoing Work

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