



PICO-500 Quartz Vessel Cleaning and Treatment

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About Me

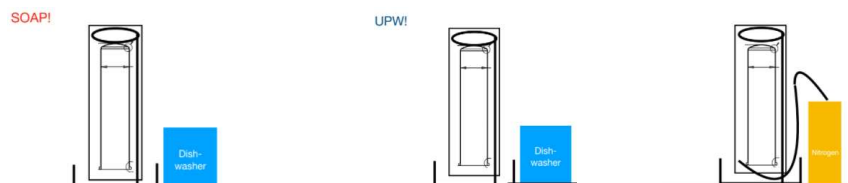
- Somewhat mediocre guitarist
- Starting my master's degree this fall at the University of Alberta

Purpose of Cleaning

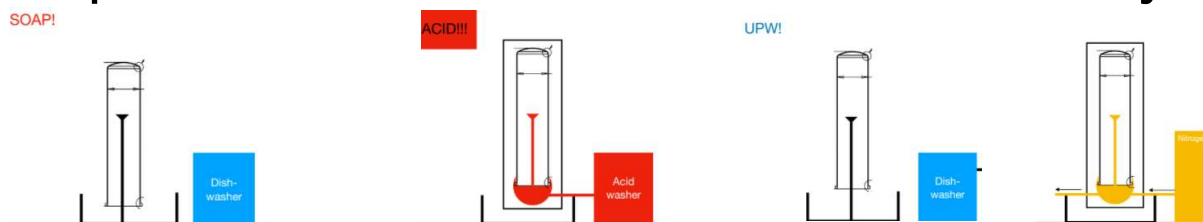
- Remove heavy metals and other contaminants from the quartz jars
 - Mitigate background radiation
- ➔ Follow PICO-40L cleaning process

Cleaning Approach (Outer Jar)

- Outside cleaning:
 - Soap+UPW \rightarrow UPW \rightarrow N₂ Drying



- Inside cleaning:
 - Soap+UPW \rightarrow 20% HNO₃ \rightarrow UPW \rightarrow N₂ Drying



The “Dishwasher” 2.0

Old “Dishwasher”



New “Dishwasher”



Improvements from previous system:

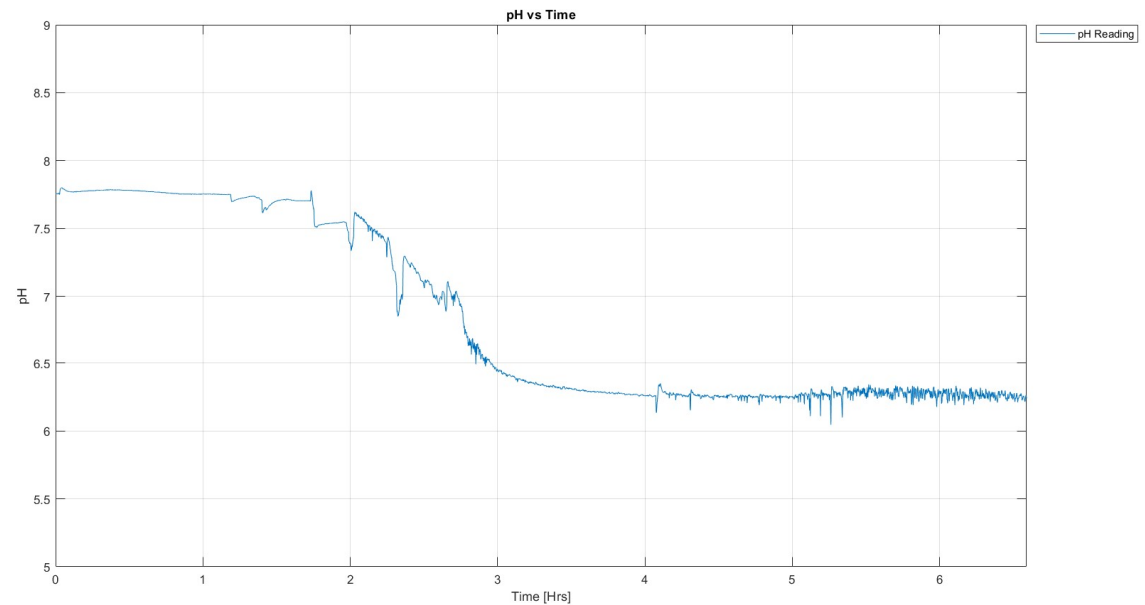
- Hard plumbing → CPVC with Viton gaskets
- Pulsation Dampener to reduce pressure spikes
- pH, Pressure sensors & thermocouples

Over 21 days of combined runtime with no leaks

pH Sensor

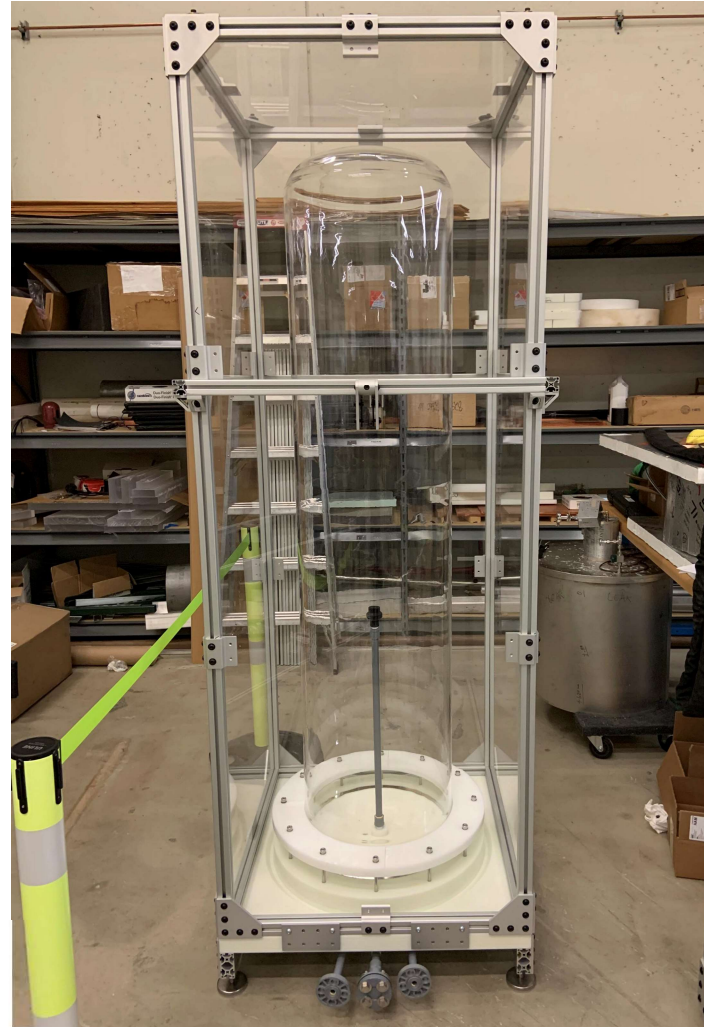
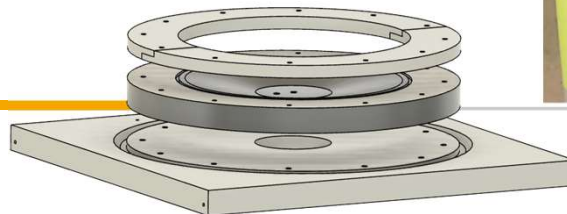
Applications:

- Will be used for monitoring nitric acid flush/dilution
- Currently used for soapy water flush/dilution
 - possibly could change to using a conductivity sensor



Outer Jar: Inside Cleaning

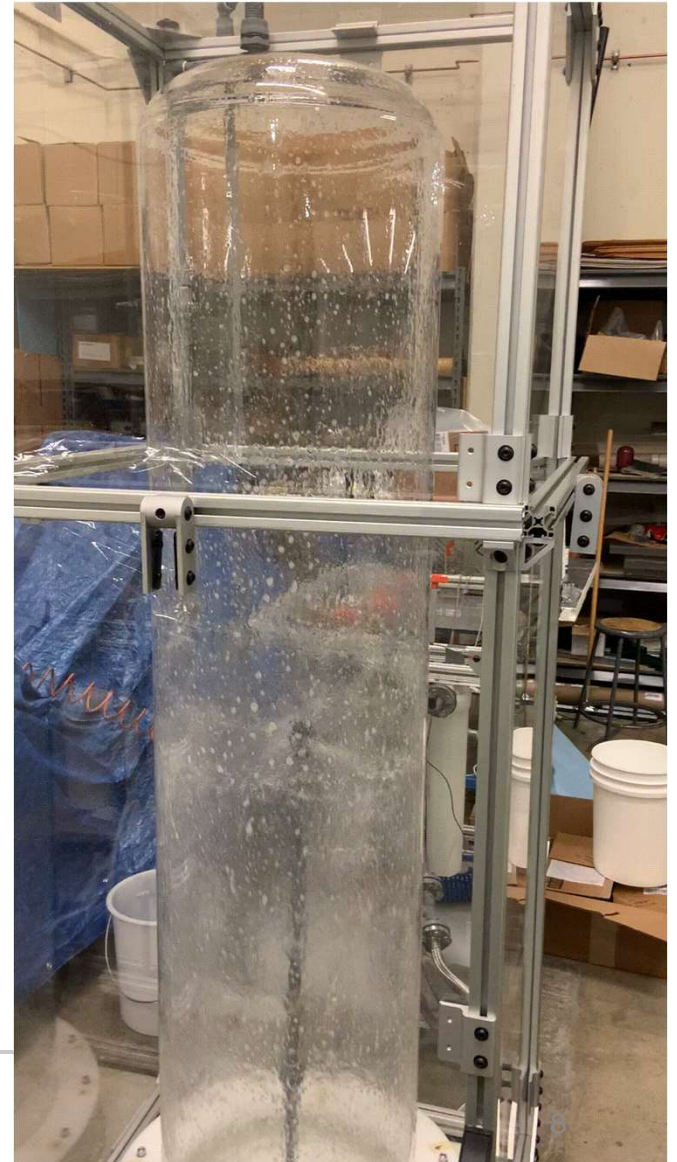
- All plastic wetted parts are made out of HDPE (Nitric acid resistant)
- Jar is sealed to the funnel using a split flange and 12 bolts (Viton O-rings)
- Enclosed by containment box to prevent leaks to the outside



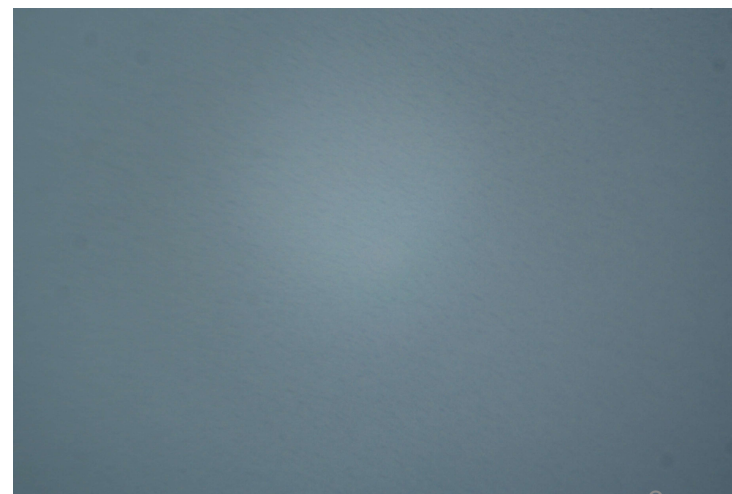
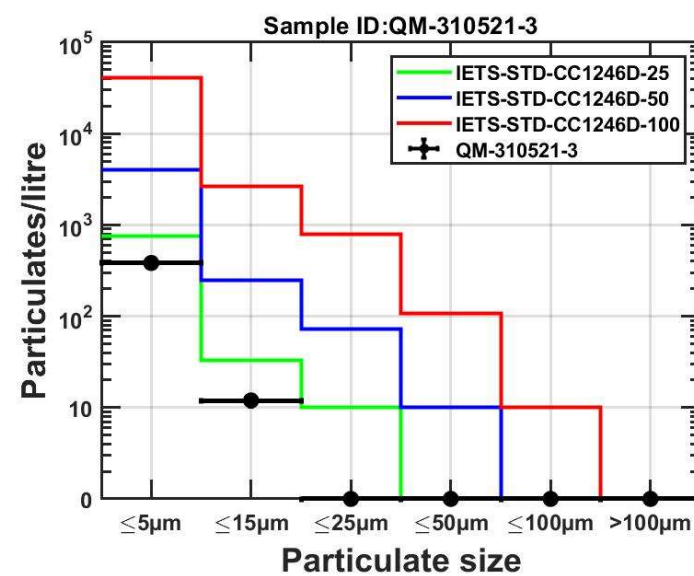
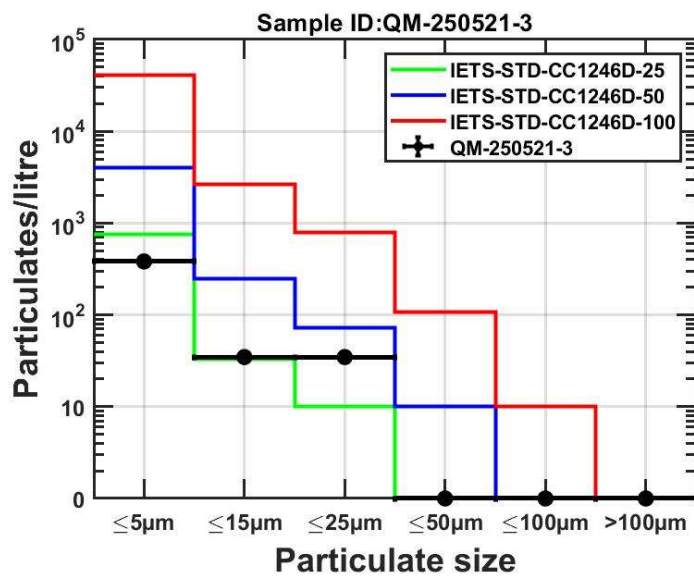
Outer Jar: Inside Cleaning

Demonstration of a Soap+UPW run →

- Nozzle is a PTFE self rotating nozzle (360° spray area)
- No nitric acid runs performed yet. Only Soap+UPW and UPW runs

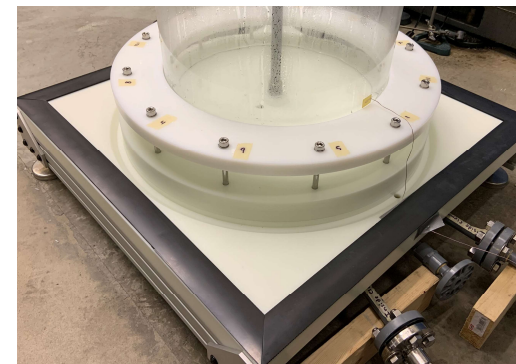


Samples



Outer Jar: Outside Cleaning

- Setup:
 - Thru-wall pipe connection at the top of the enclosure
 - 3 nozzles in series spraying one side of the jar
 - Square Viton gasket to seal the enclosure to base
- Plan:
 - Rotate enclosure to wash entire jar



Outer Jar: Outside Cleaning

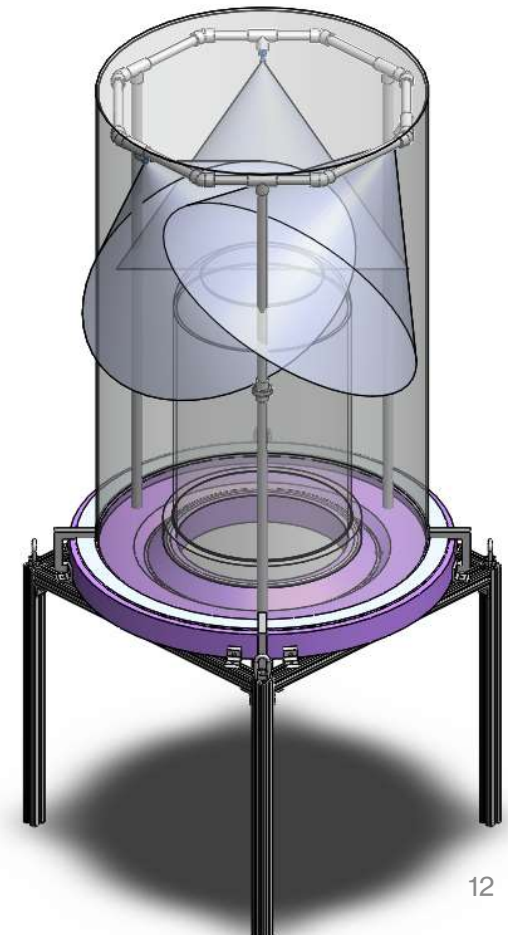
First Outside Cleaning Test →

- Currently in the design and testing phase



Inner Jar: Outside Cleaning

- Outside cleaning:
 - Soap+UPW → 20% HNO₃ → UPW → N₂ Drying
- Inner jar will be enclosed by a HDPE tank
- Plan is to seal the quartz jar to base by pulling a vacuum
- Base plate is currently being machined!



Inner Jar: Inner Cleaning

- Inside cleaning:
 - Soap+UPW → UPW → N₂ Drying
- Final setup: TBD
- Simplest Approach:
 - Utilize the SS self rotating nozzle that's on site



Future Experiments

- Nitric acid-radon cleaning effectiveness
 - Current Plan:
 - Expose quartz sample slides to a radon source
 - Measure alpha contamination with a dedicated alpha counter
 - Clean them by putting them in the Inner Jar setup
 - Will allow us to measure how effective nitric acid and other cleaning methods are at removing radon



THANK YOU!

Questions?
