

Tar Sampling Program Developments and Observations at the University of California

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Review of Methods

SPE/SPA:

- Short duration (<5min)
- Small volume (100ml typical)
- Simple sampling
 - Not isokinetic (usually pulled from side wall)
 - No heat maintenance

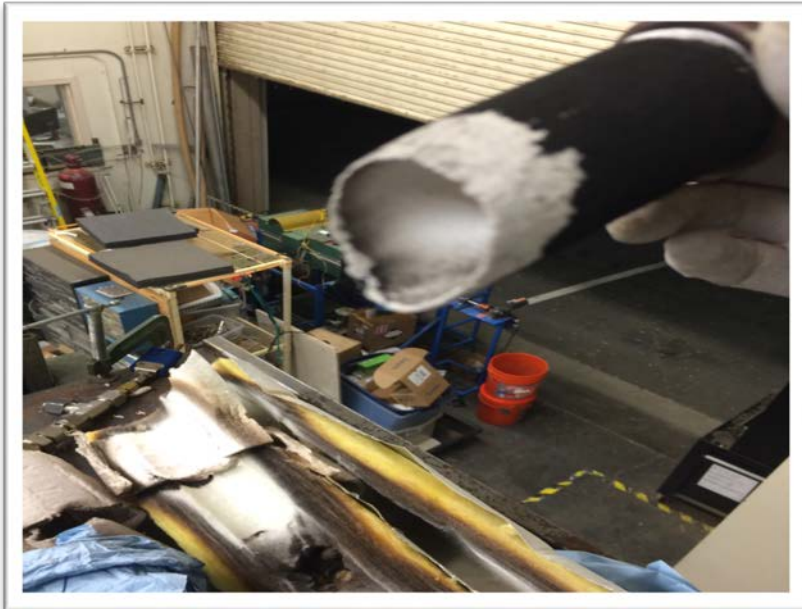
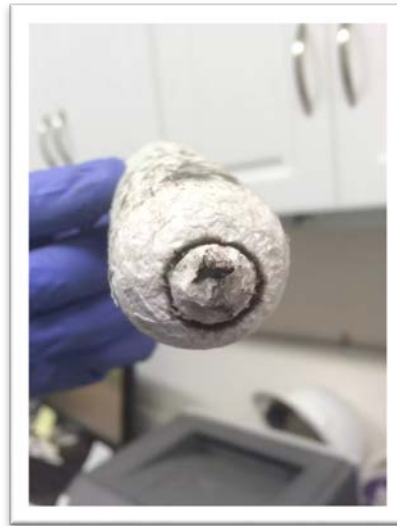
Concerns with method:

- Was never validated as a stand alone method!
- Wall condensates
- Aerosols
- Sample condensation on wall

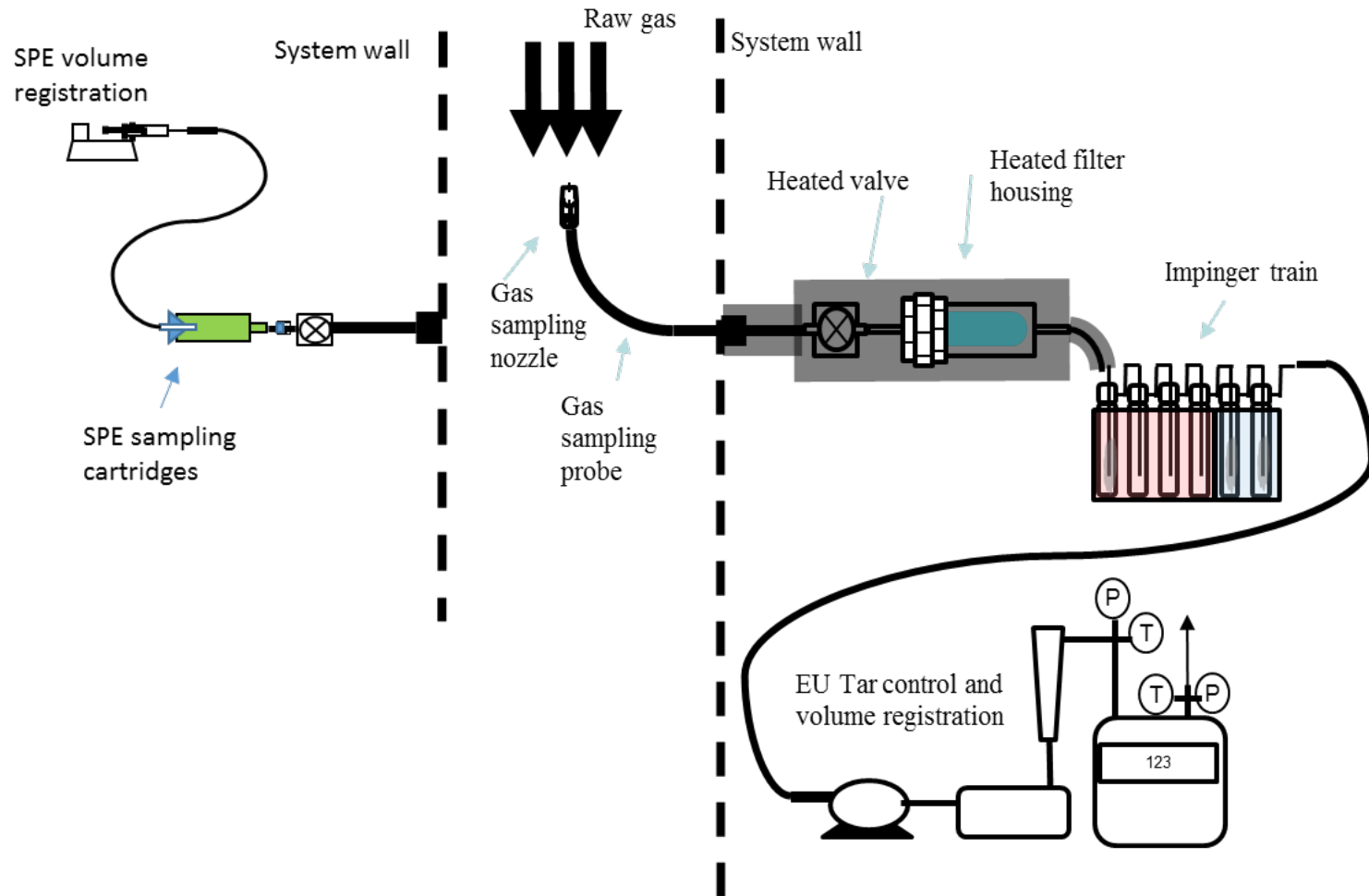
EU Method (CEN TS 15439):

- Long duration (15-60 min)
- Large volume of gas sampled
- Complex sampling
 - Isokinetic sampling
 - High temperature heat maintenance
 - Heated filter accessibility required
 - Many joints leading to leaks
 - Sub-zero temperature heat maintenance
- Complex analysis
 - ~3hr evaporation process
 - ~8hr soxhlet solvent extraction
 - Ambiguous procedure
 - Solvent rinsing of all contact surfaces

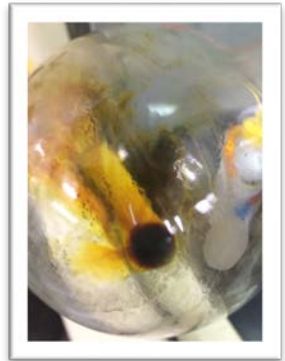
Filter Issues



Motivation



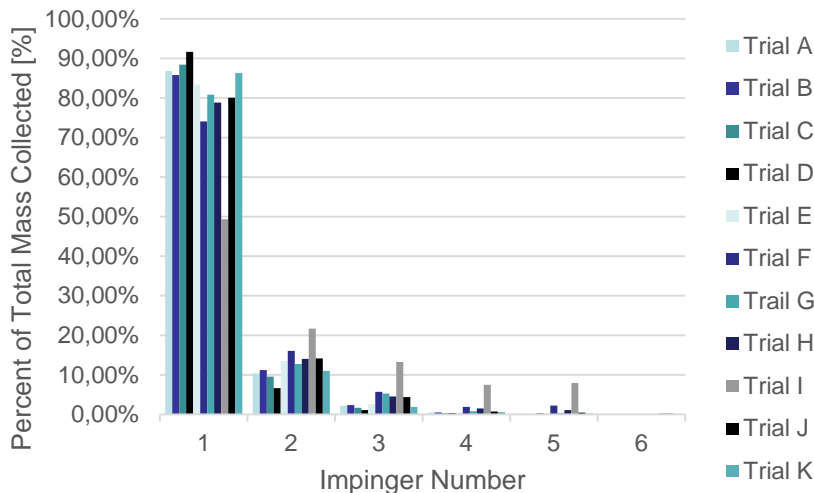
EU Method (CEN TS 15439) Validation



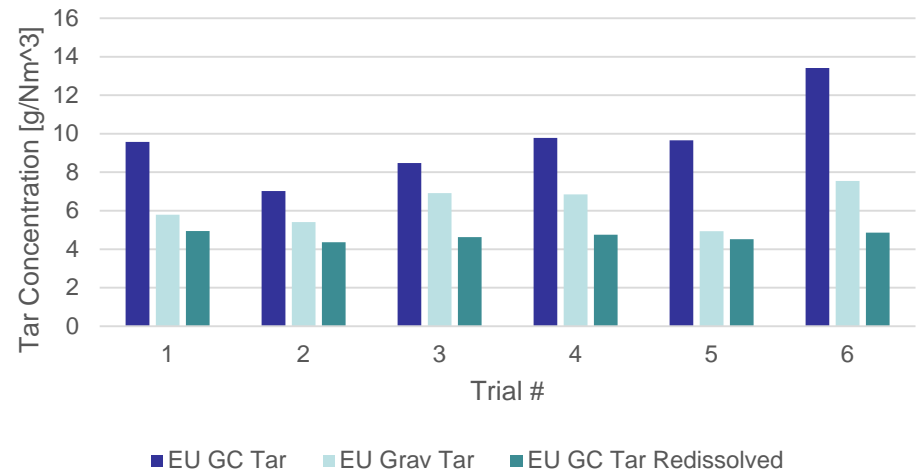
- CEN TS 15439 alternate impinger setup does capture all significant tar
- Significant tar is lost during the evaporation process
- EU Gravimetric suggests agreement with EU GC Redissolved



Impinger Train Mass Fractionation

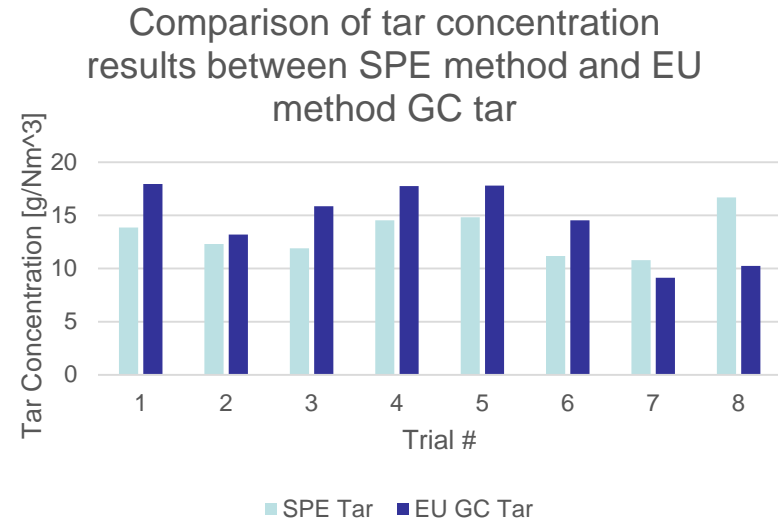


EU method tar concentration comparison



SPE/SPA Method Validation

- Under UC Davis operating conditions and sampling location geometry (150C, <1 m/s gas velocity), SPE sampling results agree with EU Tar GC results
- Under increased tar loading, SPE/SPA results become suspect
 - EU Gravimetric result: >122 g/Nm³
 - SPE/SPA method result: 28 g/Nm³

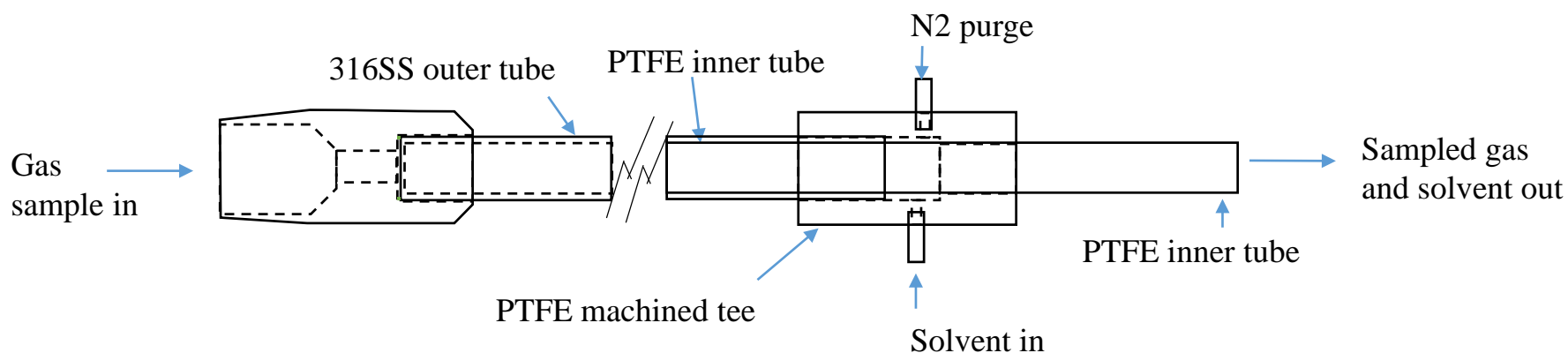
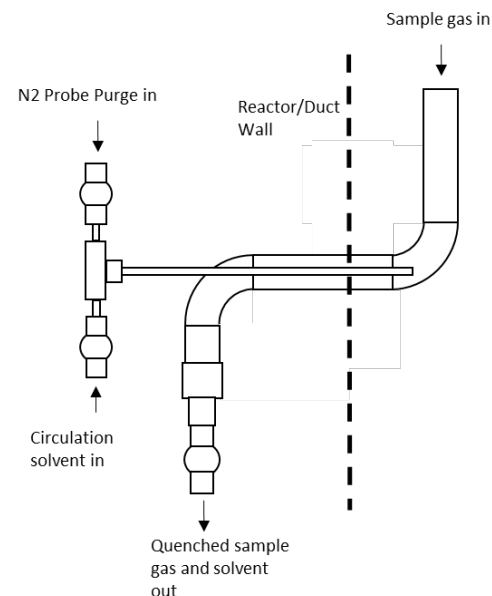


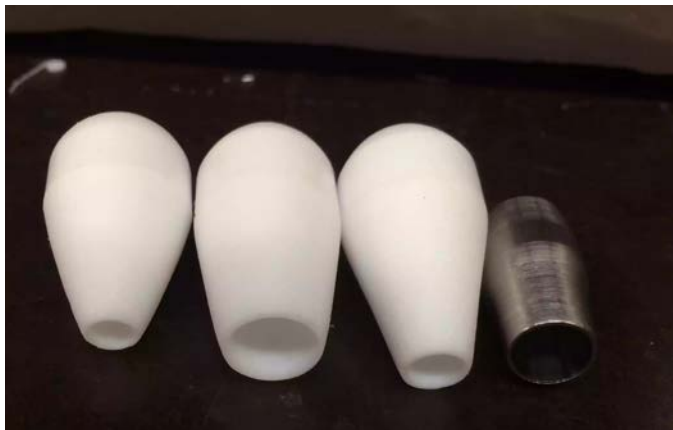
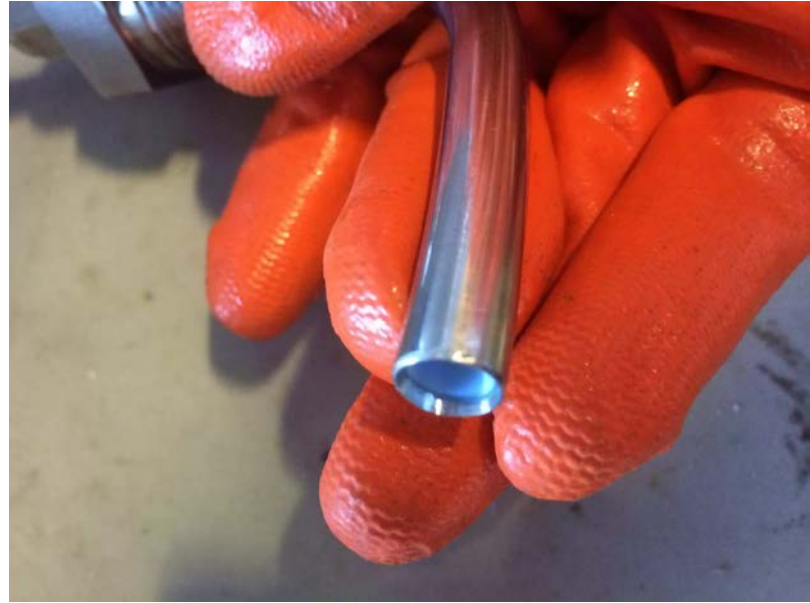
In Nozzle Solvent Quench

Simplification of EU Tar

- Improved gas/solvent interaction
- Dramatically simplified sampling setup
 - No line/filter heat maintenance requirement
 - Simplified post sampling rinse procedure
 - Only applied to filtered gases (to date)

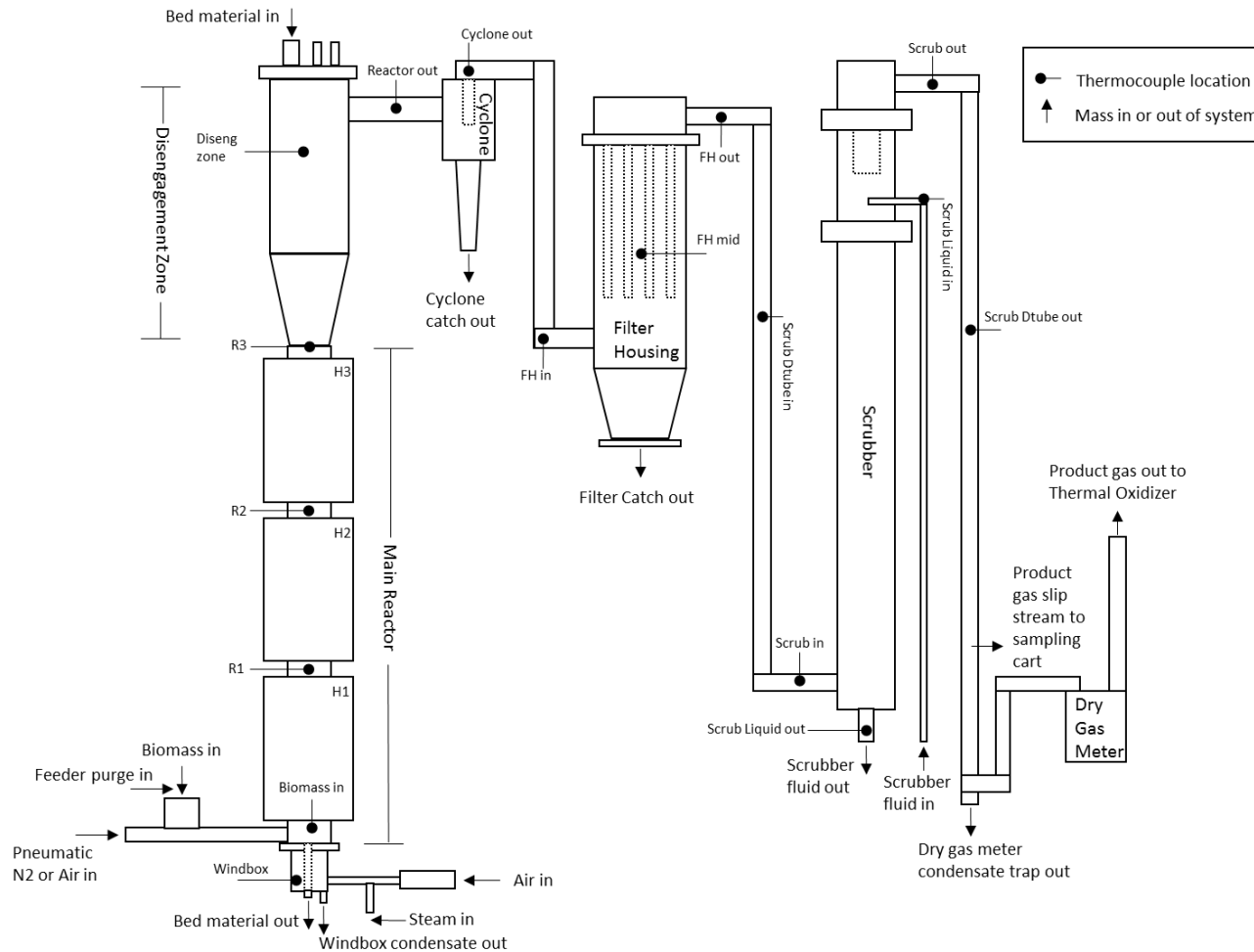
In-Nozzle Quench Diagram





Questions?

UC Davis Reactor

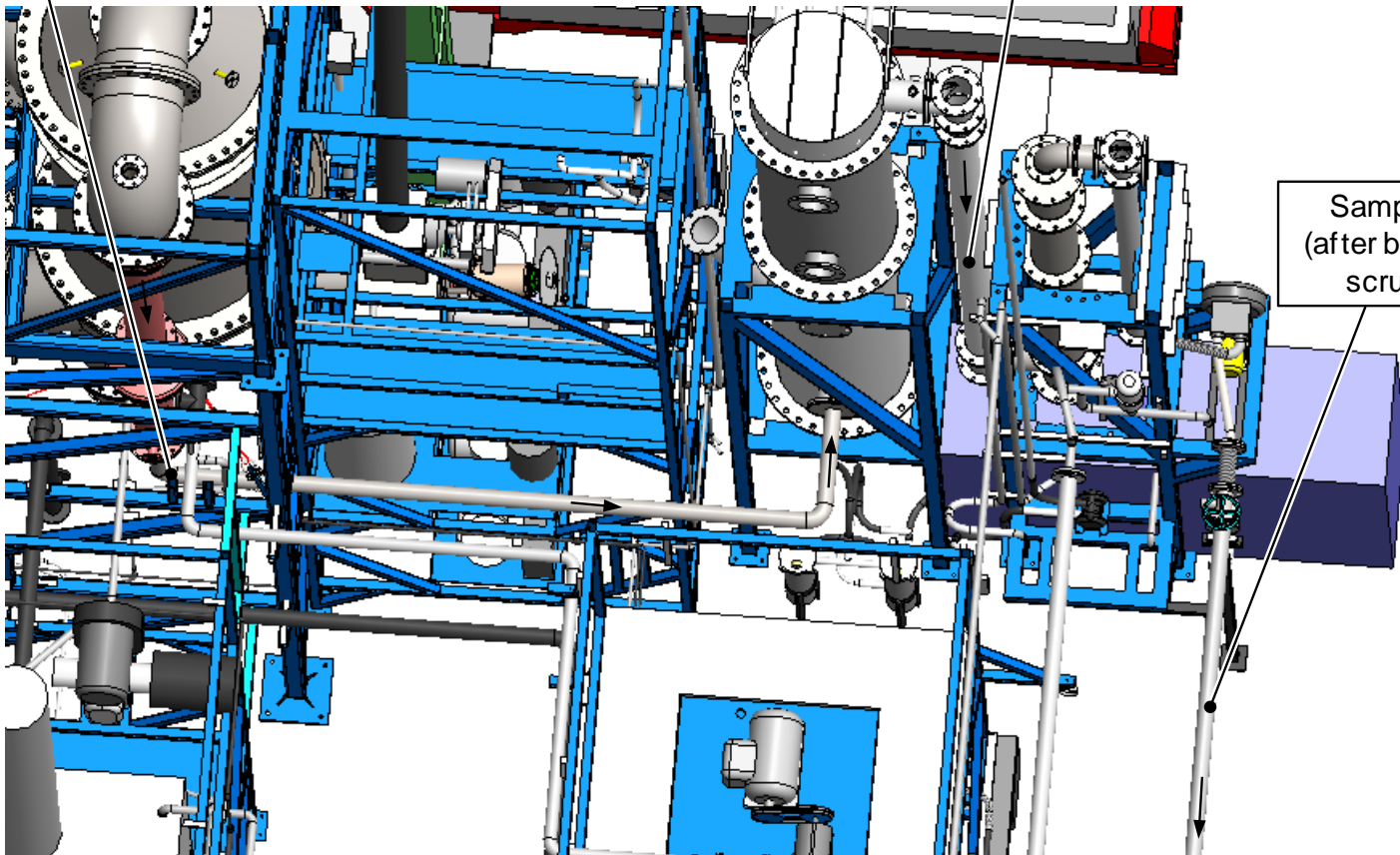


FICFB Sampling

Sampling 1
(after gasifier and
product gas cooler)

Sampling 2
(after product-
gas filter)

Sampling 3
(after biodiesel
scrubber)



The CircleDraft® Gasification Process

