# Emissions Measurement at NCCC

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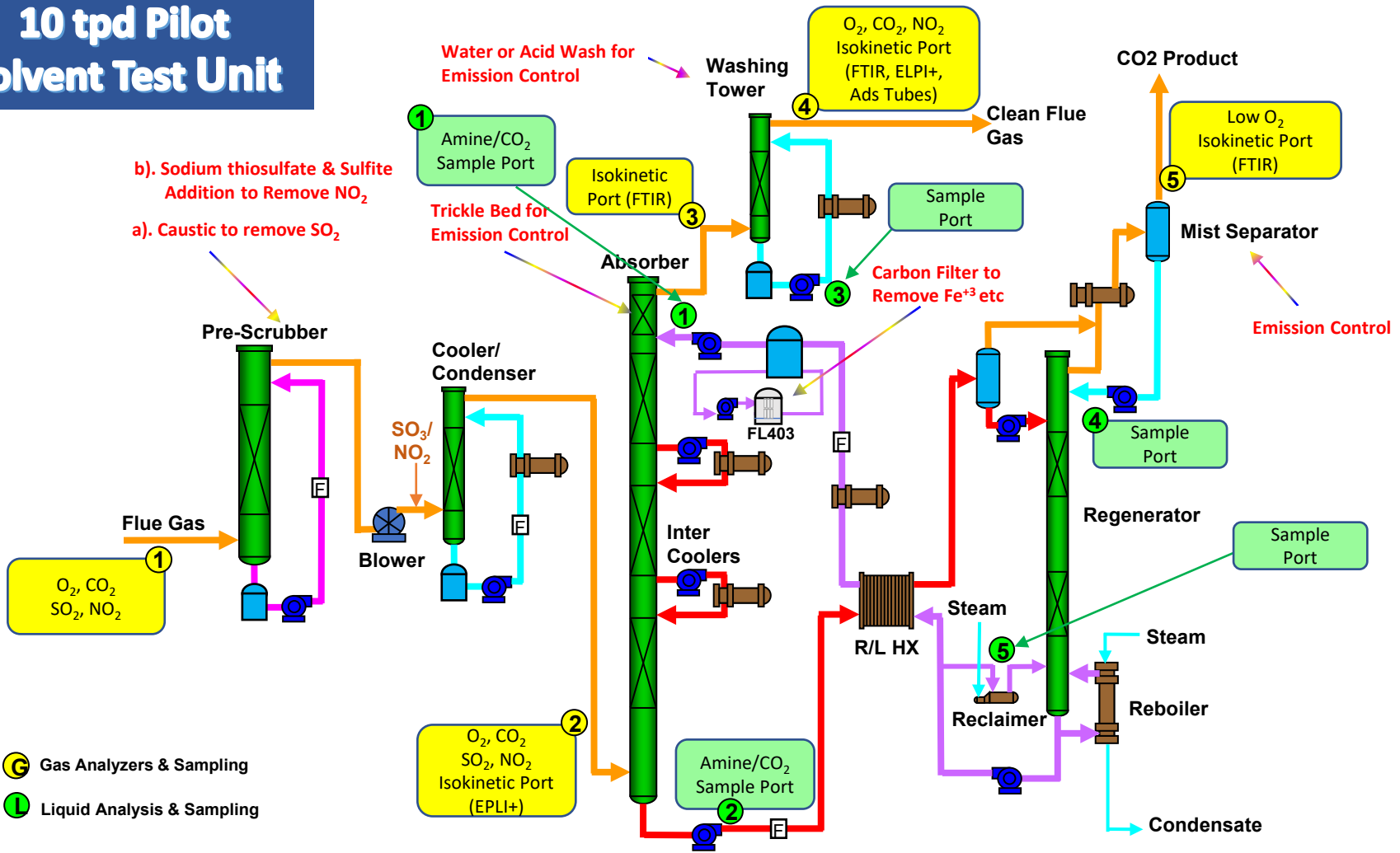
Tony Wu and Bob Lambrecht

Birmingham, AL

Workshop on Measurement, Monitoring and Controlling Potential Environmental Impacts from the Installation of Point Source Capture

U.S. DEPARTMENT OF ENERGY | NETL NATIONAL ENERGY TECHNOLOGY LABORATORY

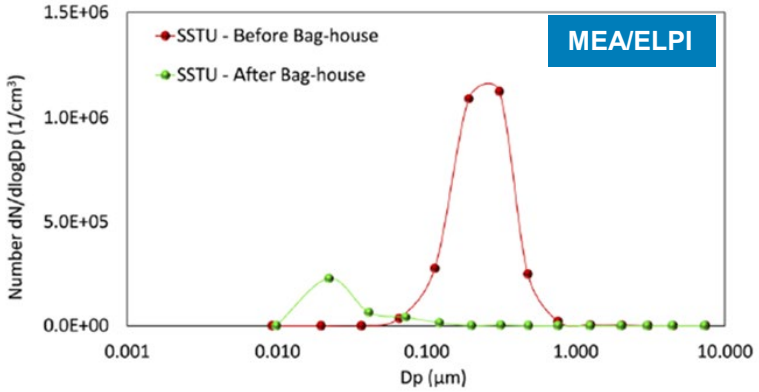
# 10 tpd Pilot Solvent Test Unit

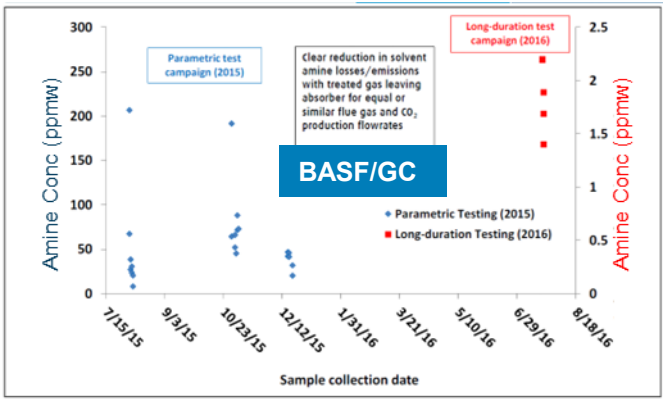


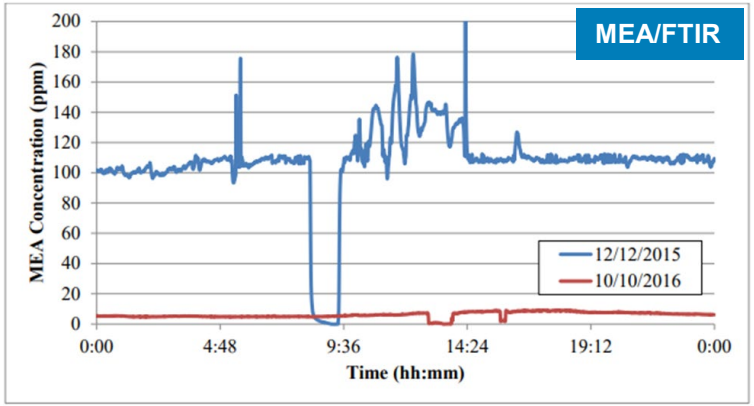
# Emission Related Analyses

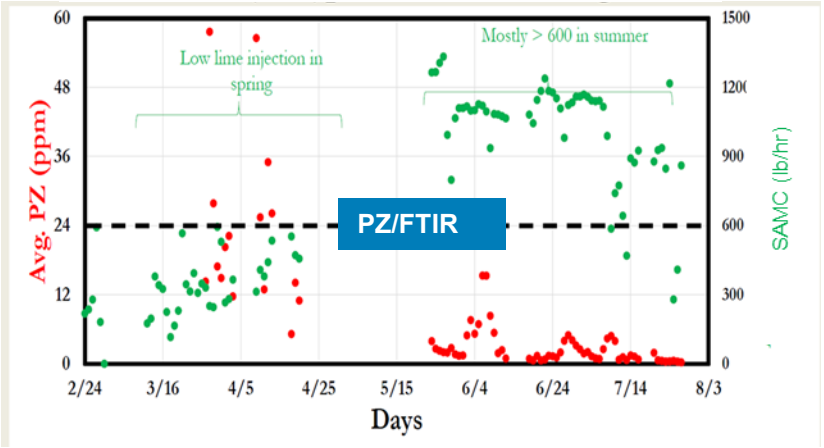
- In-house Capability
  - Sample gas treatment (condensing chillers and Nafion dryers)
  - UV Analyzers for $NO_2$ and $SO_2$
  - FTIR for amines, $NH_3$, etc.
  - $ELPI^+$ for particles concentrations and size distribution
  - Gas sampling train for offline degradation products
- In Collaboration with Technology Developers
  - FTIR, PDI, UV-Vis, Ecotech low-$NO_2$ analyzer, AMI low $O_2$ analyzer (UT Austin)
  - SMPS and APS from TSI Inc. (Linde/BASF, EPRI & WUSL) for particles distribution
  - CB&I CEM Mobile Trailer (Linde/BASF)
  - PTR-TOF MS for degradation products (UT & U of Oslo ,planned)

# Example – Impact of Aerosol ($SO_3$)

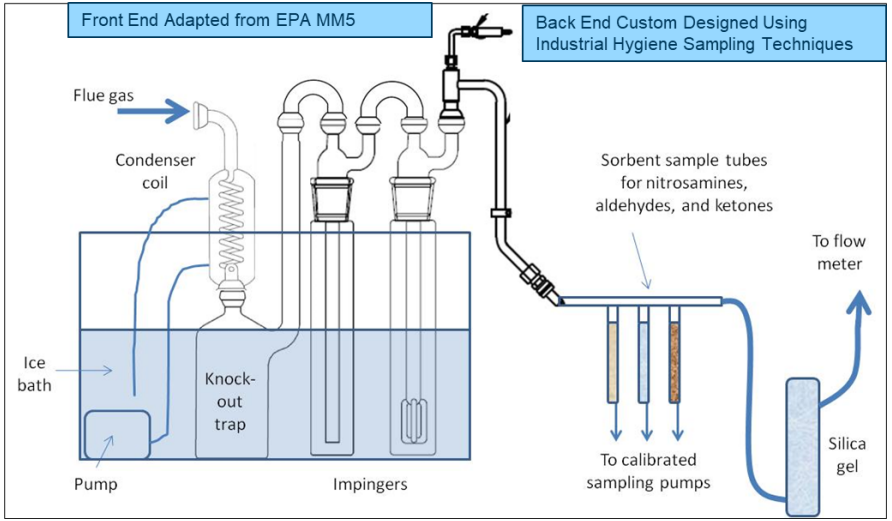


# Example - MEA Degradation Products Sampling and Results




**MEA ~ 1100 operation hours**

| Analyte | WT Outlet Concentration, ppmv (1) | |
|---|---|---|
| | Wash Tower | Regenerator |
| MEA | 135 | 0.061 |
| Formaldehyde | 0.32 | 2.09 |
| Acetaldehyde | 0.69 | 2.04 |
| Ammonia | 140 | 3.5 |
| Ethyl amine | 0.036 | ND |
| Acetone | 0.18 | 0.033 |
| Acetonitrile | 0.039 | 0.023 |
| Acetic acid | 0.021 | 0.020 |
| Propionic acid | 0.23 | 0.26 |
| N-Nitrosodimethylamine (2) | 0.000225 | 0.0000058 |
| N-Nitrosodiethanolamine (2) | 0.00106 | ND |

(1) Expressed as ppmv in the gas phase
(2) Present only in vapor samples
ND = Not Detected

# NCCC Future Considerations

- Continuous monitoring of source flue gas for changes
- Measurements in both liquid and gas phases (key locations) for comprehensive understanding
- Explore advanced analyzer/instrument for solvent degradation/emission analysis
  - PTR-TOF MS
  - Total Nitrosamines (TONO) by Stanford University
  - Raman Spectroscopy
  - Optical Sensor
- Design a flexible multi-stage flue gas washing for emission reductions (e.g. dry bed, trickle bed, water & acid wash)
- Explore the use of SSTU for long-term solvent degradation and reclamation study
- Perform emission measurement for all technologies testing at NCCC, as appropriate