National Carbon Capture Center: Post-Combustion

Patrick Crossley
Project & Design Engineering Manager
Project Facts

10/08 to 9/14
Project Value $251M

6/14 to 5/19
Project Value $188M

Industry Partners
Offering a **world-class neutral** test facility and a highly specialized staff, to **accelerate the commercialization** of advanced technologies and enable coal based power plants to achieve **near-zero emissions** (low cost CO$_2$).
Evaluate and Screen Technologies

Define Scope of Work with Technology Developer

Design and Construct

Operate according to Test Matrix

Analyze Data and Report

Technology Development Process
Post Combustion Results

- **Developers**
  - 8 pilot-scale (0.2 – 1.0 MW)
  - 6 bench-scale (0.001-0.05 MW)
- **Operating hours since 3/2011**
  - Pilot 15,213 hrs
  - Bench 15,032 hrs
  - Cansolv & Carbon Clean Solutions of India (CCSi) tested with natural gas simulated flue gas
- **Technologies**
  - 10 amine-based solvent
  - 1 carbonate-based solvent
  - 2 catalytically assisted (enzymes)
  - 2 solid sorbents
  - 1 CO₂ membrane
- **Others:**
  - Amine carryover and aerosols
  - Trace metals accumulation in solvent
  - Analytical methods development & verification

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**Pilot Test OP Hours**

- MEA: 2731
- B&W: 2000
- Hitachi: 1300
- Cansolv: 4014
- Chiyoda: 1500
- CCSI: 1077
- Aker (PB2): 2592
- Linde (PB2): 794
- MTR (PB3): 443

**Benchscale Test OP Hours**

- MTR: 10402
- Codexis: 3500
- Akermin: 250
- SRII: 149
- CCSp: 672
- DOE C2U: 60
1.2 MW
12,000 lb/hr max

To Stack

Expanded PC4 Configuration

3.5 MW
35,000 lb/hr

Benchscale Test Bays

B 1
B 2
B 3
B 4

0.4 MW
4,000 lb/hr

Pilot Bay #2

1 MW
10,000 lb/hr

Cooler

Pilot Bay #1
PSTU

0.5 MW
5,000 lb/hr

FGD

B 1
B 2
B 3
B 4

Pilot Bay #2

Plant Gaston Flue Gas

35,000 lb/hr
Post Combustion Bench Scale

Slipstream Solvent Test Unit

SRII Sorbent

MTR Membrane

DOE Sorbent

Akermin Enzyme Enhanced Solvent

CCSp Solvent (Carbon Capture Scientific)
Current Performance Period

**Solvents**
- *Carbon Clean Solutions*
- *Linde/BASF*
- Cansolv DC103/DC201
- MEA baseline to support CCSI
- *Carbon Capture Scientific*

**Membranes**
- *MTR 20 TPD*
- *MTR Plate/Frame Sweep Air module*
- *MTR 1 TPD*
- *OSU membrane*

**Sorbents**
- *SRI International*

**Tested**

**Planned**

**Solvents**
- *Linde/BASF*
- *Carbon Capture Scientific*
- MEA baseline in SSTU
- Green Technology
- *ION Engineering*
- *GE Global*
- *Univ. of Texas - Austin*

**Membranes**
- *MTR 1 TPD*
- *Air Liquide*
- *NETL Membrane*
- *GTI HFMC*

**Enzymes**
- *Akermin Biocatalyst Delivery System*

**Sorbents**
- *SRII 0.5 MW*
- *TDA Sorbent*
PSTU/SSTU Research Program

Improve the understanding of solvent processes according to:

Physical Properties
- Utilize new instrumentation to compare measured physical property data to simulation values

Hydraulic Characteristics
- Utilize AFT Fathom to create a hydraulic model to improve understanding of pressure and flow distribution in the system
- Beneficial for viscous materials or slurries
- Extended time simulations can model dynamic system behavior
Improve the understanding of solvent processes according to:

Amine Emissions
- Utilize PDI/ELPI to analyze impact of process conditions on aerosol formation
- Examine $\text{SO}_3$ influence on aerosol formation (before and after baghouse installation)

Comparison of Analytical Methods
- Determine the variability in samples arising from the analytical procedure used (sample tube versus wet chemical technique)
- Determine the variability in samples arising from the extraction technique used (materials, temperature, etc.)
Acknowledgements

More information: www.nationalcarboncapturecenter.com