



Maturing 2nd Generation Technologies

Research Triangle Institute's Water-Lean Solvent Process

DOE/FE/NETL has sponsored highly successful second-generation technologies that will dramatically reduce CO₂ capture costs. Research Triangle Institute's (RTI) Water-Lean Solvent Process is one of those technologies.



Technology Centre Mongstad (TCM)

BACKGROUND

CHALLENGE:

- Current solvent capture technologies use mixtures of ~70% water and 30% amines to absorb CO₂
- The water has negative energy impacts and doesn't capture any of the CO₂ - unlike the amines - but the water controls the corrosivity and viscosity of the amines

RTI'S SOLUTION:

- Replace water with a hydrophobic non-aqueous solvent
- Total water in the mixture goes from ~70% down to ~5-10%

SIGNIFICANT RESULTS

Techno-economic analyses indicate:

- ✓ **Reduced Capital Costs**
Enhanced solvent performance results in smaller columns, heat exchangers, and footprint
- ✓ **Reduced Operating Costs**
Lower energy requirements



Lab/Bench-Scale Development

Initiated 2009/2010

- Proof of concept/feasibility in 2009 and lab-scale testing initiated in 2010
- Bench-scale testing initiated 2014
 - Solvent formulation finalized
 - Reboiler heat duty < 2.0 GJ/tonne
- Preliminary techno-economic analysis shows capture cost ≤ \$40/tonne



Scale-up Testing

Initiated 2016

- Testing at 60-kWe scale conducted using actual flue gas at SINTEF's Tiller Plant pilot-testing facility in Norway
 - 1500+ hours of parametric and long-term testing on coal derived flue gas
- Additional testing at the National Carbon Capture Center
 - 570 hours at 50-kWe scale using coal-derived flue gas to evaluate operational issues



Large Pilot-Scale Testing

Initiated 2018

- ~12 MWe scale testing at Technology Centre Mongstad (TCM) to evaluate the viability of the RTI solvent as a drop-in replacement for conventional capture systems
- Additional testing will modify TCM's existing equipment to evaluate optimized operation with the RTI solvent



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