



Maturing 2nd Generation Technologies

ION Clean Energy Water-Lean Solvent

DOE/FE/NETL has sponsored highly successful second-generation technologies that will dramatically reduce CO₂ capture costs. ION Clean Energy's Water-Lean Solvent 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

ION'S SOLUTION:

- Replace water with an organic solvent
- Total water in the mixture goes from ~70% down to ~25%

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 2010

- Water-lean amine solvent (mixture of amines and organic compounds)
- Initial solvent mixture had unacceptable degradation rates
- Alternative mixtures tested and found to have enhanced adsorption kinetics, increased CO₂ solubility and capacity, reduced regeneration energy, and favorable process characteristics



Small Pilot-Scale Testing

Initiated 2013

- Testing conducted at National Carbon Capture Center (NCCC) pilot scale testing unit (~0.5 MWe scale) in 2015
- Parametric testing of solvent flow rate, heat rate, and flue gas flow rate
- 1,000 hours of steady state testing
- Data generated to support scale-up to large pilot



Large Pilot-Scale Testing

2016/2017

- Testing conducted at Technology Centre Mongstad (TCM) at ~12 MWe scale in 2016/2017
- More than 2,750 hours of testing - over 14,000 tonnes of CO₂ captured
- Confirmed small-scale results



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