



Maturing 2nd Generation Technologies

University of Kentucky Advanced Aqueous Amine Solvent Process

DOE/FE/NETL has sponsored highly successful second-generation technologies that will dramatically reduce CO₂ capture costs. The University of Kentucky's Advanced Aqueous Amine Solvent Process is one of those technologies.



University of Kentucky's Center for Applied Energy Research CO₂ Capture Small Pilot

BACKGROUND

CHALLENGE:

- 1st generation solvent-based capture processes have high regeneration energy requirements
- Large mass/volume throughputs and lack of process optimization result in high capital costs

KENTUCKY'S SOLUTION:

- Process intensification to drive down capital costs
- System integration and heat recovery measures drive down operating costs

SIGNIFICANT RESULTS

Techno-economic analyses indicate:

- ✓ **Process-Based Advances Have Broad Applicability**
Lead to cost reductions independent of solvent choice
- ✓ **Progress Toward Cost Targets**
Through a combination of advanced solvents and process improvements



Lab/Bench-Scale Development

Initiated 2008

- Four-pronged approach to drive capture cost reductions focusing on:
 - Process intensification
 - Two-stage solvent regeneration
 - Heat integration
 - Advanced solvent development
- Preliminary techno-economic analysis for non-optimized system showed 24% reduction in overall cost of capture



Small Pilot-Scale Testing

2015 - 2017

- Over 2,000 hours of parametric and long-duration testing (0.7 MWe scale) at Kentucky Utilities' E.W. Brown Generating Station
- Process intensification measures: CO₂ recycling and internal heat pump
- System integration and heat recovery measures: two-stage stripping and pressurized primary stripper with split rich solvent feed



Large Pilot-Scale Testing

Initiated 2015

- Detailed techno-economic analysis and a preliminary plant design with engineering/cost estimates for construction of a 10 MWe pilot facility
- One of three capture technologies advancing efforts to develop large-scale pilots for transformational coal technologies



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