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"Pilot- and Full-Scale Demonstration of Advanced Control Technologies for Lignite-Fired Power Plants"

CONTRACTOR: Energy & Environmental Research Center
PRINCIPAL INVESTIGATOR: Dr. Steve Benson

PARTICIPANTS

Sponsor	Cost Share
Basin Electric Power Cooperative	$12,500
Great River Energy	$12,500
Minnkota Power Cooperative	$12,500
Ottertail Power Company	$12,500
Montana Dakota Utilities Company	$12,500
BNI Coal, Ltd	$12,500
Dakota Westmoreland Corporation	$12,500
North American Coal Company	$12,500
DOE-NETL	$1,000,000
NDIC	$150,000
In-Kind Services (W.L.Gore, Haldor-Topsoe Babcock & Wilcox, ALSTOM, ADA Technologies)	$50,000
Total Cost	**$1,300,000**

Project Schedule – 2 Years

Contract Date – 6/26/03
Start Date – 4/01/03
Completion Date – 3/31/05

Project Deliverables

Contract Execution ✓
Quarterly Reports: 9/30/03 (✓), 12/31/03 (✓), 3/31/04 (✓), 6/30/04 (✓), 9/30/04 (✓), 12/31/04 (✓)
Final Report 3/31/05 (✓)

OBJECTIVE / STATEMENT OF WORK

Proposed project objectives are to further develop and evaluate previously identified advanced and innovative processes for controlling lignite-derived elemental mercury emissions from N.D. power plants. Performance objectives are 50 pct to 90 pct mercury reduction at costs of one-half to three-fourths of current estimates. The studies would include focused studies using bench, pilot plant and small scale field tests. The mercury emission control processes include: 1) Activated carbon injection upstream of an ESP combined with sorbent enhancement; 2) Mercury oxidation and control using wet and dry scrubbers; 3) Enhanced oxidation at a full-scale power plant using tire-derived fuel (TDF) and oxidizing catalysts; and 4) Absorption of mercury using inserts in fabric filter bags.

STATUS

April 1 – June 30, 2003. Pilot plant tests studying the use of activated carbon and chemical oxidation agents to oxidize mercury were conducted. Tail gas configurations studied include

an ESP-baghouse, an advanced hybrid fabric filter, and an ESP. Mercury emission control efficiency results reflected improvements over previous results. Future work will address spray dryer-fabric filter configurations.

July 1 – September 30, 2003. Pilot plant tests represented an ESP – baghouse configuration were completed. The purpose was to evaluate the effectiveness of mercury capture by ACI combined with various oxidation agents. Collected data is being analyzed. A pilot spray dryer was purchased and is being prepared for future tests.

Oct 1 – Dec 31, 2003. Installation of the pilot plant spray dryer upstream of a baghouse was completed. Tests were conducted using chemical additives injected into the pilot plant furnance followed by injection of AC upstream of the baghouse. Data reduction is on-going.

Jan 1 – March 31, 2004. Mercury removal across the *Advanced Hybrid*^{TM} baghouse was evaluated with sorbent injection, mercury oxidant addition and combinations of sorbent and mercury oxidant.

Apr 1 – June 30, 2004. The effectiveness of Tire-derived fuel (TDF) was evaluated at the Hestkett Station, using approximately 100 tons of TDF, representing about 10% of the total fuel input. Preliminary data indicate that the co-fired TDF affected the partitioning of mercury, reducing the fraction of elemental mercury entering the ESP and improving mercury removal. A presentation was prepared and presented at the DOE Annual Mercury Review Meeting held at the Pittsburgh Hyatt Hotel.

Final Report (includes Sept-Dec status report). Pilot-scale and field tests were performed using activated char and oxidation chemicals to evaluate mercury oxidation and capture for lignite-fired power plants equipped with ESPs, spray dryer-baghouse and ESP-wet scrubbers. Mercury capture efficiencies ranged from ~ 50% to over 90%.