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U.S. Department of
Transportation



Project Title: Cofiring Animal Waste in Low NO_x Burners for NO_x and Hg Reduction in Coal Fired Plants

DR. KALYAN ANNAMALAI

Project Goals

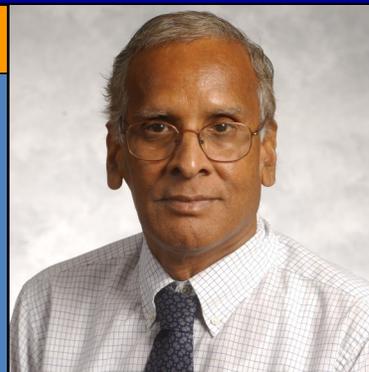
The specific goal of current proposed research is to demonstrate the use of CB as a co-fired fuel in Low NO_x burners and demonstrate the new technology in reducing NO_x

Objectives:

- Obtain CB fuel and coal characteristics.
- Modify Facility and conduct cofiring experiments.
- Conduct economic analysis on fuel collection, transportation, and processing .

Project Outcomes

- This project completed construction of a small scale LNB furnace and determined the effects of cofiring Wyoming coal (WYO):DB fuel blends in a 29.31kW (100,000BTU/hr) LNB furnace.
Note: Experiments were performed using WYO as the base case coal. These fuels were used because of lower ash to reduce ash fouling issues. The cattle biomass (CB) represent both FB and DB fuels. Low ash , high ash, separated solids were abbreviated as LA,HA and Sep Sol.
- WYO contained 3.10 kg of ash/GJ, 15.66 kg of VM/GJ, 0.36 kg of N/GJ, and 6.21 kg of O/GJ.
- LA- PC-DB-SepSol contained 11.57 kg of Ash/GJ, 36.50 kg of VM/GJ, 1.50 kg of N/GJ, and 14.48 kg of O/GJ.
- For unstaged combustion for constant fuel feed rate/heat output cases and constant air flow cases, cofiring resulted in most fuel blends showing similar NO_x emissions to WYO.
- Staged cofiring resulted in a slight increase of NO_x in rich regions while producing similar to slightly lower amounts of NO_x in lean regions.
- Inverse relationship between NO_x and CO was identified: as NO_x decreased, CO increased.
- Recently computational model was used to modify the reactor for the location of tertiary air injector which revealed better performance of LNB in reducing NO_x with coal:CB cofiring
- Respiratory Quotient (RQ= CO₂ mols/O₂ mols) method was introduced to rank fossil fuels for ranking coal and biomass based on warming potential.



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Funded: \$70,000

Start Date: 07/01/2007

End Date: 12/31/2009

Other Sources of Funding:

The PI and Co-PI cost shared a portion of their time each year. The PI's time and applicable fringe benefits and 25% indirect rate made up the 20% cost share requirement. Partial support was requested for two graduate students.