

Co-firing Coal: Feedlot and Litter Biomass Fuels

Quarterly Progress Report no: 1

Grant #: DE-FG26-00NT40810

Project Name : *Feedlot and Litter Biomass Co-firing in Pulverized Fuel and Fixed Bed Burners*

Contractor name : Texas Engineering Experiment Station, Texas A&M University

Sponsor: US Dept of Energy, National Energy Technology Laboratory

Principal Investigator: Dr. Kalyan Annamalai, Mech.Engg, Texas A&M, College Station,
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Other Investigators: Dr. John Sweeten, Professor of Agricultural Engg. and Resident Director
of Agricultural Extension Service,
Dr. Sayeed Mukhtar, Asst. Prof., Agricultural Engineering.

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Report Period: 6/15/00-9/14/2000

OBJECTIVE:

A. Proposed activities for quarter 1 (6/15/00-9/14/00)

1. Finalize the allocation of funds within TAMU to co-principal investigators and the final task lists
2. Acquire 3 D computer code for coal combustion and modify for cofiring Coal:Feedlot biomass and Coal:Litter biomass fuels
3. Develop a simple one dimensional model for fixed bed gasifier cofired with coal:biomass fuels
4. Prepare the boiler burner for reburn tests with feedlot biomass fuels

B. Achieved During Quarter 5 (6/15/00-9/14/00)

1. Funds are being allocated to co-principal investigators; task list from Prof. Mukhtar has been received (Appendix A)
2. Order has been placed to acquire Pulverized Coal gasification and Combustion 3 D (PCGC-3) computer code for coal combustion and modify for cofiring Coal: Feedlot biomass and Coal: Litter biomass fuels. Reason for selecting this code is the availability of source code for modification to include biomass fuels.
3. A simplified one-dimensional model has been developed; however convergence had not yet been achieved.
4. The length of the boiler burner has been increased to increase the residence time. A premixed propane burner has been installed to simulate coal combustion gases. First coal, as a reburn fuel will be used to generate base line data followed by methane, feedlot and litter biomass fuels.

5. Other Activities Performed during Quarter 5

Department of Education (99-02)–Renewal for 00-01 through Univ. of Illinois at Chicago,

Globalization and Employability Benchmarks for Overseas Educational Exchange,” an European Union and USA Consortia for Cooperation in Higher Education and Vocational Education and Training, Consortium Grant: USA: Univ. of Illinois at Chicago, Univ. of Ca-San Diego, Univ. of Minnesota, and Texas A&M; EU: Politecnico di Milano, Italy, Technische Universität Hamburg, Hamburg, Germany, Universidad Politecnica de Madrid, Spain, Technische Universität Wien, Austria, and Chalmers University of Technology, Sweden. It will bring in European expertise and students on biomass programs through faculty/student exchange: additional funding: 99-00 \$ 5,798

Amount for 00-01(app: \$ 11,000); exact amount:

unknown

Scholarly activities

Mohammad, S, Annamalai, K. and Wooldridge, M., “ A Review of Co-Firing of Coal: Bio-solid fuels co-firing, “ Progress in Energy and Comb. Science, in press

Sweeten, J M, Annamalai, K., McDonald, L. A. and Auvermann, B., ” Cattle Feedlot Manure Quality for Coal/Biomass Blend Combustion, “ Paper # 18-4, *17th US-Pittsburgh Coal Conference Proceedings*, Pittsburgh, Sep 11- 14, 2000

Annamalai, K., Thien, B., and Sweeten,”Co-Firing of Coal and Feedlot Biomass (FB) in a Laboratory Scale Boiler Burner, “paper # 18-05, *17th US-Pittsburgh Coal Conference Proceedings*, Pittsburgh, Sep 11- 14, 2000.

Annamalai, K. Sweeten, J., Freeman, M., Mathur, M., W.O’Dowd, and G.Walbert, “ Pilot plant testing of Coal: Feedlot Biomass (Cattle Manure) cofiring in a 500,000 BTU/hr DOE-NETL boiler Burner,” Paper # 18-06, *17th US-Pittsburgh Coal Conference Proceedings*, Pittsburgh, Sep 11- 14, 2000.

C. Proposed activities for quarter 2 (9/15/2000-12/14/00)

1. Conduct TGA and fuel characterization studies
2. Modify the 3 D combustion modeling for feedlot and litter biomass fuels
3. Perform re-burn experiments.
4. Fabricate fixed bed gasifier/combustor

Appendix A:

Detailed Tasks of Prof. Mukhtar – Co-Principal Investigator

1. Proximate and Ultimate Analyses

- A. Feed Rations
- B. Broiler Manure
- C. Poultry Litter (manure +bedding material)
- D. Bedding materials
- E. Caked Litter and Composted Litter
- F. Heating Value

2. Composting Practices

- A. Current composting Practices
- B. What is the time frame from start to finish?
- C. What microorganisms are found in the composted litter?

3. Other Information

- A. Sources of Phosphorus and Chlorine in Litter
- B. Flow Chart for Entire Poultry Operation
- C. Location of Power Plants in Texas, and Proximity to Broiler Operations
- D. Energy Consumption for Broiler Houses