Pulsed Atmospheric Fluidized Bed Combustion

Quarterly Report
July 1 - September 30, 1995

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Executive Summary

The report of activities for the third quarter of 1995 is summarized below:

Design Activities

Process. No changes in the process design encountered during this period.

Mechanical. Professional Engineer (P.E) stamping for the ThermoChem's steam/water pressure piping drawings were completed by Duke/Fluor Daniel. Design and drawings for the coal conveying eductors were completed. Ash system rerouted to minimize the pressure drop.

Civil and Structural. No changes in the civil design encountered except adding a concrete footing for the Pulse combustor blower silencer. In the structural design more access ladders/platforms were added for ease of maintenance.

Electrical and Instrumentation. Design of the programmable logic controllers (PLC) based Distributed Control System (DCS) were completed. The burner management control panel drawings and the PLC field wiring diagrams were completed.

Fabrication Activities

Fabrication of the air distributor bubble caps (modified design) are in the final stages of completion. The coarse coal bucket elevator buckets and chains were refurbished and reinstalled. The PLC instrument panel has been assembled and shipped to the site.

Site Construction Activities

All major equipment installation were completed long ago. The steam/water circulation piping work was just completed and the construction of underground piping is progressing as well. Electric power cabling to the drives were connected and the motor control center panel charged.

Planned Activities for Next Quarter

Installation of steam/water underground piping; installation of coal, limestone, ash, natural gas and cooling water piping; electrical cabling for lighting and installation of light fixtures; control & instrument wiring and fittings; installation of filter bags inside bag house; insulation and painting.

Schedule

The project is currently on schedule and there is no change in the schedule submitted during last quarter.

SECTION 1.0 DESIGN

1.1 Process Design

The process configuration remained unchanged during this quarter.

1.2 Mechanical Design

1.2.1 Fluid Bed Combustor and Piping

As reported in the last quarter, the steam/water circulation pipes connecting the boiler drum to bed modules and pulse combustor jacket were reviewed and analyzed for stresses arising from thermal expansion. The above piping drawings were reviewed and stamped by Duke/Fluor Daniel to comply with South Carolina state requirements. The stress analysis for the underground steam/water piping connecting the PAFBC plant to Clemson was completed and the working drawings were prepared by the piping vendor (Figure 1).

1.2.2 Pulse Combustor Components

No changes were made in the pulse combustor components design during this period.

1.2.3 Feed System

The design and drawings of coal conveying eductors were completed. A 4" size eductor was designed to convey coarse coal/limestone in to Fluid bed and installed at the pickup hopper opening (Figure 2). Alternatively 2" size eductor was selected to convey fine coal in to Pulse combustion chamber and installed at the fine coal feeder outlet (Figure 3). Trial test run of coal crushing mill revealed a possible coal flow problem from coal mill discharge chute in to classifier. A cantilever type overhung screw feeder was designed to eliminate this problem and will be installed below the coal mill.

1.2.4 Ash System

The vacuum ash conveying system was reviewed and field verified for trouble free operation. The pipings were rerouted by eliminating unnecessary 90 bends and pipe runs. The revised arrangement will reduce the pressure drop and minimize erosion.

1.3 Civil and Structural Design

A 3 x 3' concrete footing was cast to install the silencer for Pulse combustor roots blower. Access ladders/platforms/handrails were added to bag house, feeders and silos for ease of maintenance.

1.4 Electrical Design

The electrical design remain unchanged during this quarter.

1.5 Controls and Instrumentation Design

As discussed during last quarter, the design of Programmable Logic Controllers (PLC) based Distributed Control System (DCS) was completed. The Allen-Bradley make PLC instrument panel was designed and the modules selected (number of input and output cards) based on the process information from Piping and Instrumentation diagrams (P&ID). The design and drawings for the burner management control panel was completed (Figure 4) and procurement initiated. Also the field wiring diagrams (point to point) connecting PLC panel to the field instrument fittings were completed (Figure 5).

Figure 5 PLC Field Wiring Diagram

Section 2.0 FABRICATION ACTIVITIES

2.1 Major Equipment

As reported in the previous quarters, fabrication of all major equipments, gas ductings and reconditioning of all the used equipments were completed.

The following equipment fabrication was completed and installed during last quarter:

- PLC instrument panel
- Additional platforms, gratings and hand rails for increased access and safety.
- Bucket Elevator buckets and chains refurbishing

The machining and drilling of the air distributor bubble caps were completed and the welding of stainless steel caps with nipple is currently under progress.

Section 3.0 SITE CONSTRUCTION ACTIVITIES

Installation of all the heavy equipments was completed as reported during last two quarters. Some other activity completed include Refractory lining of combustors and hot ducts, the installation of pulse combustor steam water jacket and its components, construction of control room building and installation of perimeter ground loop.

The following construction activities were completed during this quarter.

- Bed tubes installation inside Fluid bed
- F.D. fan inlet flow measuring duct
- Fine coal receiving bag filter
- Installation of silencers for roots blowers
- Electric power cabling connections from M.C.C to drives
- Light distributor panel and transformer installation inside control panel
- Steam/water recirculation piping from boiler to combustors
- Fine coal receiving vent filter
- Partial painting (ash silo and boiler)

A photograph view of Clemson PAFBC construction site (to date) is found in Figure 6.

Figure 6 View of Clemson PAFBC Construction Site

Section 4.0 PLANNED ACTIVITIES FOR NEXT QUARTER

4.1 Design

The following design activities have been planned for the quarter which will end on December 31, 1995:

- Revising and restamping the electrical drawings (as-built) by Duke/Fluor Daniel
- Preparing a Maintenance Manual which include all the design/installation information of PAFBC parts/equipments
- Preparing an operation manual which include a detailed plant startup and shutdown instructions

4.2 Fabrication

The following fabrication activities are planned for the quarter which will end on December 31, 1995:

- Complete fabrication of coarse coal and fine coal conveying eductor
- Complete fabrication of distributor bubble caps
- Complete fabrication of coal, limestone, ash, gas and cooling water piping
- Fabrication of burner management control panel

4.3 Site Construction

The following site constructions activities are planned for the quarter which will end on December 31, 1995:

- Installation of steam/water underground piping connecting PAFBC to Clemson header
- Installation of coal, limestone, ash, gas and cooling water piping
- Refurbishing of weigh belt feeder
- Electrical cabling for the plant lighting and light fixtures installation
- Installation of control and instrument fittings and wiring
- Installation of filter bags inside the bag house
- Site cleanup and painting
- Insulation and cladding for the hot surfaces
- Sub system shakedown testing

Section 5.0 SCHEDULE

7. The project schedule reflecting the above targets and milestones is provided in Figure

Figure 7 PAFBC Project Schedule

Section 6.0 THERMOCHEM SITE CORRESPONDENCE

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