DOE/PC/88750--T7

TRW

TRW Inc.

DOE/PC/88750--T7

DE92 003244

QUARTERLY PROGRESS REPORT

TRW UTILITY DEMONSTRATION UNIT

DOE C.A. #DE-FC22-88PC88750

FEBRUARY, MARCH, APRIL 1990

DISCLAIMER

TRW

INDEX

TRW ADVANCED SLAGGING COAL COMBUSTOR
UTILITY DEMONSTRATION
SIXTH QUARTERLY PROJECT PROGRESS REPORT
FEBRUARY 1990 THROUGH APRIL 1990

ABSTRACT

The TRW Advanced Entrained Coal Combustor Demonstration Project consists of retrofitting Orange and Rockland (O&R) Utility Corporation's Lovett Plant Unit No. 3 with four (4) slagging combustors which will allow the gas/oil unit to fire 2.5% sulfur coal. The slagging combustor process will provide NO_x and SO_x emissions that meet NSPS and New York State Environmental Standards.

The TRW-Utility Demonstration Unit (UDU) is responsible for the implementation of program policies and overall direction of the project. The program was established, project activities were monitored, and progress is reviewed constantly to ensure that the project is advancing toward its set goals in an orderly and cost-effective manner. The necessary inter-organization coordination and interface communication were provided by TRW-UDU management during this quarter. The team participants are TRW, SWEC and O&R Utilities. DOE and program sponsors are informed of the project status by TRW (UDU) through quarterly, monthly project reports, cost and schedule status reports (program deliverables).

TRW-CBU is responsible for the process and design development of clean coal technology CCT-1. The development and operation of the entrained coal combustor will enable the boiler to burn low and medium sulfur coal while meeting all the Federal / State emission requirements.

The TRW Cleveland Program objective, which is sponsored by the Ohio Coal Development Office (OCDO), is to demonstrate sulfur dioxide emissions control by pulverized limestone injection into the entrained coal combustor system.

Stone & Webster Engineering Corporation (SWEC) has the responsibility of performing the day-to-day project management function under the direction of TRW (UDU). SWEC has in place an organization to perform budgeting, cost and scheduling, performance measurement and general administration required to perform and support the engineering design, purchasing, construction, testing and analysis of the project.

O&R's primary responsibilities are environmental licensing and permitting activities, transmitting technical and operating data to team participants, providing the operating staff at their facility to implement the test program and participating in analyzing the test results. O&R has provided management and control to ensure that the plant preparation activities are technically adequate and are on schedule.

During this report period, the design activities for all systems progressed to permit the release of specifications and requests for proposals. Award of contracts for long-delivery items and major equipment are being placed to meet the revised program schedule.

An aggreement on contract terms between NYSERDA and TRW was reached. NYSERDA is reviewing the final document prior to approval.

ESEERCO'S revised payment schedule was submitted to TRW this Quarter. It has been modified to initiate payments based on major milestones throughout the Program.

EPRI and TRW have finalized the contract wording and the agreement will be signed next quarter.

TRW presented a technical paper on the project at the American Power Conference in Chicago on April 25, 1990. TRW, O&R and SWEC have been accepted to present a Paper on the "TRW Entrained Combustor Technology" at the Joint Power Generation Conference, at Boston, in October 1990.

Several of the Phase I Contract Deliverables were completed and issued during this period. These included:

- Project Master Schedule (update)
- Project Summary Network Phase I/IIA
- Project Detail Summary

The following meetings were held during this Quarter:

- Meeting with ESEERCO in Cleveland to witness coal test burn
- Advisory Committee Meeting with participants
- Project Review Meetings with O&R, SWEC & TRW
- Management Meeting with DOE, TRW & O&R
- Meetings with equipment vendors to clarify / evaluate scope of supply

Key Words

Entrained/Slagging Combustor

1. EXECUTIVE SUMMARY

During this quarter, the Phase I and IIA activities on TRW's Entrained Coal Combustor utility demonstration program continued.

TRW presented the phased combustor concept (2+2 concept), to the Advisory Committee Meeting held in April 1990. This plan is based on installing two combustors during the construction phase with operation testing to follow. Immediately afterwards, the remaining two combustors would be installed. Testing with four combustors would complete the program. The revised program cost and engineering / construction management schedule were also presented. The sponsors indicated that they had significant reservation relative to the Phased Combustor program. Therefore, TRW will proceed with the completion of Phase I engineering activities based on the original four combustor program.

TRW requested additional funding of Phase I and IIA due to a six month extension in the schedule completion of these phases. Approval was delayed and is now expected in the next quarter. This slowed down the project. The current approval level of DOE Funding will be expended by June 1, 1990. The program has felt an extensive Funding shortfall. Various action plans are being investigated to overcome the program shortfall.

The Cleveland Program continued to test Ohio Coals using Ohio Limestones. In addition, tests funded by ESEERCO were conducted on low-sulfur West Virginia coal. This is the coal for Orange and Rockland's Lovett Station. Load is limited to 60% presently due to the fuel feed system design.

The project has proceeded with"Detail Design Activities", now that NEPA approval has been received. PSD regulation for emissions application documents are under preparation.

CE has completed the boiler engineering feasibility study but the results have not been released pending O&R and TRW signing a liability letter. The study confirms that the modification is possible. When the final contract Agreements between O&R and TRW are signed, the CE study will be released.

2. INTRODUCTION

TRW-UDU scheduled a meeting with O&R, SWEC and TRW-CBU to brainstorm potential solutions to the funding shortfall problem. A list of major concerns with a plan of action to address these concerns was developed at this meeting. This information will be presented to the Management Advisory Committee, DOE and the sponsors.

At Cleveland, tests funded by ESEERCO continued on low-sulfur West Virginia coal. The combustor slag tap plugging problem was resolved by enlarging the size of the opening. Eight recycle injection ports were installed in the boiler furnace front wall. Checkout of the flyash recycle and in-duct humidification equipment continued. The vibrascrew gravimetric coal feeder was installed in the fuel feed system. Several other smaller modifications have been made to eliminate the surge in coal flow and co-operational spikes caused by the feed problems. Load is limited to 25mm BTU/HR (60% load) due to the capacity of the rotary valve downstream of the coal feeder.

The project has proceeded with"detail design activities" now the NEPA approval has been received. Procurement orders for long delivery equipment are being placed in order to meet the construction and start-up schedule of the program. Vendors are only authorized to complete the design and engineering work to produce the final approved contract drawings to support the construction and program completion schedule.

Based on EPA's PSD regulation and modeling guideline, the existing Unit #4 stack height does not comply. A study of four options will be made to determine the most economical engineering solution.

Subcontract negotiations continued with both O&R and SWEC to finalize these two Agreements. The insurance issue has been addressed and the contract language is accepted by all three parties. Limitation of liability for third party claims and indemnification still need to be negotiated satisfactorily before the O&R Agreement is completed. The SWEC Agreement will be concluded immediately after the O&R contract is signed.

3. PROJECT DESCRIPTION

The activities of the proposed demonstration program will be accomplished in a three-phase effort:

Phase I involves the engineering and design of the entrained combustor system, overall entrained combustor systems engineering and balance of plant design for Lovett Station and the limestone injection and recycle process work at Cleveland. Phase II includes all work necessary to modify the Lovett Station Unit #3 to return it to commercial operation firing coal and to prepare the unit for Phase III testing. In Phase III, the operation of the combustor will be demonstrated.

The following is a brief description of the required tasks and the work to be performed during the life of the contract.

COMBUSTORS

- Preparation of a preliminary specification.
- Development of fabrication and procurement specifications.
- Procurement, contract award, development of fabrication schedule and quality assurance plan.
- Overview of vendor fabrication.
- Field support.

BAGHOUSE AND DRAFT SYSTEM

This system includes the following:

- Addition of two (2) new induced draft fans.
- Addition of a baghouse filter to remove particulates from the boiler flue gases.
- Engineering and design of the ductwork for the flue gas system to connect system components.
- Addition of the two (2) forced draft HP booster fans and two (2) LP booster fans to provide combustion air required for combustor operation.
- Engineering and design of ductwork systems to connect the forced draft booster fans to the combustors.
- Design and implementation of boiler and equipment control logic.
- Relocation and modification of ductwork in order to maintain oil/gas firing during construction and demonstration phases of the project.

BOILER MODIFICATIONS

Included are the following major activities:

- Arrangement of Combustors.
- Installation and integration of TRW Coal Combustors.
- Status and arrangement of control systems.
- Heat release, gas flow and circulation evaluation.
- Results of sensitivity study evaluated.
- Identify boiler modification requirements, issue a specification and select a boiler vendor to design, fabricate and install modifications.
- Maintain oil and gas firing.

FLY ASH HANDLING SYSTEMS

This system consists of the following:

- Pneumatic type fly ash transport system for baghouse ash removal and handling.
- System controls.

SLAG ASH HANDLING SYSTEM

This system consists of the following:

- Addition of slag tanks, clinker grinders, hydroejectors and pumps for slag removal and continuous quench.
- Integration of the slag ash handling system with the existing Unit 4 & 5 ash sluice system.

- System controls integration.

COAL TRANSFER SYSTEM

This system includes the following:

- Refurbishing of existing coal handling system including coal bunkers, tripper conveyor and addition of accessories (such as dust control system, controls and alarms).
- Refurbishing of existing coal pulverizers and addition of the accessories (such as cyclone separators, dust collectors, coal feeders, fans, controls and alarms).
- Addition of piping and chutes to deliver coal from existing pulverizer outlets to cyclones and dust collection system.
- Procurement, installation and integration of the coal transfer system.
- System controls integration.
- Field support.

COAL FEED SYSTEM

- Preparation of a preliminary specification.
- Integration of TRW/CBU equipment and SWEC general arrangements.
- Review of SWEC P&ID's and interfaces.
- Development of fabrication and procurement specifications.
- Preparation of vendor drawings.
- Procurement, contract award and development of a fabrication schedule and full-scale test plan.
- Overview of vendor fabrication and delivery.
- Installation and start-up on-site liaison.
- Field support.

LIMESTONE FEED SYSTEM

- Conceptualization studies of alternate limestone feed system
- Adaptation and scale-up of design
- Development of design specifications
- Preparation of vendor drawings
- Procurement of a limestone injection system
- Review of SWEC general arrangements and P&ID's

- Review of detailed vendor-supplied design data
- Overview of vendor fabrication.
- Installation and start-up/on-site liaison
- Field support

TURBINE GENERATOR SYSTEMS

The turbine generator manufacturer, General Electric (GE), will evaluate the capability of the turbine generator for the new cycle conditions defined by the project and recommend modifications, if any, to the turbine generator. Project will review GE recommendations and determine necessary modifications.

FEEDWATER SYSTEM

System tasks included are:

- Determine which existing feedwater heaters are to be bypassed.
- Modification of feedwater piping system.
- System Controls Integration.

COMBUSTION COOLING SYSTEM

This system includes the following:

- Refurbish existing Boiler Feed Pumps (BFP) to original design conditions. The BFP circulates boiler feedwater through the combustor shells for combustor cooling.
- Addition of circulating water piping to and from the combustors.
- System Controls Integration.

COMPRESSED AIR

This system includes the following:

- The addition of compressors/blowers and dryers for the dense phase coal feed system and limestone injection.
- Addition of instrument air system to suit the Combustor retrofit work.
- Addition of piping systems.
- System Controls Integration.

MISCELLANEOUS SYSTEMS

Provide engineering and design required for the development of miscellaneous fluid systems. These include: Ignition Gas, Inerting Gas, Makeup Water, Service Water and Miscellaneous Vents and Drains.

HEATING AND VENTILATION

Revise plant H&V facilities to assure sufficient ventilation in light of the coal handling and heat generation equipment to be added. Required additions and modifications to the existing systems will be implemented.

MISCELLANEOUS BUILDING FACILITIES SYSTEMS

Modify miscellaneous facilities systems. Required modifications include design development arising from equipment procurement, and as-built conditions of the plant, and would include drainage systems, fire protection, domestic water and other support type systems.

ENVIRONMENTAL

Based on an evaluation of applicable environmental laws and regulations SWEC will perform all engineering tasks required to support New York air, water pollution and solid waste permit applications, DOE NEPA information requests and engineering tasks to support the PSD permit application. This task will include evaluation of effluent limits, evaluation of expected test emissions and preparation of technical documents required for air, water pollution and solid waste permit applications. The information developed by SWEC and TRW-CBU will be input to the air, water pollution and solid waste disposal permit applications to be filed by O&R.

Additionally, SWEC will support the Environmental Assessment Report and Environmental Monitoring Program outline and final deliverables in conjunction with O&R.

CONTROL SYSTEMS

- Finalization of P&ID's, LSK's and ESK's
- Development of fabrication and procurement specification
- Development of configuration, programming and documentation control
- Overview of fabrication, testing, configuration, and delivery of components.
- Field support

Engineer and design all plant control systems as specified below. The plant control philosophy will be based on the installation of a Distributed Control System (DCS). This system would combine modulating and sequential control with data acquisition and operator and computer interface.

The DCS will perform data acquisition functions, which will be displayed on CRTs and copied via color printers, for studying/computing combustor activity and related parameters on the boiler unit proper. The DCS will have the capability to control the following:

- Coal Preparation, Feed and Transfer System
- Limestone Handling, Limestone Feed System
- Unit Load Control
- Boiler Master and Firing Rate Control, Gas Ignitor, etc.
- Feedwater Control
- Deaerator Level Control
- Superheat/Reheat Temperature Control
- Excess Air Control
- Carrier Air
- Furnace Draft
- Deaerator Pressure
- Combustor Cooling
- Combustor Control

In support of this facility, a system to continuously monitor stack emission will be provided in accordance with the criteria set by the Environmental Protection Agency, local Department of EPA, and other cognizant regulatory bodies.

Data logging strategy will be coordinated with SWEC, TRW-CBU and O&R.

Design and specify equipment such as pressure, temperature, and flow transmitters, control valves and drive units.

Some of the control items on the existing Unit #3 boiler control system (subject to inspection and O&R approval) will be reused wherever possible.

Additionally, the Project will review and adapt "packaged" control systems for baghouse, fly ash and slag handling systems to existing site conditions and plant operational requirements. Common alarms will be brought to the DCS and displayed on operator/engineer stations.

ELECTRICAL SYSTEMS

The systems included are:

- New 2400V Switchgear.
- New 480V Unit Substation.
- New feeder cables interconnecting the new and existing switchgear.
- New 480V Motor Control Centers (MCC) required for new loads installed during modifications.

- New 15KVA uninterruptible power supply for the new combustor control system.

STRUCTURAL ITEMS

Engineer and design foundations for the following:

- Coal Pulverizing, Feed and Transfer System.
- Limestone Handling and Feed Equipment.
- Combustor/Slag Removal System
- Fans and Blowers
- Baghouse
- Fly and Bottom Ash Handling Equipment
- Electrical Equipment
- Pumps
- Bins/Silos

Engineer and design steel and supports for the following:

- Boiler Ductwork
- Ductwork/Building Wall Penetration
- Baghouse
- Combustors and associated Cooling System
- Limestone Handling & Feed Equipment
- Miscellaneous Supports, Platforms, Stairs, Etc.
- Relocation of Platform, Stairs and Steel
- Cyclones, Fabric Filter, and Exhaust Fans associated with the Coal Feed System
- Fly Ash Handling System
- Compressed Air System
- HVAC System
- Slag Handling System
- Coal Feed System
- ID Fans

- H.P. Booster Fans
- L.P. Booster Fans

CONSTRUCTION/INSTALLATION SPECIFICATIONS

Prepare construction/installation specifications for all equipment, piping and ductwork installation and integration of electrical systems, structural and civil modifications and procurement of materials and miscellaneous equipment required to complete the plant conversion. Specifications to be prepared are as follows:

- Mechanical Installation
- Civil/Concrete Work
- Structural Steel Supply
- Structural/Miscellaneous Steel Installation
- Electrical Installation
- Instrumentation/Control Systems Installation
- Insulation Installation
- Piping
- Valves
- Fire Protection
- HVAC

TEST PLAN

A Test Plan will be implemented to demonstrate that a unit originally designed to burn pulverized coal, but currently burning oil or gas can be converted to burn coal in an entrained combustor efficiently while meeting all environmental requirements.

FIELD CONSTRUCTION SUPERVISION

Under TRW-UDU program management, SWEC will provide Field Construction Supervision for the project. These activities will include the following:

- Provide management of site contractors.
- Monitor contractor's operations relative to safety, compliance to the Engineer's specifications, and the Project Schedule.
- Coordinate site contractor operations with the Owner's plant requirements.
- Monitor and status construction schedule.

- Monitor site material receipts.
- Review contractor billings.
- Manage change control.

ADVISORY OPERATIONS/START-UP SERVICES

An operating and maintenance (O&M) manual will be assembled by SWEC identifying systems and vendor-supplied O&M procedures for boiler and piping systems, equipment and components. The O&M Manual will include updated P&IDs and a spare parts list.

START-UP/SHAKEDOWN/CHECKOUT ASSISTANCE

SWEC will prepare start-up and operating procedures and will be supported in this work by O&R and TRW-CBU. O&R will provide the staff at their facility to operate the retrofitted unit.

PROCUREMENT

SWEC is responsible for purchasing all equipment for the BOP with approval of the TRW-UDU Program Manager. Procurement activities include the following:

- Bid Documents for Major Equipment (Specifications and invitations issued by Stone & Webster using their Commercial Terms and Conditions)
- Bid Documents for General Construction (Specifications and Drawings; Commercial and Invitations).
- Evaluation of Bids (Technical and Commercial) and preparation of purchase specification for selected Vendors.
- Purchase Orders/Contracts
- Change Orders, technical and commercial evaluation.
- Invoice Review, Scheduling and Expediting of Shipments.

4. PROJECT STATUS

Detailed engineering and design work is continuing.

Purchase Orders have been issued for the following equipment/vendors:

- Fly Ash Handling System - United Conveyor Corp.
- Slag Removal System - United Conveyor Corp.
- Baghouse - Joy Industries
- Limestone Handling System Blowers - Susquehanna Valley Systems
- 2400V Switchgear - Siemens

- Unit Substation - Siemens
- 480V MCC - Siemens
- FD and ID Fans - TLT Babcock
- Boiler Loading Diagram - Foster Wheeler
- Coal Handling Refurbishment - Ridgway
- Soot Blowers - Diamond Power
- Soot Blower Air Compressors - Scales

Work continued on the preparation of the following technical specifications:

- Demolition, Alteration and Erection of Structural Steel (SS-01)
- Piping (SM-154)
- Mechanical Installation (SM-158)
- Demolition and Alteration of Concrete (SS-02)
- Valves (SM-155)
- Distributed Control System (SC-301)
- Flue Gas Dampers (SM-156)
- Insulation (SM-159)
- Ductwork (SM-128A)
- Instrumentation and Control Installation (SC-302)
- Air Compressors (Instrument and Service Air) (SM-127B)
- Electrical Installation (SE-215)

Work was started on the following specifications:

- HVAC System (SM-128)
- Miscellaneous Steel Embedment (SS-04)
- Soil and Rock Excavation (SS-05)
- Demolition and Alteration of Concrete (SS-02)
- Architectural Finishes (SS-06)

Coal Pulverizer, coal bunker, boiler bottom ash hopper and electrical equipment evaluations are on hold pending resolution of contract insurance issues.

The Turbine evaluation is still on hold pending completion of CE's preliminary engineering.

The Coal Transfer System continues to be on hold pending TRW(CBU) resolution of new coal feed system.

Review of vendor drawings continued for the following equipment:

- Baghouse and Multiclone - Joy Industries
- Slag Removal - United Conveyor Corp.
- Fly Ash Handling - United Conveyor Corp.
- Blowers for Limestone Handling - Susquehanna Valley Systems
- 2400V Switchgear - Siemens
- 480V MCC - Siemans
- Boiler Loading Diagram (Unit No. 4) - Foster Wheeler
- F.D. Booster and I.D. Fans - TLT Babcock

Work continued on the following drawings and documents:

- Functional and Logic Diagrams
- Elementary Diagrams
- Instrument List
- DCS I/O List
- Equipment List
- Slag Removal Piping
- Fly Ash Piping
- Slag Tank Design
- Electrical Feeder Bus Duct
- Cable Block Wiring Diagram
- Cable Schedules
- Tray and Conduit Layout
- Electrical Underground Layout

The following activities were worked on during the period.

- Stress analysis of hot air ducts.

- Stress analysis of flue gas ducts.
- Hot air and flue gas duct drawings are being updated to indicate and locate expansion joints and duct supports.
- Received bids for the Instrument and Service Air Compressors (Specification SM-127B)
- Bidder's Lists are being developed for the Construction Specifications.
- One line diagrams are being updated.
- Steel reinforcement of the Unit 4 boiler structure are being checked.
- Design of silencer support system is on hold pending resolution of method to increase stack height approximately 30 ft.
- Resolve slag chute/slag tank interface problems. Coordinate TRW (CBU), United Conveyor Corp. (UCC) and SWEC design.
- Issue structural steel drawings to support the Structural Steel Supply and Demolition Alteration, and Erection of Structural Steel Specifications.
- Completed work on Best Available Control Technology (BACT) for the Prevention of Significant Deterioration (PSD) Permit Application.
- Issued conference notes for the April 5, 1990 Advisory Committee Meeting.
- Reviewed Taunton Engineering proposal for the Limestone Handling System and transmitted comments to TRW (CBU).
- A meeting was held in SWEC's office in New York to review Combustion Engineering's design and status of the Boiler Feasibility and Preliminary Engineering Study and the proposal for Boiler Modifications. CE stated that based on their study, it is feasible to modify the Lovett No. 3 boiler to operate satisfactory burning coal using the TRW entrained combustors.
- Visited the Entrained Coal Combustor Test Facility in Cleveland, Ohio to witness combustor operation utilizing the 0.7% sulphur coal currently being burned at the Lovett Station in Units 4 and 5.

As a cost saving measure, only one soot blower air compressor will be refurbished. A change order will be issued for this change in scope.

SWEC continued to support TRW-CBU in their conceptual design of the Coal Feed and Limestone Handling Systems. In addition to attending meetings with TRW-CBU vendors, SWEC prepared sketches and drawings of the revised Coal Feed System and preliminary coal pipe routine.

COMBUSTORS

Based on the results of competitive bidding, the Munroe Corporation of Pittsburgh was selected as the vendor for four (4) Model 65 combustors. The vendor selection was reviewed and approved by the TRW-UDU Program Office and the O&R Project Office.

Dies and tube bends were provided to Munroe to assure the fabricability of 180 degree return bends to the specified tolerances.

The quality of bend provided by Munroe with respect to internal and external surface finish and out-of-roundness was excellent, however, tube thinning had exceeded the specified requirement and there was a greater than anticipated decrease in internal diameter at the bend. A study will be carried out to determine the effect of this on stress and water-side pressure drop.

P&ID's for the ignitor and scanner systems and a P&ID for the miscellaneous air system were completed, and the relevant instrumentation was incorporated by SWEC-Denver. The SWEC Basis of Design document was revised to incorporate primarily the final coal and limestone feed systems

A Request for Quotation for ignitors and scanners was issued to:

- Coen Company, Inc.
- North American Manufacturing Company
- Stemco (ref. for Rytrol Corp)
- Peabody Engineering
- Sur-Lite Corporation

North American Manufacturing Co. elected to "no-bid" the request.

The technical evaluation was completed. Although two (2) offerings were found technically acceptable, Coen's offering of the equipment and services was judged superior, based on Coen being the manufacturer and assembler of the majority of their offering. Additionally, Coen's history of successfully supplying systems to the power industry provides a greater degree of confidence in meeting the exact design requirement.

The vendor selection was reviewed and approved by the TRW/UDU Program Office and the O&R Project Office.

LIMESTONE FEED SYSTEM

Selection of Taunton Engineering Corporation to supply the limestone feed system was reviewed and approved by the TRW/UDU Program Office and the O&R Project Office.

Final design questions were resolved. Coordination meetings were held at Taunton on February 14 by TRW/SWEC-NY/SWEC-Denver and Taunton Engineering to resolve remaining design, arrangement and scope-of-supply questions. The following changes were made:

- Based on recent results at Cleveland, the limestone injection points were split between the periscope and the secondary burner annulus.
- O&R desired to have sufficient storage capacity for limestone on site (Lovett Station) to permit daytime delivery by truck only and sufficient to sustain operation at full load over a three-day weekend. In accordance with the above, a second truck discharge line to the storage silo was added to provide unloading of limestone transport trailers during daytime hours only. The dust collector capacity was increased correspondingly.
- To provide a three-day limestone storage capacity for testing 2.5% sulfur coal at full load, a temporary mobile trailer with a 4,200 ft^3 capacity will be leased during Phase III. The design of the limestone feed system was completed and the system supplier, Taunton Equipment Corporation, is proceeding with the preparation of vendor drawings.

COAL FEED SYSTEM

The selection of Stock Equipment Corporation as the supplier of the coal feed system was reviewed and approved by the TRW-UDU Program Office and the O&R Project Office.

Coordination meetings were held with Stock Equipment Corporation, SWEC-NY and SWEC-Denver in Chagrin Falls, Ohio, and New York. Remaining design issues, such as the design of the splitter, purge piping and coal recycle piping were resolved. The dimensions of the surge tank are being addressed jointly by Stock, SWEC-NY and Fox Valves (supplier of eductors).

For operation of the coal feed system, it is necessary to control the volume of coal flow from the volumetric feeder, through the mill/cyclone/surge bin system, as well as the feed rate through the gravimetric weighbelt, a splitter, the eductor-to-combustor conveying pipes and the recycle/purge pipes. The system arrangement study showed that a surge bin capable of holding 3600 lbs. (approximately 15 minutes supply) can be accommodated. This is sufficient to permit coal flow under worst case operational conditions. Final piping layout remains to be accomplished and the design of the pulverizer circuits is to be completed.

Calculation of the air volume and pressure required to transport coal from the Venturi eductors to the main combustor, with the pipe length runs and bends laid out by SWEC, also showed that it is necessary to use compressors. All other design questions had been resolved previously and the design effort was completed. The equipment vendor, Stock Equipment Corp., is proceeding with the preparation of drawings.

DISTRIBUTED CONTROL SYSTEM

Completion of the design of the major combustor component system permitted resumption of the DCS specification design work. This work included:

- Completion and issue of revised P&ID's for review.
- Completion of combustor DCS specification work (final comments, logic and I/O list for incorporation into final, complete review document).
- Completion of combustor logic and functional descriptions and issue for review.
- Start of instrument list.
- Issue of instrument data sheets for comments.
- Continue revisions to Basis of Design document.

OCDO/ESEERCO ACTIVITIES

The following summarizes the activities during this reporting period:

- An on-site visit of the Cleveland test facility by NYPA, O&R staff and P. Winegar representing the ESEERCO project took place on February 7. During this visit the combustor was firing low sulfur (0.7%) W. Virginia coal. Questions regarding the completion of tests and test results were addressed in a meeting at NYPA on March 15.

- Installation of the Vibrascrew gravimetric feeder was initiated in March and this activity also involved modifications to the existing coal feed system at the inlet and outlet of the gravimetric feeder, electrical work, and modifications to the computer control system.

- Initial check-out of the modified coal feed system indicated that the rotary valve was a limiting component in the system. A rotary valve was installed with deeper pockets and was successful in allowing a greater volume of coal to pass at a lower valve speed.

- Coal appeared to be fed to the gravimetric feeder at varying density, causing unpredictable flow rate surges, which resulted in CO spikes in the stack gases. For safety reasons, the control logic is programmed to shut down the facility when CO exceeds 750ppm. These flow rate surges were caused by aerated coal (bulk density less than or equal to 25 lb/ft^3) which has a tendency to flow at times almost like a liquid. Several modifications were made to alleviate this problem:

  - The coal classifier downstream of the pulverizer which controls the coal fineness was changed to provide a coarser coal grind to the combustor. This increased the bulk density and decreased the aeration of the coal.

  - Various vents and valves were installed and adjusted to alleviate a system pressure imbalance which led to the coal flow surges.

  - The surge bin upstream of the gravimetric feeder was modified to reduce coal aeration and provide uniform-density coal feed to the gravimetric feeder.

  - A new rotary valve was installed with tighter clearances to minimize upstream air flow.

  These improvements allowed continuous, safe operation of the system at loads not exceeding approximately 25 MMBtu/hr. At higher loads coal flow rate surges were still occurring, requiring shutdowns. Therefore, all tests were conducted at loads less than 25 MMBtu/hr.

  The recycle and in-duct humidification systems were checked out. Preliminary results from an in-duct humidification test on medium-sulfur coal showed that the in-duct humidification decreased sulfur emissions compared to limestone injection only. However, a build-up of hardened flyash and sorbent material was found in the duct just downstream of the humidification nozzle.

  A pallet of 33 bags of the Lime Crest limestone identified by O&R was ordered for handling tests at Cleveland.

Other Activities

Agreement on contract terms between NYSERDA and TRW was reached and contract copies were processed by TRW and submitted to NYSERDA for execution.

An amended proposal to OCDO was prepared. Under the terms approved by OCDO's Technical Advisory Committee the agreement provides sufficient Ohio coal (2.5% sulfur) and Ohio limestone for five (5) weeks of testing at Lovett during Phase III of the DOE program.

An RFP for O&R baseline testing was issued. Proposals are due on May 16.

The EPRI Executive Committee endorsed the TRW contract. It is to be signed by EPRI and is expected by mid-May. All co-sponsor contracts will then be complete.

A revision of the ESEERCO/TRW payment schedule has been executed to allow payment for the Phase II and III periods tied to a milestone schedule.

The overall status of Orange and Rockland work activities is as follows:

- Reviewed and commented on vendor progress, drawings, bill of materials and related correspondence from the following suppliers:

- Joy Technologies, Inc. - Electrical diagrams, general arrangement plan, support structure,loading diagram and inlet poppet valves. Also reviewed the Dust Collector Assembly and Details, Insulation, Fabrication and Painting Specifications.

- Joy Technologies, Inc. - Arrangement and thermal expansion, structural supports, access facilities, inlet and outlet manifolds, logic diagrams, materials, and control panels for the Pulseflo baghouse and multiclone precollector.

- United conveyor Corporation - slag handling system.

- United conveyor - Ash handling system.

- Siemens Energy & Automation Inc. - Distribution Switchgear revisions - 2400V.

- Siemens Energy & Automation Inc. - General Arrangements, Floor Plans, Wiring Diagrams, Three Line Schematics, Panel Arrangements and Sections.

- Ridgway Industries - General Arrangement for Coal Handling System - Dust collector Supports and Details, Bunker Modifications, Belt Feeder and Slide Gate and description of Control and Operation for Unit 3, 4, 5.

- TLT-Babcock, Inc. - F. D. Booster and I.D. Fans Performance Data, General Arrangement and foundation Plans, Sections and Views, Torque Curves, Silencer drawings.

- TRW-Combustion business Unit - Pulverized Coal Feed System - P & ID and Flow Diagrams.

- On February 1, 1990 a preliminary inspection of Lovett Unit No. 3 bottom ash hopper was performed by O&R and found to be in excellent condition. Both refractory and seal trough indicated little deterioration, However, some refurbishment of the seal plate is required to eliminate air leakage. Further evaluation is required.

- On February 7, 1990 O&R visited the Slagging coal Combustor Test Facility in Cleveland, Ohio to witness combustor operation utilizing the 0.7% sulphur coal currently burned at the Lovett Station in Unit No. 4 and No. 5. Positive results were observed during the test burn.

- Reviewed and commented on the specifications for Overflow and Sluice Pumps and Thermal Insulation of Piping, Equipment and Ductwork. Further, reviewed and commented on Functional Diagrams for Feedwater, Level, Flow and Temperature Control.

- TRW's Evaluation of Taunton Engineering and Stock Equipment Proposal was reviewed and comments provided on Pneumatic Unloading, Storage Bunker, Pneumatic Conveying, Limestone Feed Bin, Dust Collectors for Storage and Feed Bins and Supports and Hangers.

- Researched engineering records and forwarded information as required to TRW, SWEC and Vendors. Ridgway was provided electrical, structural and mechanical drawings and design data and Unit 3, 4, and 5 Coal Feed System. SWEC was provided additional information on Unit No. 5 civil, structural and architectural design.

- Reviewed and commented on Combustor Cooling Water and Feedwater System, Fly Ash System P & ID, Combustion Air and Flue Gas System P & ID's, Slag Handling System Hydroejector Discharge Piping Plan, and the Slag Tank Study for Combustors Nos. 1, 2, 3 and 4.

- Prepared and forwarded the Monthly Summary Reports including Monthly Activities Summary and Cost Performance.

- Attended the third annual meeting of the Advisory Committee on April 5, 1990 along with other

sponsors of the project. Program technical issues reviewed included the Tiger Team Report, proposed (two-plus-two) phased combustor plan, schedule and costs.

- Attended several meetings during this report period with TRW and SWEC to review project issues and schedule.
- Reviewed and approved, with comments, the Procurement Specification for the Limestone Feed System.
- O&R approved award of Soot Blower Air Compressor Reconditioning to Scales Air Compressor Corporation and Coal Handling System Refurbishment to Ridgway Industries, Inc.
- Researched engineering records and forwarded information as required to TRW, SWEC and vendors on Electrical Power and Control Cable Specification, Coal Handling System Electrical, Mechanical and Structural drawings, Lovett #3 Feedwater Operating Conditions and Pipe Hanger Supports and Vents.

5. **Planned Activities**

Planned activities for the next reporting period includes the following:

- Continue preparation of general arrangement drawings to make 95% issue.
- Issue the following P&IDs (95%) issue:
  - Index & nomenclature sheets 1 & 2
  - Coal Preparation & Feed System
  - Limestone Preparation & Feed System
  - Combustion Air & Flue Gas System
  - Flyash System
  - Slag Handling System
  - Instrument & Service Air Compressor
- Continue work on the following specifications:
  - Mechanical Installation (SM-158)
  - Piping (SM-154)
  - Ductwork (SM-128A)
  - Electrical Installation (SE-215)
  - Continuous Emissions Monitoring (part of Instrumentation Specification) (SC-302)
  - Instrumentation and Control Installation (SC-302)
  - DCS (SM-301)
  - Valves (SM-155)

- Insulation (SM-159)
- HVAC System (SM-128)
- Flue Gas Dampers (SM-156)
- Demolition and Alteration of Concrete (SS-02)

COMBUSTORS

The effects of tube wall thinning and decreased tube internal diameter will be reviewed. Discussions will be held with Munroe towards a satisfactory resolution of this aspect of the design.

LIMESTONE FEED SYSTEM

A coordination meeting will be held with representatives of TRW/Taunton/SWEC-NY/SWEC-Denver to review design, interfaces and scope of supply. Vendor drawings will be completed.

COAL FEED SYSTEM

A coordination meeting will be held with representatives of TRW/Stock/SWEC-NY/SWEC-Denver to review design issues, interface and scope of supply. Vendor drawings will be completed.

DISTRIBUTED CONTROL SYSTEM (DCS)

Preparation of a specification for the DCS will be completed.

CLEVELAND ACTIVITIES

Additional upgrades to raise the maximum load handling above 25 MMBtu/hr are planned as given below:

- A new drag chain in the Vibrascrew gravimetric feeder with closer clearances between the moving vanes and the walls.
- Installation of an inner core at the entrance of the surge bin to distribute the coal.
- A pneumatic rapping device on the surge bin for deaerating the coal.
- Exploration of higher than recommended rotary valve speeds.
- Complete all OCDO tests, including limestone/flyash recycle.
- Complete all partial load ESEERCO tests, including limestone/flyash recycle firing the W. Virginia coal.
- Conduct remaining ESEERCO tests at full load (35 to 40 MMBtu/hr).

Q&R Planned Activities

Work to be performed during the next reporting period, May through July 1990, will include: raising funds for the project, vendor drawing review and any other activities which may arise in support of engineering and permitting.

Removal of the Unit No. 4 precipitatior.

TRW

QUARTERLY ENVIRONMENTAL MONITORING REPORT

(February 1990 - April 1990)

1. The EMPO does not call for environmental monitoring during the report period (February, 1990 - April, 1990). Therefore, no monitoring was performed or reported.

2. The EMPO does not call for environmental monitoring in May, June and July, 1990; thus, none is planned.

END

DATE
FILMED
1/15/92

I