Tidd PFBC Demonstration Project

Quarterly Report
April - June 1995

July 1995

Work Performed Under Contract No.: DE-FC21-87MC24132

For
U.S. Department of Energy
Office of Fossil Energy
Morgantown Energy Technology Center
Morgantown, West Virginia

By
Ohio Power Company
Columbus, Ohio

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TABLE OF CONTENTS

	PAGE
GLOSSARY OF ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT	ii
I. INTRODUCTION AND SUMMARY	1
II. DESIGN AND PERMITTING	1
A. Engineering and Design	1
B. Environmental	5
III. PROJECT SUPPORT	5
IV. MANPOWER REPORT	6
V. COST DATA	7

GLOSSARY OF ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT

AARP	Annunciator Alarm Response Procedures
AB	ASEA Babcock - A business partnership between a subsidiary of ABBC and the Babcock & Wilcox Company (USA)
AEP	American Electric Power Company, Inc.
AEPSC	American Electric Power Service Corporation, a subsidiary of AEP
AFC	Approved for Construction
AFL	Approved for Layout
ABBC	ABB Carbon - a subsidiary of ASEA-Brown Boveri (subcontractor)
AOP	Abnormal Operating Procedure
B&W	The Babcock & Wilcox Company (subcontractor)
BWCC	The Babcock & Wilcox Construction Company (subcontractor)
BOP	Balance of Plant
CBI	Chicago Bridge and Iron, Inc. (subcontractor)
CSWD	Cable Schematics Wiring Drawings
CTF	Component Test Facility
DOE	Department of Energy (United States)
DRC	Design Review Committee
E&SC	Electrical Equipment Service Corporation (subcontractor)
ECP	Engineering Control Procedure
EMP	Environmental Monitoring Plan
EOP	Emergency Operating Procedure
EPA	Environmental Protection Agency
ESP	Electrostatic Precipitator
FAT	Net 90 - Factory Acceptance Test

GLOSSARY OF ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT

GSU	Generator Step-up Transformer
GT	Gas Turbine
HPT	High Pressure Tubine
HVAC	Heating, Ventilating & Air Conditioning
I&C	Instrumentation & Control
IOI	Initial Operating Instructions
LPT	Low Pressure Turbine
MCR	Material Control Record
MCS	Management Command System
MCC	Motor Control Center
MED	Mechanical Engineering Division
NDE	Nondestructive Examination
NEMA	National Electric Manufacturers Association
NOP	Normal Operating Procedure
NOVAA	North Ohio Valley Air Authority
NPDES	National Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
OCDO	Ohio Coal Development Office - a part of Ohio Department of Development
OPCo	Ohio Power Company
PES	Plant Electrical Systems
PFBC	Pressurized Fluidized Bed Combustion
PMP	Project Management Plan
POPS	Plant Operations and Performance System

GLOSSARY OF ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT

ppb	Parts Per Billion
PTI	Permit to Install
PTO	Permit to Operate
PWHT	Post Weld Heat Treatment
RDR	Request for Drawing Revision
RFQ	Request for Quotation
SD-0	System Description (Rev. 0)
SD-1	System Description (Rev. 1)
SD-2	System Description (Rev. 2)
SD-2.5	System Description (Rev. 2.5)
SD-3.0	System Description (Final)
SPCC	Spill Prevention Control & Countermeasures

I. INTRODUCTION AND SUMMARY

This is the thirty-third Technical Progress Report submitted to the Department of Energy in connection with the Cooperative Agreement between the DOE and the Ohio Power Company for the Tidd PFBC Demonstration Plant. This report covers the period from April 1, 1995, to June 30, 1995.

Major activities during this period include:

- Post-shutdown equipment inspections were accomplished.
- Decommissioning activities were initiated.
- The final report on the first three years of operations was submitted to the DOE.
- Work is proceeding on the final report on Tidd.

Major activities planned for the next period include:

- Submittal of the final report on the fourth year of operation.
- Submit the decommissioning plan to the DOE.

II. DESIGN AND PERMITTING

A. Engineering and Design

Tidd Equipment Inspections

Combustor Vessel:

Six high temperature penetration nozzles were die-penetrant checked for signs of cracking. No indications were found.

Boiler:

In-Bed Tube Bundle:

Two evaporator platens and one secondary superheater platen were cut loose and lifted into the freeboard for examination. The platens removed were adjacent to one another and were centered around the fuel nozzle No. 3 location. Inspection of the platens revealed no major deficiencies. Their condition was similar to that noted during previous platen inspections with the most serious findings being localized erosion on the secondary superheater tubes, missing tube support clips and bent support truss members.

Removal of the above three platens provided space for access to inspect the boiler enclosure front and rear walls. Inspection of the membrane tubed waterwall revealed significant erosion of front and rear wall tubes at a bed height of

approximately 60 inches. Ultrasonic examination of the exposed rear wall tubes showed some tubes with up to 65% wall thickness loss. Since ready access to the bed side of the boiler enclosure side walls was not available, a short section of the side wall panel at 60" bed height was cut out from the outside of the boiler. The cut out section revealed wall loss of up to 40% had occurred. Energy Dispersive x-ray analysis of samples of both the thinned rear wall and side wall tube sections revealed that an erosion mechanism is strongly indicated, and no corrosion mechanism was found.

Boiler Freeboard Enclosure Insulation Liner:

A section of the segmented stainless steel plate freeboard enclosure insulation liner was removed along the north wall at the bottom of the liner. Inspection of the then exposed wall tubes revealed only minor surface corrosion. The most interesting finding was that the insulation material was missing from the very bottom area, and had been displaced by bed ash.

Sparge Ducts:

Visual examination of the sparge ducts revealed no previously unidentified damage. The most significant problem with the ducts was the distortion towards the side walls, which had been noted in mid-1994 after bed ash cooling and drain flow problems were experienced with very fine bed material.

Only minor amounts of bed material were found inside the sparge ducts.

Bottom Hoppers:

Visual inspection of the boiler bottom hopper cones revealed that they were in good condition.

Visual inspection of the ash cooling pipes below the sparge ducts revealed only minor ash plugging of the cooling air distribution holes. Visual inspection of the "chinese hat" coolers and hopper outlet coolers revealed no damage or ash pluggage.

Gas Cleaning Cyclones:

Ultrasonic wall thickness measurements were taken on one primary and one secondary cyclone. No wall thinning was noted. Windows were cut in one secondary cyclone and one primary cyclone to permit internal visual inspection. No signs of wall erosion were noted. The hex metal restrained refractory in the primary cyclone transition region was generally intact; however, as was noted in previous boroscope examinations, the refractory hexes had spalled back in a depth of approximately 1/4". The only thing unusual noted was a small crack at a weld on the inside of the cyclone near a support bracket attachment.

Hot Gas Collection Manifold:

Ultrasonic thickness readings were taken on sections of the hot gas collection manifold which connected the secondary cyclones to the crossover pipe. The

examination found no wall loss.

An inspection window was cut in the hot gas manifold elbow that fed into the crossover pipe. Internal inspection of the piping revealed a thin hard ash deposit on the pipe walls with a number of pieces of the deposits that had flaked off laying in the bottom of the pipe.

Material samples of the cyclones and hot gas manifold were sent to ABB Carbon for metallurgical examination.

Coal Paste Injection System:

Ultrasonic wall thickness measurements were taken on the coal pasted tank, and no measurable wall thinning was noted.

An elbow in one of the stainless steel fuel feed lines was cut out for internal visual examination, which revealed no pipe wall erosion had occurred.

Sorbent Injection System:

Inspection of the ceramic lined sorbent transport piping revealed no erosion or other damage to the ceramic lining material.

Boroscope examination of the sorbent lockhoppers revealed nothing unusual.

Cyclone Ash Removal System:

Primary Cyclone Ash Removal System:

One Tee bend, one internal ash cooler return chamber and one suction nozzle were removed and cut open for visual inspection. No erosion damage was found.

Inspection of the internals of the V102 transport line pressure reducer, which was located atop the cyclone ash silo, revealed no damage to the pressure reduction nozzle, but the nozzle outlet cone had the severe metal erosion. The eroded condition of the outlet cone was typical of that found in past inspections.

Boroscope inspection of various sections of the primary cyclone transport piping revealed no unusual conditions.

Secondary Cyclone Ash Removal System:

One long radius ash transport line bend and one suction nozzle were removed and cut open for inspection. Inspection of the elbow revealed a minor erosion induced groove on the ID surface. Inspection of the suction nozzle revealed an erosion induced hole just beyond the bend near the outlet of the suction nozzle. Visual inspection of another secondary cyclone suction nozzle did not reveal any holes.

Boroscope inspection of various sections of secondary ash transport piping revealed no unusual conditions.

Three secondary ash transport line pressure reduction orifices were removed for visual inspection. The inspection revealed no erosion damage, just dust build-up that tended to restrict operation of the valves.

Bed Ash Removal System:

Boroscope inspection of the L-valves, the lockhoppers, the vent lines and the atmospheric hopper revealed no unusual conditions.

Visual inspection of the bed plate on the short aero-belt conveyor revealed no noticeable material loss.

Bed Ash Reinjection System:

Visual inspection of the refractory lining inside of the reinjection vessels revealed only minor cracking and no significant spalling of the refractory.

Boroscope examination of one of the lift lines revealed no noticeable pipe wall loss.

One reinjection vessel vent line pressure reduction assembly was removed for visual examination. No erosion was noted in the orifice.

Gas Turbine/Compressor:

The gas turbine was in relatively good condition. Very minor erosion was observed on the turbine blades. However, significant erosion occurred at the LPT variable-pitch inlet guide vanes inner and outer rings.

Economizer:

A section of the internal insulation liner and insulation was removed to gain access to the inside surface of the economizer casing. Visual inspection revealed that no significant corrosion had occurred on the carbon steel casing material.

A final visual inspection of the degree of fouling of the economizer tubes revealed that the eight air sootblowers were adequate at keeping most of the finned tube surface fairly clean. The only area where the sootblowers were ineffective was at the bottom of the outlet bank. The tenacious fouling problem in that area is believed to be due to the upward sloping duct floor that is just beyond the economizer outlet.

B. Environmental

On June 26, 1995, construction initiated for the storage yard closure project. All coal and most of the dolomite was removed from the yard. All sediment in the settling pond was removed to the Cardinal ash pond. The top of the dike's south end was removed and silt fences/ straw bales were appropriately placed for sediment control. Stormwater swale construction was initiated. A July 12 inspection of standing water from storm runoff in the swale looked clean, with no noticeable sheen. Water around the pumphouse and with the transport lines were tested for pH and conductivity before discharging to Blockhouse Hollow Run. The pumphouse is in the process of being demolished. On a weekly basis and after every 5-inch, 24-hour storm event, the yard area and all sediment control measures are inspected for adequacy of the erosion control. Ohio EPA is kept informed of the project through copies of stormwater pollution prevention plan revisions.

III. PROJECT SUPPORT

A. Schedule

Work is proceeding in accordance with the decommissioning Schedule. To date all PFBC systems have been decommissioned. Additional activities completed as part of the major tasks include plugging and capping of water wells and development and distribution of the Equipment Inventory Catalogs. Work continues on the Decommissioning of the Support Facilities and activities associated with the Site Utilization Study.

B. Work in Progress

Current Activities Include:

- Renovation of the coal/ dolomite storage yard which is being performed under a contract with the United Construction Company, Inc. (UCCI). This contract also includes removal of the river pier.
- Submittal of recommendations by professional appraisers for disposal of the plant's assets.
- Finalization of accounting procedures for asset recovery.
- Review of the most economical manner to arrange for removal of equipment based on inquiries already received.

IV. MANPOWER REPORT

As of June 30, 1995, AEPSC actual work-hours for the Phase III accounted for 50.2% of the total budget of 135,098. Figure 1 represents the budget versus actual work-hours for this phase. For the reporting period, a total of 2,468.2 hours were charged to the project by AEPSC personnel.

FIGURE 1

V. COST DATA

1. Project Cost Status

The actual cost shared expenditures during the Second Quarter 1995 were \$593,460. As of June 30, 1995, the cumulative cost shared expenditures for Phase I, II, and III were \$180,282,104.

Figure 2 depicts the cumulative expenditure forecast for the project from Calendar Year (CY) 1986 to CY 1995. This cash flow curve represents the entire project, all three phases, including expenditures that are not cost shared with DOE.

FIGURE 2

Figure 3 is a projection of the quarterly expenditures for all participants. It also identifies the actual quarterly expenditures through the Second Quarter 1995.

FIGURE 3

	(in Millions)														
	Thru 91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95	2Q95
Forecast	1.657	0.573	0.437	0.488	0.587	0.391	0.348	0.600	1.060	0.059	0.000	0.000	0.000	0.000	0.000
Actual	1.657	0.573	0.437	0.488	0.587	0.391	0.348	0.451	0.752	0.516	0.000	0.000	0.000	0.000	0.000
TO-DATE															6.200

The following table summarizes the project expenditures as of June 30, 1995, of all participants:

	<u>DOE</u>	<u>OCDO</u>	<u>OPCO</u>	Total Expended as of <u>03/31/95</u>
<u>Phase I</u> Design & Permitting	\$ 8,469,449	\$ 5,000,000	\$ 8,069,734	\$ 21,539,183
<u>Phase II</u> Construction & Start-up	\$49,095,184	\$ 5,000,000	\$ 68,128,704	\$122,223,888
<u>Phase III</u> Operation, Data Collection, Reporting & Disposition	<u>\$ 6,200,000</u>	<u>\$ -</u>	<u>\$ 30,319,033</u>	<u>\$ 36,519,573</u>
Total:	\$63,764,633	\$10,000,000	\$106,517,471	\$180,282,104

Figure 4 is the Phase III DOE quarterly actual and projected expenditures.

FIGURE 4

	(in Millions)															
	Thru 91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95	2Q95	TO-DATE
Forecast	158.776	3.161	3.212	3.311	3.116	3.072	3.427	3.334	5.889	5.888	0.354	0.000	0.354	0.000	0.000	193.9
Actual	148.810	3.659	2.603	4.967	3.402	2.721	1.979	2.478	4.397	3.423	0.384	0.103	0.384	0.696	0.593	180.6

The following represents the financial status of the Tidd PFBC Demonstration Project - Phase III - 4th year, as of June 30, 1995.

Expenditures

Operations (Est. \$12,457,000) \$11,754,916*

Funding Source

-	USDOE Share of Cost Growth	(\$3,564,633)	\$3,564,633
-	USDOE Cost Sharing	(\$3,192,360)	2,918,091
-	OCDO Cash Contribution	(\$2,600,000)	2,340,000
-	OPCO Coal Contribution	(\$2,300,007)	2,125,655
-	ABBC Contribution	(\$ 400,000)	200,000
-	B&W Contribution	(\$ 400,000)	<u>406,537</u>

Total Funding To-Date \$11,754,916

Remaining Portion of Expenditures to be Recovered \$ (0)

2. Contracts Awarded During Second Quarter 1995

No major contractual commitments were issued during this reporting period.

*Expenditures do not include the March 1995 provisions for estimated future costs totaling \$887,000.

Figure 5 is the 4th Year Operations Quarterly Actual and Projected DOE Share of Expenditures.

FIGURE 5

	1Q94		2Q94		3Q94		4Q94		1Q95		2Q95
PROJECTED	813000.0	**	2439000.0	**	1641000.0	**	1117000.0	**	748000.0	**	0.0
ACTUAL	0.0	**	3469363.0	**	2679045.0	**	2577914.0	**	2538779.0	**	489815.0