DOE/MC/24132 -- 5002
(DE95009738)

TIDD PFBC Demonstration Project

Quarterly Report
January - March 1995

April 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
American Electric Power Service Corporation
Columbus, Ohio

DISCLAIMER

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Morgantown, West Virginia 26507-0880

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1 Riverside Plaza
Columbus, Ohio 43215

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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-O	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-second 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 January 1, 1995 to March 31, 1995.

Major activities during this period include:

- The unit operated for 718 hours on coal, bringing the grand total for coal fire through the end of the quarter to 11,442 hours.
- There were seven gas turbine starts, nine bed preheater starts, and nine operating periods on coal.
- During this quarter, total gross generation was 57,693 MWH, the peak unit output for one hour was 74 MWH, and the coal consumption was 27,866 tons.
- Twelve performance tests were conducted during this quarter, bringing the total number of tests for the plant to 95.
- On March 30, 1995, at 8:27 am, the Tidd PFBC Demonstration Plant was manually tripped for the last time.

Major activities planned for the next period include:

- Inspection of the equipment.
- Submittal of the final report on the first three years of operation.
- Continue development of the decommissioning plan for the Plant.

II. DESIGN AND PERMITTING

A. Engineering and Design

Sorbent Preparation System

During the week of March 20, the sorbent preparation system sizer was reconfigured to a double screening arrangement in order to produce a product with a minimal quantity of minus 60 mesh fines. Dramatic improvements in sorbent utilization had been achieved in the preceding year by using a sorbent with reduced fines. However, that material was crushed and sized at the quarry and delivered by bulk trucks. This product, termed "Designer" dolomite, was nominally 100% minus 12 mesh with approximately 25% less than 60 mesh in size. It was made with the typical Plum Run Greenfield dolomite that had become the standard sorbent used at Tidd. Reconfiguration of the sizer was performed in an attempt to produce this "Designer" sorbent on site.

In the spring of 1994, the original sizer was replaced with a larger double deck screen. This new sizer was typically run throughout 1994 with its upper and lower decks arranged in parallel using 12 mesh self-cleaning screens in both decks. In this configuration, the over-size product from both decks was recycled to the system crusher, and the material passing through the screens was the prepared product. The product produced was nominally 100% minus 12 mesh with approximately 45% minus 60 mesh.

In order to produce the "Designer" material on site, the sizer was reconfigured in a series arrangement with a 12 mesh screen in the top deck and a 50 mesh screen in the bottom. The oversize product from the 12 mesh deck was recycled to the crusher, whereas the material passing through the 50 mesh screen was collected by vacuum truck and discarded as waste. The material collected between the screens became the prepared product. This type of operation was termed "scalping/ dedusting" mode. Due to the rejection of the fines and the series arrangement of the screen decks, the capacity of system was reduced to approximately 4 - 5 tons/ hour. This low capacity limited the load at which the unit could be tested with this product. Test 94 was conducted on March 23, 1995 at a bed level of 90 inches using this site prepared "designer" Plum Run Greenfield dolomite.

Gas Turbine

The HGCU insulation failure in February caused some damage to the HPT blading. Four 2" x 2" metal washers used to retain insulation had broken free, allowing insulation and washers to go downstream to the gas turbine. Gas turbine vibration and HPT disk temperatures went high following the incident. Upon inspection, three of the washers were found lodged in the HPT inlet guide vanes. The fourth washer went through the gas turbine and was found in pieces in the outlet duct. A boroscope inspection of the HPT showed impact damage to the first stage rotating blades trailing edges. Three of those blades had material removed by the impact. The downstream stages had additional impacts of lesser severity than the first stage. After evaluation of the visible impact damage and comparison to acceptable industry standards, a decision was made to continue to operate the gas turbine without additional internal inspection. The gas turbine ran for the balance of the quarter with slightly higher vibration and was tripped from service for the final time on 3/ 31 without incident.

B. Environmental

All monthly and quarterly environmental monitoring reports were filed with the North Ohio Valley Air Authority and Ohio EPA, as required.

The DOE's Environmental Monitoring Plan (EMP) requires quarterly reports be filed within 60 days of the end of each quarter. In compliance with that requirement, the EMP quarterly report for the fourth quarter of 1994 was submitted to DOE.

Monitoring of solid, liquid, and gaseous waste streams as required by the operations phase of the EMP was performed throughout the quarter.

C. Performance Testing

Twelve performance tests were conducted during the final three months of the Tidd test program bringing the total number of tests completed during the project to 95. The various

coals tested during the quarter included MM Pittsburgh #8 coal, Minnehaha coal, and Consol Mahoning Valley Pittsburgh #8 coal; and the sorbents tested included Plum Run Greenfield dolomite, Mulzer dolomite, and National Lime Delaware limestone. Preliminary results for Tests 84 through 95 completed during the quarter are presented in the attachment "Test Results Summary". Graphical results for tests completed in the fourth year of operation are presented in Figures 1 through 5. A description of the most significant tests completed during the quarter is presented below.

On 2/ 22/ 95 Test 85 was completed using MM Pittsburgh #8 coal and Plum Run Greenfield #12-mesh "designer" dolomite at 132" bed level and 1582F bed temperature. The unit grossed an average of 72.1 MW over the four hour test period which was the highest output ever achieved during a performance test. Firing rate was 218 MW_t (approximately 5% over design) and feedwater flow was 468 kpph. A Ca/ S ratio (adjusted to 90% SR and 1580F bed temperature) of 1.44 was achieved. Although sorbent utilization was better than with site prepared sorbent, the Ca/ S ratio was not as good as expected for the "designer" sorbent being tested. One reason for the higher than expected Ca/ S ratio may have been due to the relatively short time in allowing the bed to mature prior to conducting the test. Normally the bed is allowed 36 hours to mature after switching sorbents, however, due to delivery constraints and a limited window of cold weather opportunity to test the unit at full load, the sorbent hit the bed only 18 hours prior to the beginning of the test period.

On 2/ 27/ 95 Test 87 was completed using MM Pittsburgh #8 coal and Mulzer #12-mesh site prepared dolomite at 116" bed level. A Ca/ S ratio (adjusted to 90% SR and 1580F bed temperature) of 1.75 was achieved. This is within the range of results obtained with Plum Run Greenfield #12-mesh site prepared dolomite at the same bed level indicating that the two dolomites have similar reactivities.

On 2/ 28 and 3/ 2/ 95 Tests 88 and 89 were completed using Minnehaha coal which has approximately half the sulfur content of MM Pittsburgh #8 coal. Mulzer dolomite was used for Test 88 and PRG dolomite for Test 89. The tests were conducted at 114" and 125" bed levels respectively. The Ca/ S ratios calculated for these tests are approximately 30% higher than with the MM Pittsburgh #8 coal. The decline in sorbent utilization may be due in part to the lower sulfur content of Minnehaha coal. It should also be mentioned that a much higher content of water was required to produce an acceptable coal water paste. The Minnehaha coal required 35% to 40% water content in the paste where typically 25% to 28% water content is used.

On 3/ 3/ 95 coal was switched to Consol Mahoning Valley Pittsburgh #8 coal for the remainder of the test program. Tests 90 through 93 were conducted in March 1995 using Plum Run Greenfield #12-mesh site prepared dolomite at various bed levels in order to develop a new baseline curve with the Consol coal. Although the sulfur content of the Consol coal is approximately 30% lower than that of the MM coal, the Ca/ S ratios obtained during the Consol coal tests are closely in line with those of the MM Pittsburgh #8 coal tests. Test 90 was conducted at full bed level (141 inches) and 1562F bed temperature; a Ca/ S ratio (adjusted to 90% SR and 1580F bed temperature) of 1.62 was achieved.

On 3/ 23/ 95 Test 94 was completed using Consol coal and Plum Run Greenfield dolomite while the sorbent preparation system was operating in the scalping/ dedusting mode. In this mode of operation the sorbent fines (less than 60-mesh) are separated from the process and discarded. The sorbent being tested is essentially 12x60 mesh. Due to the reduced capacity of the sorbent preparation system in this mode, the test was conducted at 90 inch bed level. A Ca/ S ratio (adjusted to 90% SR and 1580F bed temperature) of 1.54 was achieved during this test which is an improvement of approximately 20% better than the results obtained with the #12-mesh site prepared dolomite at the same bed level. These results, when normalized to an equivalent bed level, represent sorbent utilization performance levels within the range of the earlier tests with PRG #12-mesh "designer" dolomite and MM Pittsburgh #8 coal. This test supports the theory that the optimum sorbent size consists of those particles just over the directly elutriable size of 60-mesh. Although analyses of the cyclone and bed ash samples have not yet been received for this test, it is expected that sulfation rates will be similar to those of the PRG #12-mesh "designer" dolomite tests (i.e., bed ash sulfation rates of approximately 70% and cyclone ash sulfation rates of approximately 40%). The cyclone ash/ bedash split for this test was 63%/ 37% compared to a typical ash split of 75/ 25 for the #12-mesh site prepared sorbent and 55/ 45 for the #12-mesh "designer" sorbent.

The final test of the program was completed on 3/ 28/ 95 while operating with Consol coal and National Lime Delaware #12-mesh site prepared limestone (the Consol coal has similar ash fusion characteristics as the MM Pittsburgh #8 coal). This test was conducted at 118" bed level and a reduced bed temperature of 1500F. The unit was operated for approximately 40 hours on limestone during which time the bed showed signs of deterioration (bed and evaporator temperature distributions were slowly degrading as bed density and steam flow continued to drop), however, there were no signs of excessive egg sinter formation in the bed drains. At the conclusion of the test, sorbent was switched back to PRG dolomite in order to stabilize bed conditions. The operating experiences gained from this test are similar to the experiences gained from the limestone testing of October 1994 when the unit was operated on Bucyrus #18-mesh "designer" limestone for approximately 36 hours during which time bed conditions were similarly noted to be deteriorating again without the signs of excessive egg sinter formation. The difference in the latest two limestone tests from the earlier attempts of 1992-1993 (which resulted in unit shutdowns due to bed deterioration) is that the more recent tests used a finer size grade of limestone. The fact that excessive egg sinters were not observed during these latest two tests would lead us to believe that the limestone some how causes bed conditions to deteriorate which leads to conditions favorable for sinter formation as opposed to our previous belief that limestone operation causes egg sinter formation which leads to bed deterioration. Although testing at the Tidd Plant has not provided a clear understanding of the phenomenon that is taking place in the bed while operating with limestone, it does appear that fluidization of the bed is adversely affected by the presence of limestone. Additional investigation of how limestone impacts the bed is recommended.

III. PROJECT SUPPORT

A. Schedule

A preliminary schedule was developed covering disposition of the plant following termination of the Demonstration Program. The main tasks identified include Decommissioning of Operations, Decommissioning of the PFBC Support Facilities and development of a Site Utilization Plan. Support in the implementation of these tasks is being provided by the Plant, Environmental Engineering and the Labor Contracting Groups.

B. Work in Progress

Current Activities Include:

- –Decommissioning and inspection of various systems
- –Preparation and distribution of equipment inventory lists
- –Preparation and proposal to the DOE for disposal of PFBC equipment on site
- –Submittal of data to the Ohio EPA pertinent to closure of the coal/ dolomite storage yard.
- –Solicitation of budget estimates for asbestos abatement.
- –Development of bid package for regrading the coal/ dolomite yard
- –Preparation of accounting procedures for asset recovery.

Table 1. Preliminary Test Results

TEST RESULTS SUMMARY

	TEST NUMBER		84	85	86	87	88	89
	TEST DATE		02/01/95	02/22/95	02/24/95	02/27/95	02/28/95	03/02/95
	TEST PERIOD		2200-0155	0200-0600	2300-0600	0200-0800	0000-0800	0600-1400
COAL AND SORBENT TYPES								
	COAL TYPE		MM Pitts 8	MM Pitts 8	MM Pitts 8	MM Pitts 8	Minnehaha	Minnehaha
	SORBENT TYPE		PRG	PRG	PRG	Mulzer	Mulzer	PRG
	sorbent mesh size - "site" or "designer"		#12 site	#12 design	#12 site	#12 site	#12 site	#12 site
OPERATING DATA								
n/a	BED LEVEL (CALC)	INCHES	128.2	132.3	134.1	116.0	114.0	124.5
886	ST GEN MW	MW	51.7	57.1	54.5	48.8	47.6	50.6
885	GT GEN MW	MW	14.0	15.0	15.2	11.9	12.0	15.0
n/a	COAL PASTE FLOW (CALC	PPH	73950	78866	78030	69920	88477	83311
217	MEAN BED TEMP	F	1579.0	1582.3	1577.4	1581.7	1580.8	1577.6
691,692	INT VALVE INLET TEMP	F	1516.8	1542.4	1552.4	1448.9	1436.0	1505.2
191	AVG. BED OUTLET O2	PERCENT	3.3	2.6	2.9	3.5	3.4	3.4
260	MEAN CYCLONE TEMP IN.	F	1540.9	1566.9	1577.2	1471.3	1456.6	1525.7
604	AIR FLOW (INDICATED)	KPPH	724.3	735.0	734.8	680.1	669.4	729.9
864	FEEDWATER FLOW (MVS)	KPPH	432.7	468.1	452.4	412.0	398.3	425.9
EMISSIONS								
710	SO2 LVG ESP (RAW)	PPM	198.2	195.4	166.4	209.5	119.9	47.8
709	NOX LVG ESP (RAW)	PPM	111.0	98.4	109.5	119.1	127.6	158.9
n/a	NOX LVG ESP (CALC)	LB/MMBTU	0.17	0.15	0.17	0.19	0.21	0.26
n/a	SO2 LVG ESP (CALC)	LB/MMBTU	0.48	0.46	0.40	0.51	0.31	0.12
FEEDSTOCK ANALYSIS								
	COAL SULFUR (D/B)	WT. PCT.	2.85	3.16	3.11	3.10	1.60	1.63
	COAL SO2	LB/MMBTU	4.48	4.88	4.85	4.94	2.49	2.53
	PASTE MOISTURE (A/F)	WT. PCT.	26.46	27.19	27.40	26.40	40.97	34.28
	SORBENT CaO (D/B)	WT. PCT.	29.81	29.39	29.98	28.68	28.97	29.14
	SORBENT SMD (from ELH)	MICRONS	245	423	274	273	272	260
CALCULATED RESULTS								
	FIRING RATE	MWT	203.1	218.1	213.3	189.5	196.8	207.3
	SULFUR CAPTURE	PERCENT	89.2	90.7	91.8	89.6	87.5	95.2
	Ca/S TEST	RATIO	1.71	1.48	1.84	1.71	2.01	3.08
	Ca/S @ 90%, 1580 TBED	RATIO	1.77	1.44	1.68	1.75	2.23	2.33
	Ca/S @ 95%, 1580 TBED	RATIO	2.30	1.88	2.19	2.28	2.90	3.03
	COAL FLOW (DRY)	PPH (D/B)	54383	57422	56650	51461	52228	54752
	TOTAL SORBENT FLOW	PPH	15560	15960	18890	16680	10140	16510
	SORBENT IN PASTE	PERCENT	0.0	0.0	0.0	0.0	0.0	0.0
	BED ASH FLOW	PPH	6500	9390	7000	7860	3858	5947
	CYCLONE ASH FLOW	PPH	14611	11666	16753	14771	11011	15063
	PERCENT CYCLONE ASH	PERCENT	69.2	55.4	70.5	65.3	74.1	71.7
	HEAT BALANCE CLOSURE	PERCENT	99.3	99.2	99.4	99.2	101.5	100.2
	CALCIUM CLOSURE	PERCENT	later	later	96.1	86.1	later	later
	SULFUR CLOSURE	PERCENT	later	later	98.7	96.3	later	later
	CYC ASH SULPHATION	PERCENT	later	later	42.8	36.9	later	later
	BED ASH SULPHATION	PERCENT	later	69.6	58.4	59.6	later	later

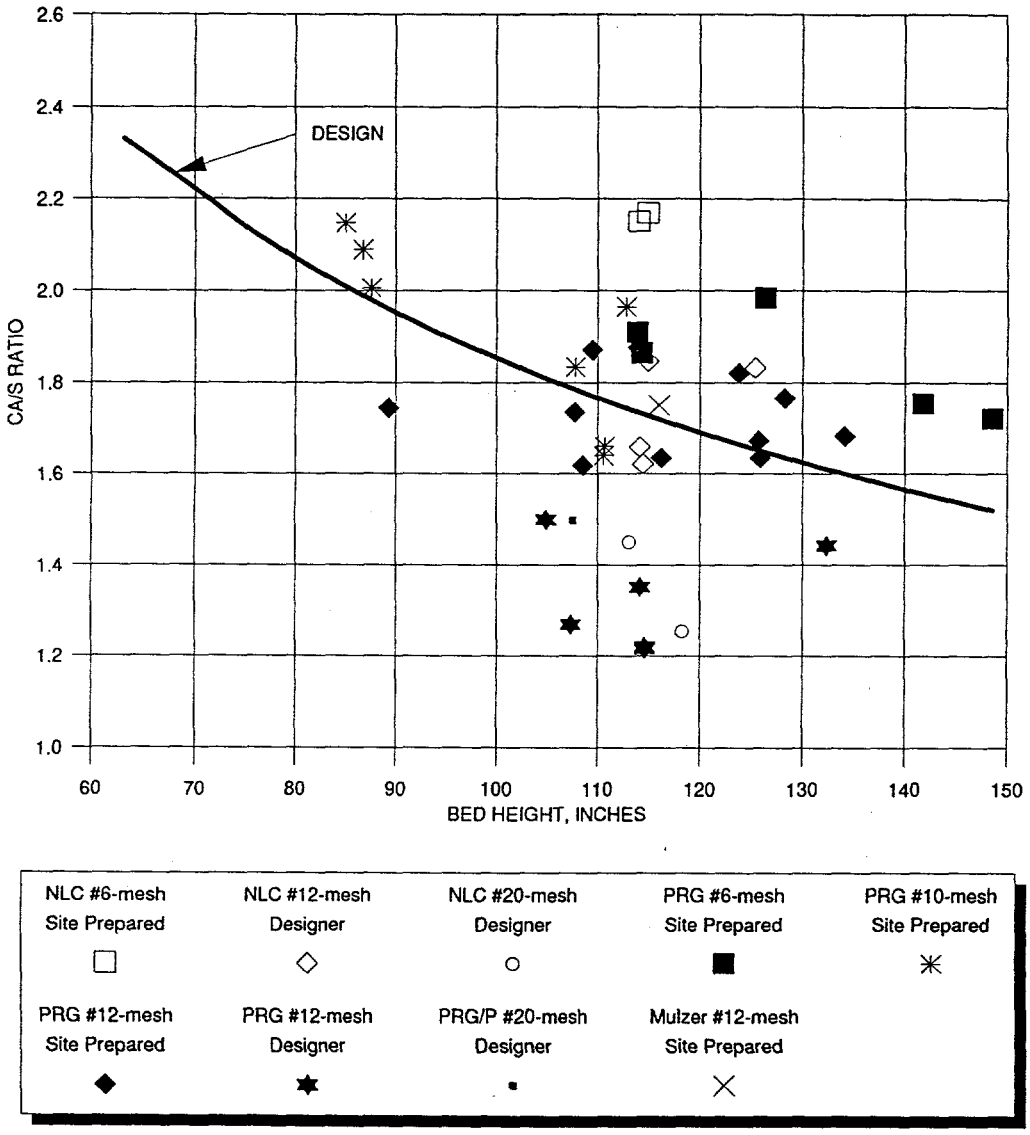
Table 1. Preliminary Test Results (cont.)

TEST RESULTS SUMMARY

	TEST NUMBER		90	91	92	93	94	95
	TEST DATE		03/04/95	03/05/95	03/07/95	03/17/95	03/23/95	03/28/95
	TEST PERIOD		0000-0600	2000-0400	0800-1600	0200-0800	0000-0900	0900-1400
COAL AND SORBENT TYPES								
	COAL TYPE		Consol MV	Consol MV	Consol MV	Consol MV	Consol MV	Consol MV
	SORBENT TYPE		PRG	PRG	PRG	PRG	PRG	Delaware
	sorbent mesh size - "site" or "designer"		#12 site	#12 site	#12 site	#12 site	#12 x 60	#12 site
OPERATING DATA								
n/a	BED LEVEL (CALC)	INCHES	141.3	116.7	90.6	90.3	91.0	117.9
886	ST GEN MW	MW	53.0	48.1	35.5	34.4	35.6	37.2
885	GT GEN MW	MW	15.1	11.2	4.5	5.6	6.0	9.2
n/a	COAL PASTE FLOW (CALC	PPH	79994	72252	52826	53284	53820	58425
217	MEAN BED TEMP	F	1562.5	1579.6	1580.4	1580.8	1581.5	1496.9
691,692	INT VALVE INLET TEMP	F	1557.9	1438.4	1255.9	1241.8	1255.9	1391.7
191	AVG. BED OUTLET O2	PERCENT	2.9	3.9	5.1	5.8	5.8	5.8
260	MEAN CYCLONE TEMP IN.	F	1580.4	1458.5	1269.2	1258.6	1272.2	1412.7
604	AIR FLOW (INDICATED)	KPPH	720.6	690.1	532.8	551.8	569.6	649.5
864	FEEDWATER FLOW (MVS)	KPPH	442.9	403.7	312.3	306.3	314.5	326.4
EMISSIONS								
710	SO2 LVG ESP (RAW)	PPM	158.0	115.7	103.6	79.6	119.5	130.3
709	NOX LVG ESP (RAW)	PPM	115.5	131.4	114.4	123.7	131.7	132.4
n/a	NOX LVG ESP (CALC)	LB/MMBTU	0.18	0.21	0.20	0.23	0.24	0.24
n/a	SO2 LVG ESP (CALC)	LB/MMBTU	0.38	0.30	0.28	0.23	0.34	0.37
FEEDSTOCK ANALYSIS								
	COAL SULFUR (D/B)	WT. PCT.	2.15	2.08	1.90	1.77	2.00	2.03
	COAL SO2	LB/MMBTU	3.50	3.36	3.07	2.87	3.26	3.34
	PASTE MOISTURE (A/F)	WT. PCT.	27.32	28.06	27.52	27.85	26.50	26.50
	SORBENT CaO (D/B)	WT. PCT.	29.62	29.50	29.37	29.00	29.00	45.00
	SORBENT SMD (from ELH)	MICRONS	281	later	263	later	later	later
CALCULATED RESULTS								
	FIRING RATE	MWT	209.3	189.0	138.8	139.3	142.5	153.3
	SULFUR CAPTURE	PERCENT	89.1	91.2	90.8	92.0	89.5	88.8
	Ca/S TEST	RATIO	1.61	2.05	2.09	1.94	1.51	2.86
	Ca/S @ 90%, 1580 TBED	RATIO	1.62	1.94	2.02	1.77	1.54	2.52
	Ca/S @ 95%, 1580 TBED	RATIO	2.10	2.53	2.63	2.30	2.01	3.28
	COAL FLOW (DRY)	PPH (D/B)	58140	51978	38288	38445	39557	42943
	TOTAL SORBENT FLOW	PPH	11910	13130	9060	7950	7200	9680
	SORBENT IN PASTE	PERCENT	0.0	0.0	0.0	0.0	0.0	0.0
	BED ASH FLOW	PPH	4673	4877	3387	3150	4660	3940
	CYCLONE ASH FLOW	PPH	15326	14408	10406	9657	8048	13316
	PERCENT CYCLONE ASH	PERCENT	76.6	74.7	75.4	75.4	63.3	77.2
	HEAT BALANCE CLOSURE	PERCENT	99.8	100.2	100.6	100.9	100.4	99.2
	CALCIUM CLOSURE	PERCENT	75.2	87.5	later	later	later	later
	SULFUR CLOSURE	PERCENT	101.8	100.0	later	later	later	later
	CYC ASH SULPHATION	PERCENT	34.7	32.1	later	later	later	later
	BED ASH SULPHATION	PERCENT	54.3	52.7	later	later	later	later

Figure 1. Ca\ S Ratio vs. Bed Height at 90% S. R., 1580F Bed Temp.

Tidd PFBC Demonstration Plant
Ca/S Ratio vs. Bed Height at 90% SR, 1580 F Bed Temperature
MM Pitts #8 Coal with Plum Run, National Lime, or Mulzer Dolomite
Tests 48-77, 79-87



4yr-MM Pitts 8 7-APR-95

Figure 2. Ca\S Ratio vs. Bed Height at 90% S. R., 1580F Bed Temp.

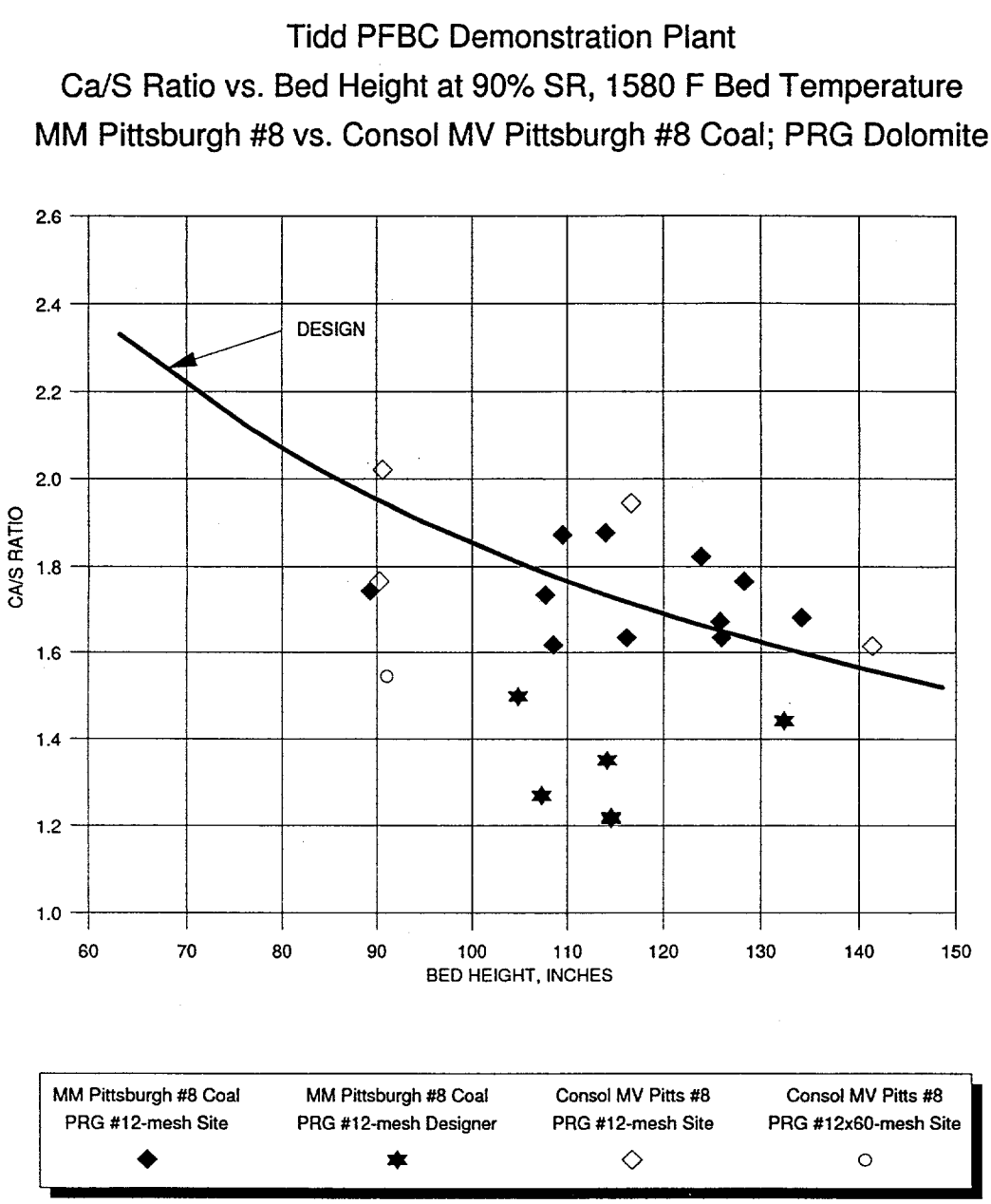
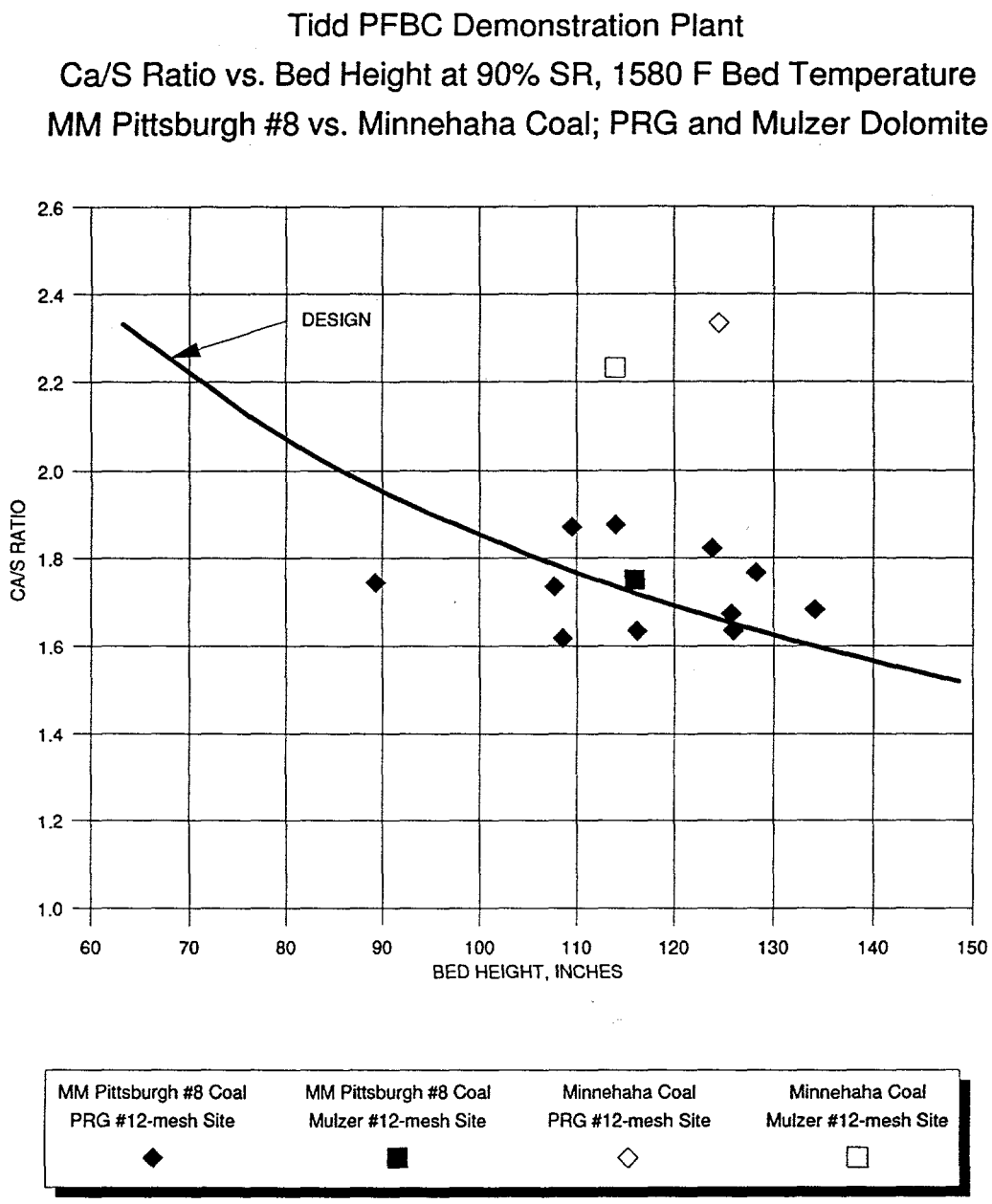


Figure 3. Ca\ S Ratio vs. Bed Height at 90% S. R., 1580F Bed Temp.



IV. OPERATIONS

The following is a summary of accumulated operating data for the period January 1, 1995 through March 31, 1995.

Steam Turbine Generation	47,267 MWH
Gas Turbine Generation	10,426 MWH
Total Gross Generation	57,693 MWH
Peak Generation for 1 Hour	74 MWH
Total Oil Fire Operating Time	50.127 Hours
Total Coal Fire Operating Time	718.06 Hours
Total Coal Injected	27,866 Tons
Total Sorbent Injected	3,455.5 KLB

The unit was operated for a total of 1270.06 hours (including gas turbine warming). There were a total of 7 gas turbine starts, 9 bed preheater starts, and 9 operating periods with coal fire. The peak gross output of 74 MWH was for the time period of 2200 - 2300 on February 21, 1995, and again for the time period of 0400 - 0600 on February 22, 1995.

The HGCU system was in service from January 13 through the end of the period.

1. The unit was in service at the beginning of the period as a continuation of TD-SU-94-12-02.

   At the beginning of the period, the unit was operating at a bed level of 115" and a bed temperature of 1540°F.

   On Monday, January 2, 1995, the fuel preparation system Polysius crusher movable roll gear box failed. Due to the inability to prep coal, the combustor was tripped at 1057 hours on January 2, 1995. The bed material was cooled with the gas turbine; the gas turbine was removed from service at 2044 hours. The combustor was further cooled and released to maintenance for outage work.

2. Start-Up TD-SU-95-01-01.....January 12, 1995 - January 13, 1995

   The combustor was released by the maintenance department at 1412 hours on January 12, 1995.

   The gas turbine was rolled at 0341 hours on January 13, 1995, and paralleled at 0406 hours. Air flow was established through the combustor at 0414 hours.

   Oil fire was established at 0805 hours; the steam turbine was paralleled at 1253 hours. A coal fire was established at 1324 hours at a bed temperature of 1050°F.

   Sorbent injection was initiated at 1415 hours.

   At approximately 1200 hours on January 13, 1995, #16 cyclone began exhibiting signs of being plugged. As a result of this, the combustor was tripped at 1747 hours. The gas turbine was tripped at 1931 hours and after further cooling the unit was released to maintenance for outage work.

3. Start-Up TD-SU-95-02-01.....January 17 - January 19, 1995

The combustor was released by the maintenance department at 203 hours on January 17, 1995.

The gas turbine was rolled on January 18, 1995 at 0523 hours. At 0541 hours, the gas turbine was paralleled and air flow was established at 0547 hours.

An oil fire was established at 1124 hours. The steam turbine was placed in parallel at 1518 hours.

A coal fire was established at 1553 hours at 1050°F bed temperature.

At 0839 hours on January 19, 1995 a gas turbine trip was experienced due to HCV-T122 (bypass intercept valve) going closed.

The bed was inerted with N2 and gas recirculation utilized to cool the bed.

Investigation into HCV-T122 revealed a small piece of O-ring material lodged in the orifice in the hydraulic circuit.

4. Start-Up TD-SU-95-02-02.....January 20 - 21, 1995

The combustor was released by the maintenance department at 0613 hours on January 20, 1995.

On Friday, January 20, 1995, the gas turbine was rolled at 1125 hours. At 1157 hours, the gas turbine was placed in parallel, and at 1225 hours air flow was established.

An oil fire was established at 1247 hours on January 20, 1995. The steam turbine was rolled at 1533 hours and placed in parallel at 1607 hours.

After gas turbine roll, bed temperatures were very unusual. Following oil fire, these bed thermocouples remained low, but did respond some. The bed had the appearance of poor fluidization.

A coal fire was established at 1735 hours, once again at 1050°F bed temperature.

The bed continued to have low temperature spots. Eventually, several evaporator tubes came into alarm while still below once through. It was decided to trip the unit and inspect the bed and sparge ducts. The combustor was tripped at 0044 hours, January 21, 1995. The gas turbine was taken off at 0618 hours on January 21, 1995.

5. Start-Up TD-SU-95-03-01.....January 25 - February 2, 1995

The combustor was released by the Maintenance Department at 2306 hours on January 25, 1995.

On Thursday, January 26, 1995, the gas turbine was rolled at 1257 hours. At 1327 hours,

the gas turbine was placed in parallel, and at 1336 hours air flow was established.

An oil fire was established at 1815 hours on January 26, 1995. The steam turbine was rolled at 2222 hours and placed in parallel at 2323 hours.

At 0058 hours, January 27, 1995, coal was lit. Once through occurred at 0652 hours on January 27, 1995. The bed was matured and on Monday, January 30, 1995, the bed level was increased to 125" and bed temperature raised from 1540°F to 1580°F. Bed temperature distribution was excellent and the evaporator tube profile was nearly flat.

Several unusual excursions took place on the HGCU system on February 1, 1995. Tube sheet differential, ash temperatures, and gas turbine vibration were affected.

Early the morning of February 2, 1995, a blind flange in HGCU system, located on the backup cyclone outlet, was found to be hot, necessitating the removal of the unit from service. The combustor was tripped at 0205 hours on February 2, 1995. The gas turbine was removed from service at 1024 hours on February 2, 1995.

6. Start-Up TD-SU-95-04-01.....February 7-9, 1995

The combustor was released by the Maintenance Department at 2300 hours on February 7, 1995.

On Wednesday, February 8, 1995, the gas turbine was rolled at 1043 hours. At 1115 hours, the gas turbine was placed in parallel, and at 1122 hours air flow was established.

An oil fire was established at 1850 hours on February 8, 1995. The steam turbine was rolled at 2308 hours and placed in parallel at 0014 hours on February 9, 1995.

At 0030 hours, February 9, 1995, coal was lit. Once through occurred at 0542 hours on February 9, 1995.

An instrument line on the economizer froze and broke. This resulted in a combustor trip at 1509 hours on February 9, 1995 due to high S.S.H. temperatures. The unit was readied for a hot re-start.

7. Start-Up TD-SU-95-04-02.....February 9-10, 1995

The unit was hot re-started following isolation of the economizer instrument and taking the bed up into 274 vessels.

An oil fire was established at 2326 hours on February 9, 1995. The steam turbine was rolled at 0255 hours on February 10, 1995 and placed in parallel at 0329 hours.

At 0408 hours, February 10, 1995, coal was lit. Once through occurred at 1018 hours on February 10, 1995.

The combustor was tripped at 1834 hours on February 10, 1995 due to a gasket failure on the line going to the HGCU surge hopper.

8. Start-Up TD-SU-95-04-03.....February 11-13, 1995

The unit was hot re-started following the repair of the gasket leak in the line going to the HGCU surge hopper.

On February 11, 1995, oil fire was established at 0454 hours, steam turbine was rolled at 0844 hours and paralleled at 0915 hours, coal fire was lit at 0926 hours, and once through occurred at 1222 hours.

The unit was brought up to 128 inches bed height. Steam flow reached 440,000 lb/ hr and load went to 70.1 MW. The alternate ash line and emergency ash line in the HGCU system were plugged by 2 pieces of broken candle. Ash backed up and the water screw cooler tripped. The lockhopper was not able to remove ash fast enough and the ash level came up in the APF. The combustor was manually tripped at 1751 hours on February 12, 1995.

While trying to unplug the alternate ash line, the isolation valve stuck open. The valve handle was broken while trying to get the valve closed, necessitating a gas turbine trip at 0028 hours on February 13, 1995.

9. Start-Up TD-SU-95-05-01.....February 13-16, 1995

The unit was hot re-started following a shutdown due to a high ash level in the HGCU APF.

The gas turbine was rolled at 0548 hours on February 13, 1995, paralleled at 0606 hours, and air flow established at 0647 hours.

On February 13, 1995, an oil fire was established at 0814 hours, steam turbine was rolled at 1100 hours and paralleled at 1136 hours, coal fire was lit at 1143 hours, and once through occurred at 1607 hours.

The unit was brought up to 112" bed level, at which time several hot spots appeared on the APF. Leak Repair, Inc. spent a day pumping Fiberfrax to bring the temperatures down.

On February 16, 1995, problems developed with the fuel preparation system. The coal crusher was not able to properly crush the coal and the paste fines were low. All pump DP's increased. At 1243 hours, on February 16, 1995. it became necessary to trip the combustor due to both #2 and #3 paste pumps not pumping.

10. Start-Up TD-SU-95-06-01.....February 16- March 8, 1995

The unit was warm re-started following a shutdown due to poor paste quality.

The fuel nozzles were cleaned. The coal in the bunkers was emptied out. It was determined the main coal pile was getting down to some old coal and possibly some 6A coal. A switch was made to the south pile, which crushed fine.

The gas turbine was rolled at 0848 hours on February 18, 1995, paralleled at 0924 hours, and air flow established at 1003 hours.

On February 18, 1995, an oil fire was established at 1533 hours, steam turbine was rolled

at 1805 hours and paralleled at 1850 hours, coal fire was lit at 1929 hours, and once through occurred at 2230 hours.

The unit was brought up to 133" at 1580°F bed temperature on delivered #12 Plum Run dolomite. Four tests were run in the week of February 23 to March 1, 1995, and four additional tests were conducted the week of March 1 to March 8, 1995.

On March 8, 1995, problems again developed with the fuel preparation system. The coal crusher was not able to properly crush the coal and the paste fines were low. All pump DP's increased. At 1440 hours, on March 8, 1995, it became necessary to trip the combustor due to two paste pumps not pumping. Extremely wet coal was the cause of the crushing difficulty.

11. Start-Up TD-SU-95-07-01.....March 13-30, 1995

The unit was released from a mini gas side clearance at 2050 hours, on March 13,1995 following a shutdown due to poor paste quality.

The fuel nozzles were cleaned. The coal in the bunkers was emptied out. It was determined that the quality of coal which was being received on a daily basis was suspect due to its high moisture content. The rolls of the crusher were dressed and the minimum gap was reset. This coupled with a more consistent coal supply allowed the preparation system to perform at a rate that could support unit operation.

The gas turbine was rolled at 0531 hours on March 14, 1995, and paralleled at 0552 hours, and air flow established at 0603 hours.

On March 14, 1995, at 1059 hours oil fire was established. The steam turbine was rolled at 1355 hours and paralleled at 1506 hours, on March 14, 1995. Coal fire was established at 1715 hours on March 14, 1995, followed by once through boiler operation being established at 2041 hours.

The unit was brought up to 115" bed level and 1580° F bed temperature on site prepared Plum Run dolomite. Two tests were run the week of March 13, 1995 to March 20, 1995. The week of March 20, 1995, the sorbent preparation system was set up in scalping/ de-dusting mode and the bed level was reduced to 90" in order to complete two more tests. The week of March 27, 1995, one test was completed with the bed level at 115", utilizing site prepared National Lime limestone.

The operation of the unit through out the period was characterized by excessive leakage in the external primary ash cooler. By the time the unit was removed from service, the closed cycle cooling expansion tank level was being topped off 25 times every shift. The combustor was tripped for the final time at 0827 hours, on March 30, 1995.

V. MAINTENANCE

1. Outage TD-OT-95-01-01 ..... January 2 - 12, 1995

Polysius crusher movable roll gear box bearings failed causing the unit to be removed from service. Both gear boxes on the movable and stationary rolls were replaced.

Restored HGCU system for service, include APF vessel (with new candle filters), expansion joins, dirty gas piping, etc. Replaced the original backup cyclone ash line with new piping having longer radius bends. Backpulse compressor fourth stage discharge valve, oil seals and gaskets were replaced. APF surge hopper valves HCV-J926, -927, and -928 were changed and linkage was adjusted for limit switches.

Video boroscoped LPT inner guide vane ring which indicated some wear. Visual inspections were also conducted. LPT disc temperatures were high, requiring us to increase openings on V-12 and V-13 orifices to 18mm and 28mm, respectively. A bypass was also installed around V-13 orifice. This bypass has a 10.5mm orifice installed. Inspected and repaired a leak in the gas turbine intercooler.

Sorbent booster compressor inlet guide vane assembly was bound up, therefore it was disassembled and cleaned for smoother operation.

Replace number 7 cyclone O2 analyzer tubing completely. Replaced number 3 cyclone O2 analyzer piping at cyclone duct to first Swagelok fitting.

Repaired leaks on primary ash piping inside internal ash coolers.

2. Outage TD-OT-95-02-01 ..... January 13 - January 17, 1995

The unit was taken out of service because number 16 cyclone was plugged, thereby preventing ash flow.

Inspected screw cooler, outlet pipe, surge and lockhoppers. Recovered several small pieces of silicone carbide candle. Inspected and cleaned ash from alternate ash line. Removed small piece of candle which plugged the orifice.

3. Outage TD-OT-95-03-01 ..... January 19 - January 20, 1995

The gas turbine tripped due to a piece of O-ring which was blocking control fluid flow to bypass valve T-122. This restriction caused the valve to close. Repairs were made by the Performance Department.

4. Outage TD-OT-95-04-01 January 21 ..... January 25, 1995

The bed was not able to fluidize, causing us to bring the unit out of service. Inspected central duct and sparge ducts and found excessive build up of ash; vacuumed out same. Sand-blast cleaned sparge nozzles. Inspected bed cooling air tubes and found bed material, which was vacuumed out.

5. Outage TD-OT-95-05-01 ..... February 2 - February 7, 1995

Removed unit from service due to elevated temperatures (1400°F) on the backup cyclone (BUC) outlet tee blind flange. Removal of the blind flange revealed missing insulation from behind a holding plate which failed. Fragments of these plates were found in the gas turbine LP exhaust duct and 3 plates were found intact at the inlet guide vanes of the HP turbine. A revised design of insulating the blind flanges was utilized.

6. Outage TD-OT-95-06-01 ..... February 16 - February 18, 1995

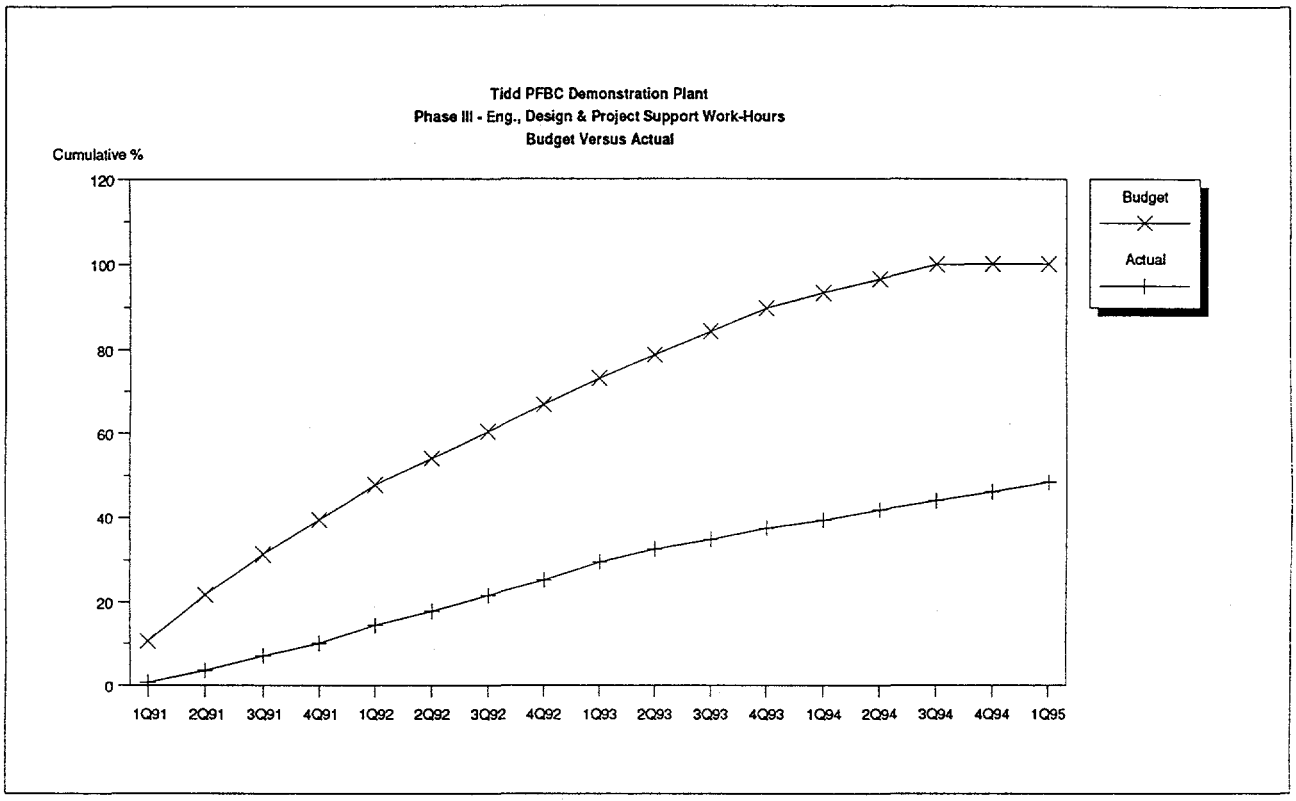
Due to bad coal paste, number 3 fuel nozzle plugged and shortly after, number 2 nozzle plugged. Because of this and problems crushing coal, the unit was taken out of service. All nozzles were disassembled, from outside of the combustor, cleaned and restored. All coal bunkers, paste tanks and the truck hopper were emptied of coal which created crushing and pluggage problems. Polysius crusher rolls were adjusted more closely on each side by 4mm to 4mm on the left side and 5mm on the right (north).

Inspected the advanced particle filter (APF) for broken candle pieces. Removed pieces of candle from the ash transport piping below the APF lockhopper. Unplugged ash from the alternate ash line. Installed a screen arrangement in the alternate ash line to prevent future pluggage. Unplugged ash from the emergency ash line purge air supply.

V. MANPOWER REPORT

As of March 31, 1995, AEPSC actual work-hours for the Phase III accounted for 48.3% of the total budget of 135,098. Figure 4 represents the budget versus actual work-hours for this phase. For the reporting period, a total of 3,060.2 hours were charged to the project by AEPSC personnel.

FIGURE 4



	1Q91	2Q91	3Q91	4Q91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95
Budget	10.6	21.7	31.3	39.4	47.7	54.1	60.4	66.8	73.1	78.7	84.3	89.7	93.3	96.5	99.9	100.0	100.0
Actual	0.7	3.6	7.1	10.1	14.4	17.8	21.6	25.2	29.5	32.5	34.8	37.4	39.3	41.8	44.0	46.1	48.3

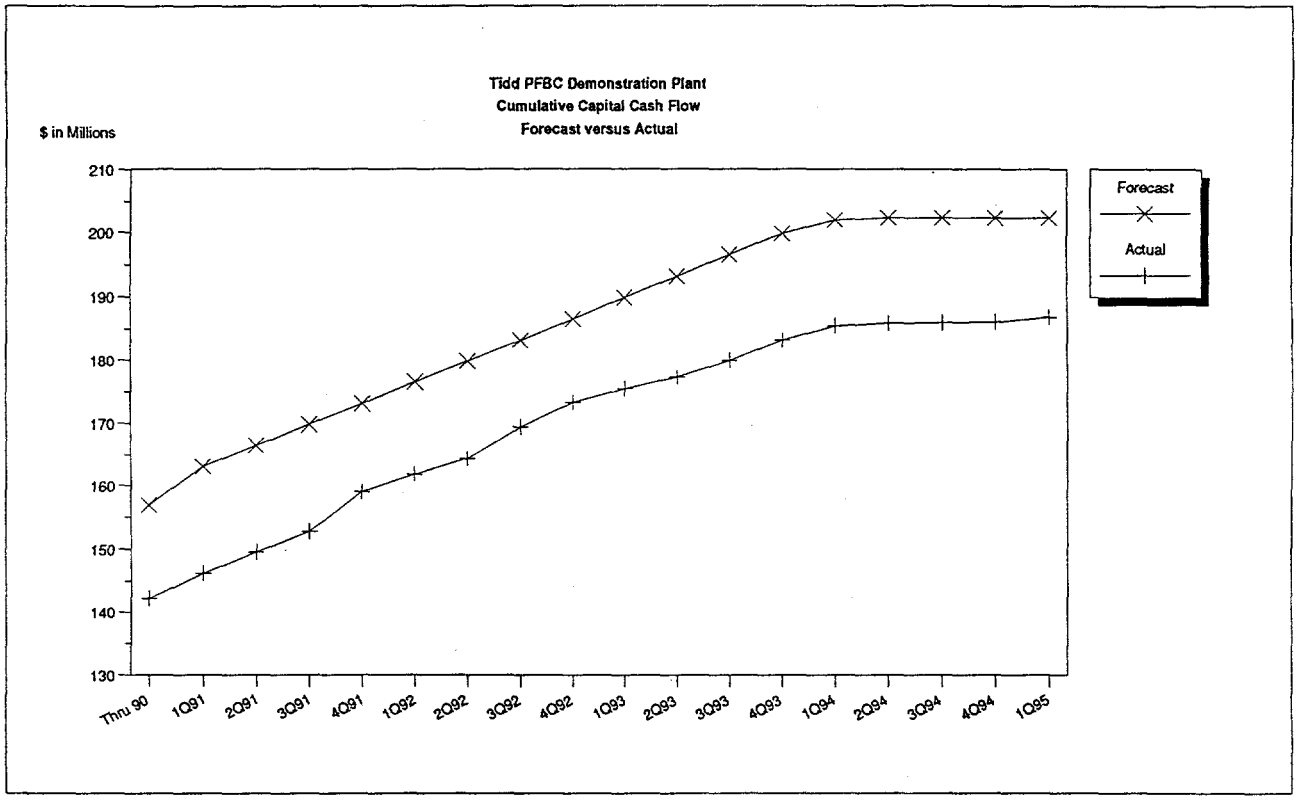
VI. COST DATA

1. Project Cost Status

The actual cost shared expenditures during the First Quarter 1995 were $694,893. As of March 31, 1995, the cumulative cost shared expenditures for Phase I, II, and III were $179,688,644.

Figure 5 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.

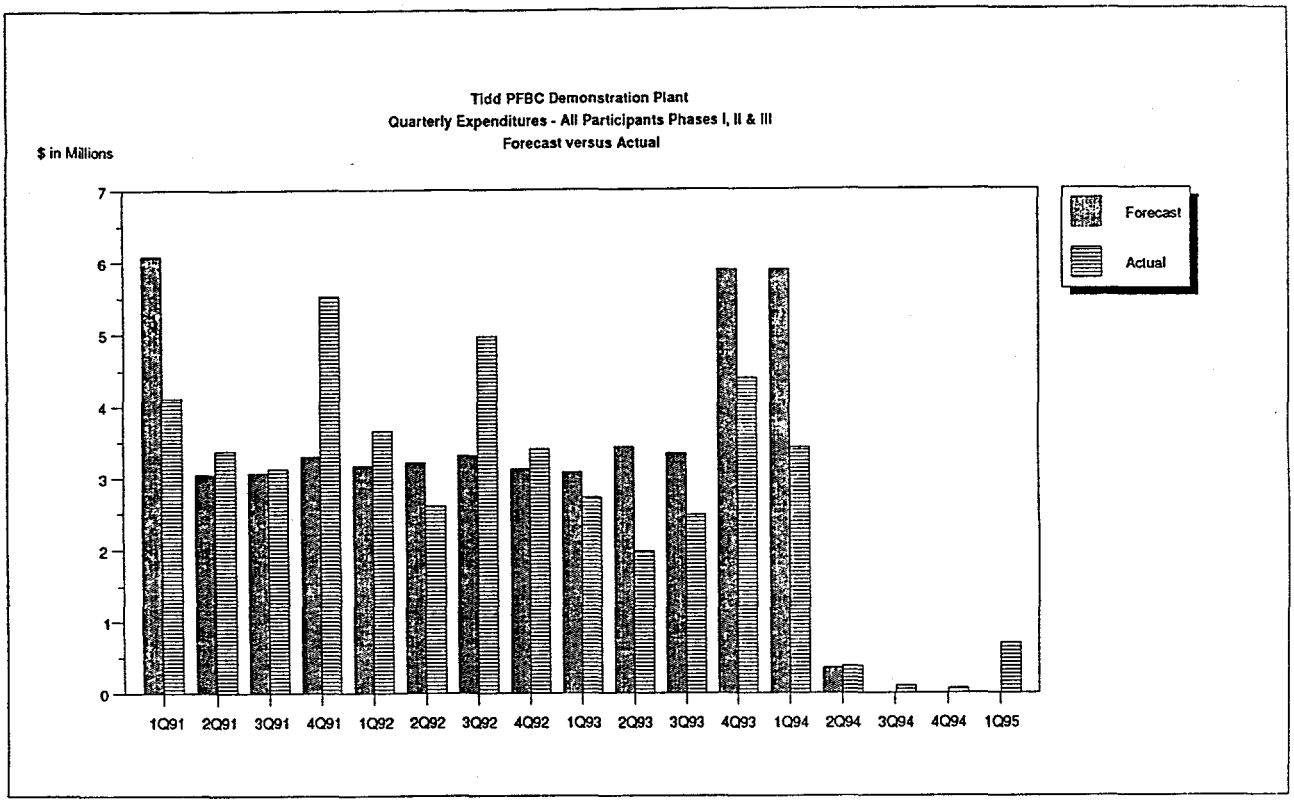
FIGURE 5



	(in Millions)																	
	Thru 90	1Q91	2Q91	3Q91	4Q91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95
Forecast	156.9	163.1	166.5	169.8	173.1	176.5	179.8	183.1	186.5	189.8	193.1	196.5	199.8	202.0	202.4	202.4	202.4	202.4
Actual	142.2	146.2	149.6	152.7	159.0	161.8	164.4	169.4	173.3	175.4	177.2	179.9	183.2	185.5	185.9	186.0	186.1	186.8

Figure 6 is a projection of the quarterly expenditures for all participants. It also identifies the actual quarterly expenditures through the First Quarter 1995.

FIGURE 6



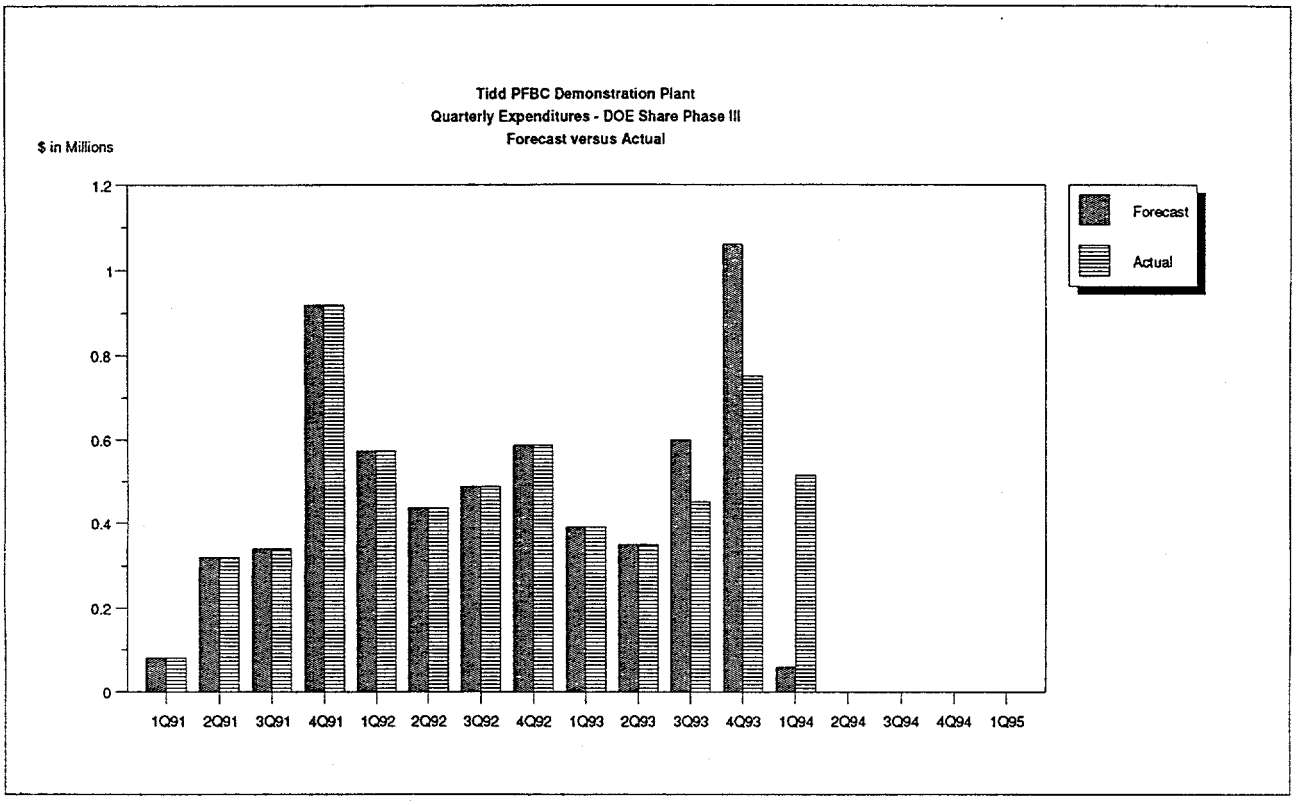
	(in Millions)																		
	Thru 90	1Q91	2Q91	3Q91	4Q91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95	To-date
Forecast	143.289	6.082	3.044	3.063	3.298	3.161	3.212	3.311	3.116	3.072	3.427	3.334	5.889	5.888	0.354	0.000	0.000	0.000	193.540
Actual	132.688	4.107	3.373	3.121	5.521	3.659	2.603	4.967	3.402	2.721	1.979	2.478	4.397	3.423	0.384	0.103	0.067	0.696	179.680

The following table summarizes the project expenditures as of March 31, 1995, of all participants:

Phase I	DOE	OCDO	OPCO	Total Expended as of 03/31/95
Design & Permitting	$ 8,469,449	$ 5,000,000	$ 8,069,734	$ 21,539,183
Phase II				
Construction & Start-up	$49,095,184	$ 5,000,000	$ 68,128,704	$122,223,888
Phase III				
Operation, Data Collection, Reporting & Disposition	$ 6,200,000	$ -	$ 29,725,573	$ 35,925,573
Total:	$63,764,633	$10,000,000	$105,924,011	$179,688,644

Figure 7 is the Phase III DOE quarterly actual and projected expenditures.

FIGURE 7



	(in Millions)																	
	1Q91	2Q91	3Q91	4Q91	1Q92	2Q92	3Q92	4Q92	1Q93	2Q93	3Q93	4Q93	1Q94	2Q94	3Q94	4Q94	1Q95	TO-DATE
Forecast	0.080	0.320	0.339	0.918	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	6.200
Actual	0.080	0.320	0.339	0.918	0.573	0.437	0.488	0.587	0.391	0.348	0.451	0.752	0.515	0.000	0.000	0.000	0.000	6.200

The following represents the financial status of the Tidd PFBC Demonstration Project - Phase III - 4th year, as of March 31, 1995.

Expenditures

Operations (Est. $12,457,000)		$11,265,101*
Funding Source		
- USDOE Share of Cost Growth	($3,564,633)	$3,564,633
- USDOE Cost Sharing	($3,192,360)	2,465,149
- OCDO Cash Contribution	($2,600,000)	2,340,000
- OPCO Coal Contribution	($2,300,007)	2,288,782
- ABBC Contribution	($ 400,000)	200,000
- B&W Contribution	($ 400,000)	406,537
Total Funding To-Date		$11,265,101
Remaining Portion of Expenditures to be Recovered		$ (0)

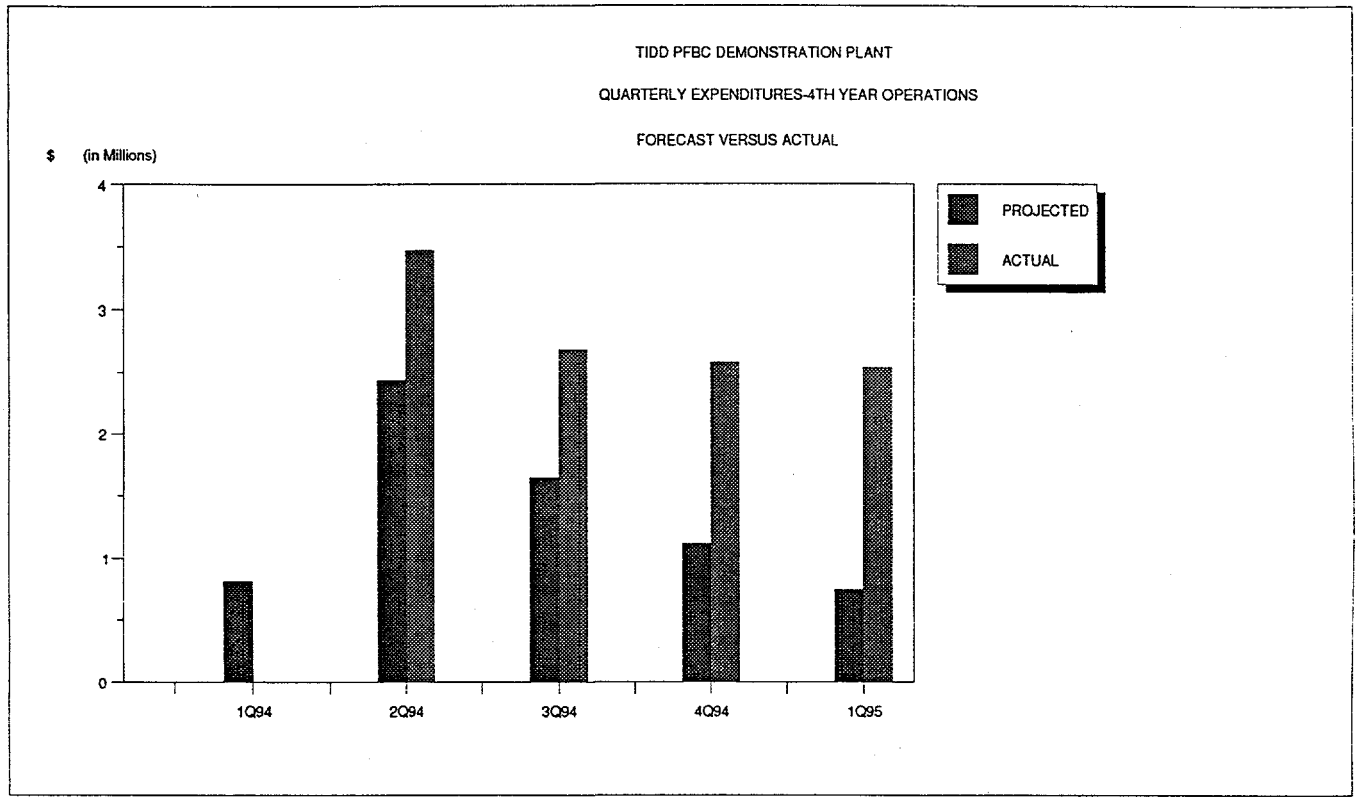
2. Contracts Awarded During First Quarter 1995

No major contractual commitments were issued during this reporting period.

*Expenditures do not Include the March 1995 Unvouchered Charges totaling $486,861 and provisions for estimated future costs totaling $887,000.

Figure 8 is the 4th Year Operations Quarterly Actual and Projected DOE Share of Expenditures.

FIGURE 8



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