FE 2452-28
Dist. Category UC-90e

EXXON RESEARCH AND ENGINEERING COMPANY

HOT CORROSION/EROSION TESTING OF MATERIALS FOR APPLICATION TO ADVANCED POWER CONVERSION SYSTEMS USING COAL-DERIVED FUELS TASK II - FLUIDIZED BED COMBUSTION

SECOND TASK REPORT

For Period January 1, 1978 - July 1, 1978

R. R. Bertrand
M. Ernst
R. C. Hoke
M. D. Loughnane
M. S. Nutkis
V. J. Siminski

EXXON RESEARCH AND ENGINEERING COMPANY
GOVERNMENT RESEARCH LABORATORIES
P.O. Box 8
Linden, New Jersey 07036

September 1978

PREPARED FOR THE
UNITED STATES DEPARTMENT OF ENERGY

Under Contract No. EX-76-C-01-2452

government research

P. O. BOX 8 ■ LINDEN, NEW JERSEY 07036

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES (Cont'd)

LIST OF TABLES

I. ABSTRACT

The first portion of a 1000 hour exposure test of potential gas turbine and boiler tube materials suitable for use in Pressurized Fluidized Bed Coal Combustion (PFBC) was successfully completed. A 250 hour test was carried out in the Exxon PFBC Miniplant under realistic test conditions. All test condition specifications were met.

The run was interrupted for one six hour period due to the failure of the coal feed line. The combustor was fed with liquid fuel during that period to maintain combustor and combustor flue gas outlet temperatures. Flue gas temperatures downstream of the combustor were maintained at 1550°F or higher during the test by injection of natural gas at five points between the combustor and the gas turbine materials test section. Temperatures of the boiler tube test specimens were well controlled during the test.

Measurements of the particulate loading entering and leaving the gas turbine test section indicated a loading of 0.02 to 0.05 gr/SCF. The particulates had a mass median particle size of 2 $\pm$ 1 microns. Alkali metal levels in the flue gas entering the gas turbine test section were measured as 2.5 wppm Na and 0.5 wppm K.

Gas turbine and boiler tube specimens showed no obvious signs of damage after the 250 hour test. The gas turbine specimens showed some signs of deposition, but the deposits were easily removed by brushing. Samples of the gas turbine and boiler tube specimens were removed and will be examined in more detail by General Electric (gas turbine specimens) and Westinghouse (boiler tube specimens).

An additional 250 hour exposure will be made before October 1, 1978 and the specimens again removed and examined.

II. SCOPE OF WORK

Introduction

Pressurized fluidized bed combustion offers the potential of an efficient and compact coal combustion technique also capable of providing pollution control. The technology involves the combustion of coal in a bed of particles maintained in a state of fluidization by the air required for combustion. The use of limestone or other suitable sorbent as the bed material permits the capture and removal of sulfur dioxide concurrently with the combustion process.

This program objective is to operate the pressurized fluidized bed coal combustion miniplant for 1100 hours to provide a test site and environment for exposure of specimens of potential PFBCC fireside heat exchanger alloys (supplied by Westinghouse) and gas turbine materials (supplied by General Electric). The intent of these PFBCC exposure tests is to compile a sound engineering data base for the characterization of the corrosion/erosion behavior of a number of commercially available alloys when exposed to a pressurized fluidized bed combustion environment. These pressurized fluidized bed combustion exposures will provide corrosion/erosion data and comparisons of materials for application to advanced power systems using coal-derived fuels.

Test Program and Operating Conditions

The initial 100 hours of testing represented the shakedown phase of the program. It was intended to assess the performance of the heat exchanger specimen probes and the turbine test section and to evaluate the compatibility of these components with the miniplant combustor operating conditions and controls. It also provided an early opportunity for General Electric and Westinghouse to evaluate materials after a short test run. The shakedown run was completed and the results were reported in the first task report, March 1978.

The shakedown run will be followed by the extended exposure tests of the heat exchanger materials supplied by Westinghouse Research and the gas turbine materials supplied by General Electric Company. Total exposure time will be up to 1000 hours, with the tests interrupted at the 250, 500 and 700 accumulated hour intervals to allow removal, inspection and re-insertion of the material specimens.

The intended Exxon FBC miniplant operating conditions for the extended hot corrosion/erosion exposure runs are - pressure: 8.7-9.1 atmospheres; combustor bed temperature: 1700-1750°F (925-950°C); superficial bed velocity: 6 ft/sec (1.8 m/sec); excess air: 15-20%. The coal will be Illinois No. 6 and the sorbent Pfizer dolomite. Expected GE turbine test section inlet conditions are 9 atmospheres pressure, 1550°F minimum gas temperature and 0.72 to 0.92 lb/sec gas mass flow rate.

This report summarizes the results of the first 250 hour test following the shakedown run.

Description of PFBCC Miniplant

The Exxon miniplant combustor is a 32 ft (10 m) tall vessel with a 24 inch (61 cm) pressure shell, refractory lined to a 13 inch (33 cm) inside diameter. It was modified by fabricating and inserting new sections to accommodate the 12 in-bed and 9 above-bed heat exchanger specimens (Figure 1).

Main fluidizing air for the combustor is supplied at pressures to 10 atmospheres and controlled flow rates of 600 to 1100 SCFM. Coal and dolomite (or limestone) are proportioned, premixed and continuously injected into the combustor at a port 11 inches (28 cm) above the distributor grid. The air passes up through the distributor grid where it fluidizes the bed material and provides the air required for combustion.

Heat extraction in the combustor is achieved by cooling coils through which water is circulated; they are mounted on flanges and immersed in the fluidized bed. The coils, fabricated from type 316 stainless steel 1/2 inch Sch. 40 pipe, are arranged in a serpentine, vertical orientation. Each coil covers a vertical distance of 18 inches and consists of 5.9 ft^2 (0.55 m^2) of surface area. Three coils were inserted in the combustor for the shakedown run - one below the new lower probe section and two above. This coil surface area was calculated to provide desired combustor temperatures for the shakedown run conditions. From the shakedown run it was learned that only two coils would be needed and subsequently one was removed.

Flue gas exists the combustor and flows through three stages of cyclones (Figure 2) for particulate removal. The solids collected by the first stage cyclone are returned to the combustor 20 inches above the grid. Solids, mainly fly ash, collected by the second and third cyclones are collected by means of a lock hopper system. The expanded bed height is controlled by continuously rejecting solids at a controlled rate through a port at the 90-inch (2.3 m) elevation. Initial check-out was done with the gases from the second cyclone entering a vessel containing granular bed filters for final particulate removal before the flue gases entered the turbine test section. Operating difficulties with the granular bed filter prompted its replacement with a third stage cyclone inside the pressure vessel.

Pressure control is accomplished by bleeding a small amount of flue gas through a by-pass line around the turbine test section (Figure 2). The by-pass stream is expanded through a choked nozzle with make up air supplying the back pressure control. A measuring orifice was installed downstream of the turbine test section. During a run both turbine mass flow and inlet temperature are scanned once a minute and recorded on magnetic tape. Particulate and analytical sampling trains are also located downstream of the turbine section at 200 kPa pressure.

Figure 1

Combustor Corrosion Probe Location

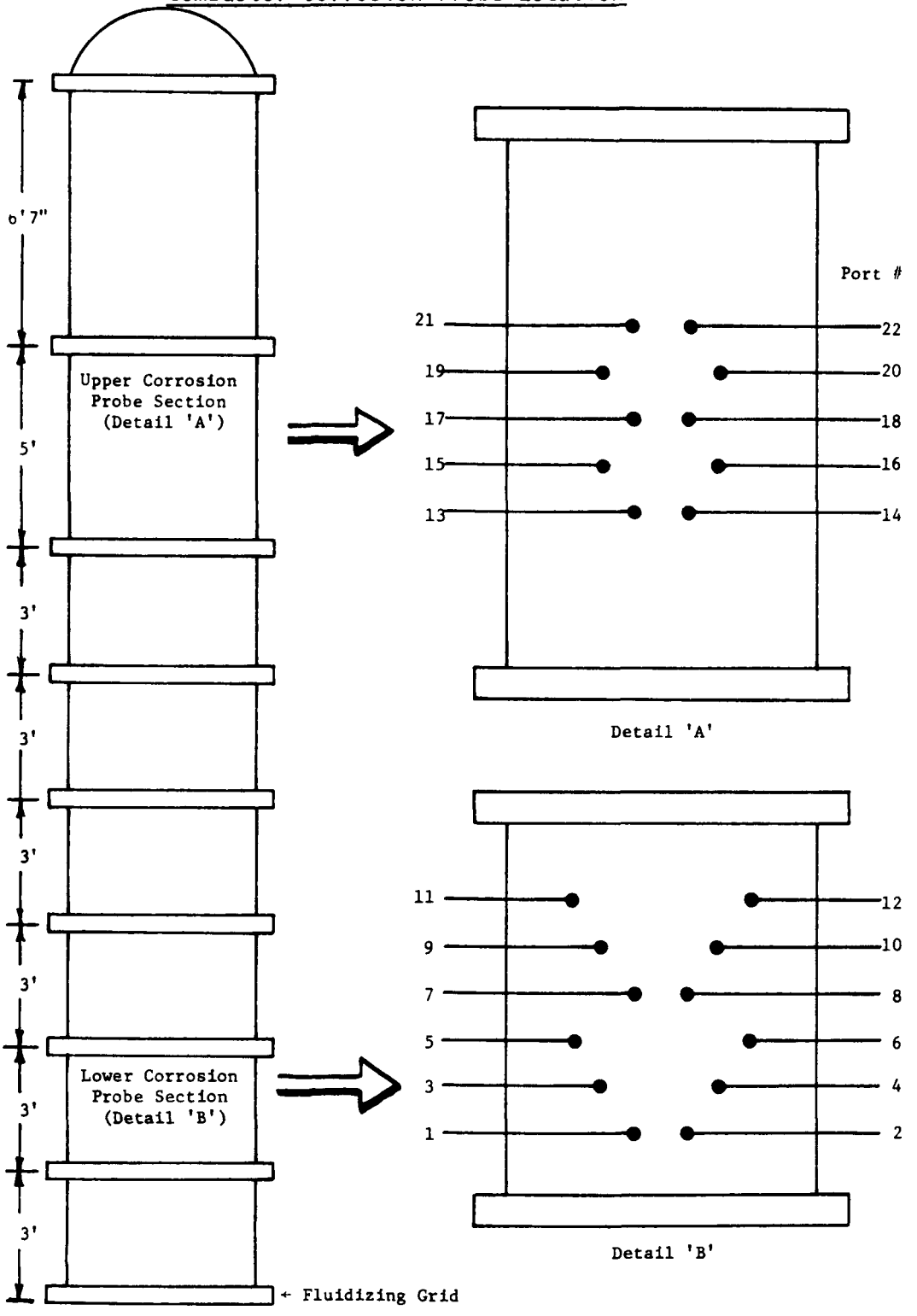
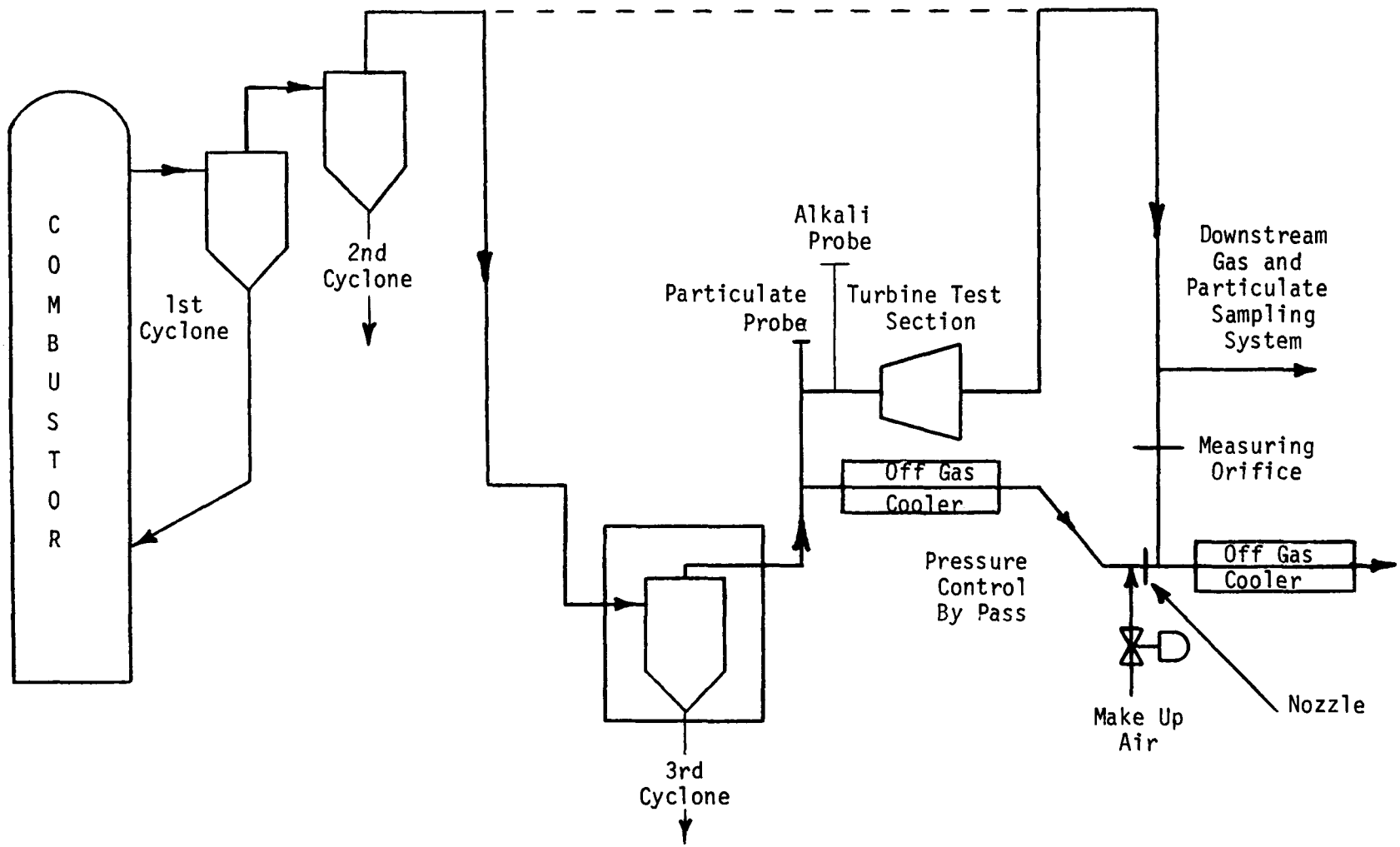


Figure 2

Miniplant Flow Schematic



Heat Exchanger Specimen Probes

The specimens prepared by Westinghouse for the FBC combustor fireside corrosion/erosion exposures are 1.25 inch OD X 1.00 inch ID by 3 inch long cylinders with thermocouples inserted in the walls. Specimens of 2 different alloys selected for a given test matrix temperature are welded together, plugged at the end and welded to a tube section to form a bayonet probe. This specimen probe consists of a central cooling tube, thermocouple conduits, cooling air inlet and outlet and a flange for connection to the miniplant combustor port (Figure 3). The temperature of each specimen probe is controlled independently by regulating the flow rate of cooling air delivered to that probe. Each probe has a separate temperature control loop (Figure 3) consisting of a temperature controller, transducer (current-to-pneumatic) and control valve. Cooling air to the in-bed probes is supplied by an air compressor and a blower supplies air to the probes in the free board. This provides a reliable, independent and readily adjustable temperature control for the 21 specimens probes (each with 2 alloy specimens) inserted in the combustor. It permits control of 12 in-bed specimen probes at mean temperatures of 1050°F, 1200°F, 1400°F and 1600°F and 9 above-bed specimen probes at temperatures of 1200°F, 1400°F and 1600°F, with 3 specimen probes at each temperature.

The alloy-temperature matrix for in-bed and above-bed Exxon miniplant PFBCC exposure tests is shown in Table 1.

Table 1

Heat Exchanger Materials
Alloy-Temperature Matrix

	Specimen Temperature (°F)			
	In-Bed Only	In-Bed and Above-Bed		
Alloy	1050°	1200	1400	1600
2 1/4 Cr - 1 Mo	X			
9 Cr - 1 Mo	X			
304 Stainless Steel		X		
Incoloy 800		X	X	
Hastelloy X			X	X
Haynes 188				X

The heat exchanger specimen probes were installed in the combustor according to the location schedule presented in Table 2. Probes in ports #1 to 12 are immersed in the fluidized bed (i.e., "in-bed" probes).

The probes were installed prior to the shakedown run and had accumulated 117 hours of exposure time during the shakedown. Therefore, at the completion of the current 250 hour test, the probes had been exposed for a total of 367 hours.

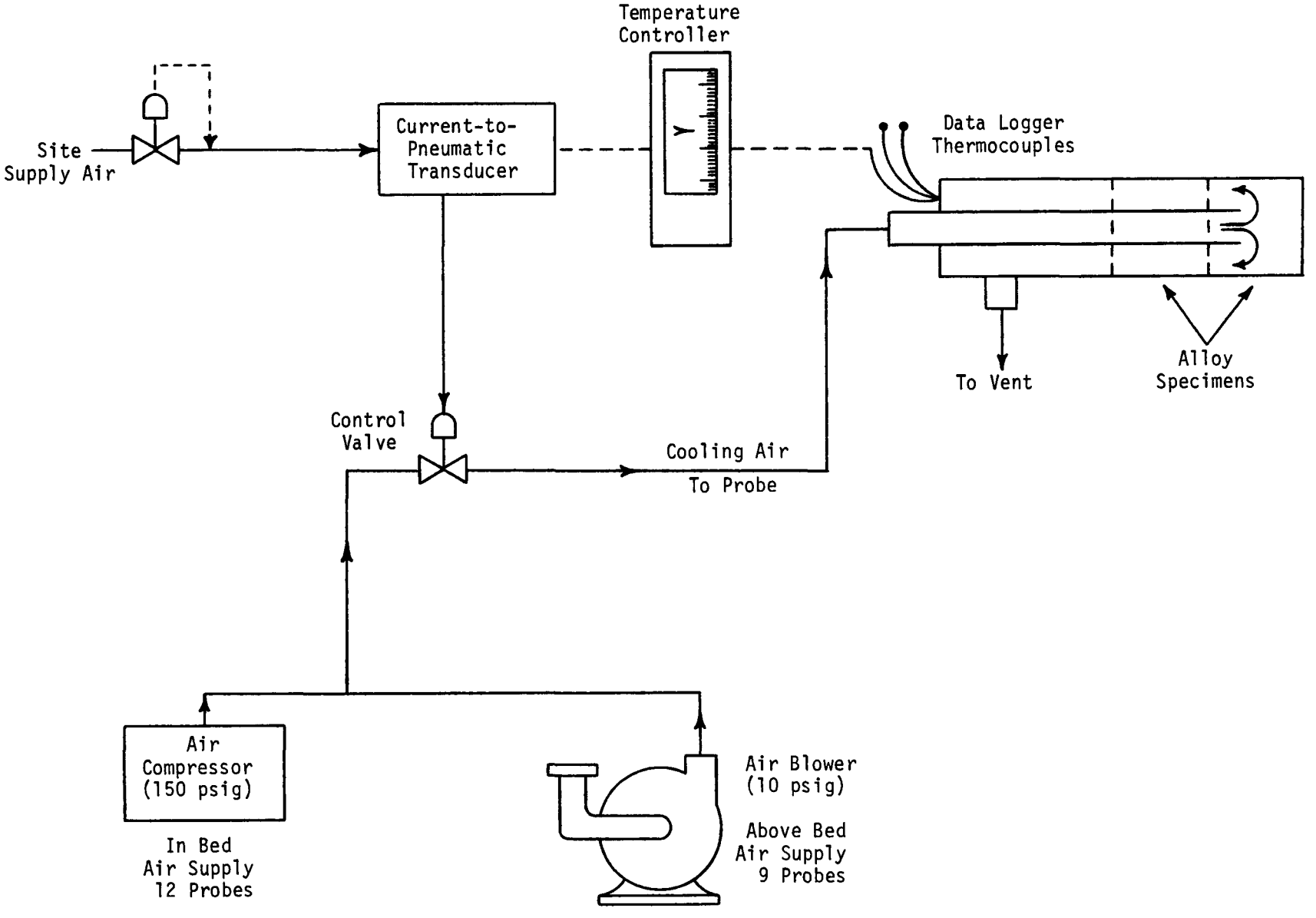


Figure 3

ER&E Miniplant PFBCC Hot Corrosion Specimen Probe Temperature Control System

Table 2

Material Description and Location

Combustor Port #	Specimen Material (Outer)*	(Inner)*	Target Operating Temperature °F	°C
1	H	X	1600	871
2	X	8	1400	760
3	X	H	1600	871
4	8	X	1400	760
5	X	H	1600	871
6	8	X	1400	760
7	8	3	1200	649
8	9	2	1050	566
9	3	8	1200	649
10	2	9	1050	566
11	3	8	1200	649
12	2	9	1050	566
13	H	X	1600	871
14	8	X	1400	760
15	X	H	1600	871
16	8	X	1400	760
17	X	H	1600	871
18	X	8	1400	760
19	3	8	1200	649
20	8	3	1200	649
22	3	8	1200	649

Materials:		
	H - Haynes 188	1600
	X - Hastelloy X	1600 and 1400
	8 - Incoloy 800	1400 and 1200
	9 - 9 Cr - 1 Mo	1050
	2 - 2-1/4 Cr - 1 Mo	1050
	3 - 304 stainless steel	1200

---

* Inner specimen is closest to center of combustor

* Outer specimen is closest to combustor wall

Individual heat exchanger specimen temperatures are recorded on a new 100-point data logger - a Doric "Digitrend 210" with alarm capabilities. This unit provides a time-temperature record of the heat exchanger probe specimens at specified intervals. If the temperature of any specimen deviates from a pre-selected acceptable range, the data logger system will (1) alarm, (2) print out all specimen temperatures and the time once, and (3) continue to print the temperatures of the specimens outside of the control span until the proper specimen test temperature is restored.

Gas Turbine Test Section

The turbine test section is intended to provide a region with representative flow velocities to furnish engineering information on the possible corrosion/erosion deterioration of gas turbine materials exposed to the exhaust gas from a pressurized fluidized bed coal combustor. A photograph of the turbine test section components in their proper flow sequence is presented in Figure 4.

The General Electric test section for gas turbine materials corrosion/erosion evaluation incorporates both buckets and nozzle test specimens (Figure 5). The bucket (impulse profile) specimens are arranged in 3 cascades (6 specimens in each cascade) forming 3 right angle turns in the flow stream. A fourth cascade, which returns the flow to its original direction, consists of 6 nozzles (reaction profiles) which accelerate the exit flow to a 1.0 Mach number. The rectangular duct is 5/8 inch deep and 2-5/8 inch wide at the bucket cascade section. All profile chords are 1.0 inch.

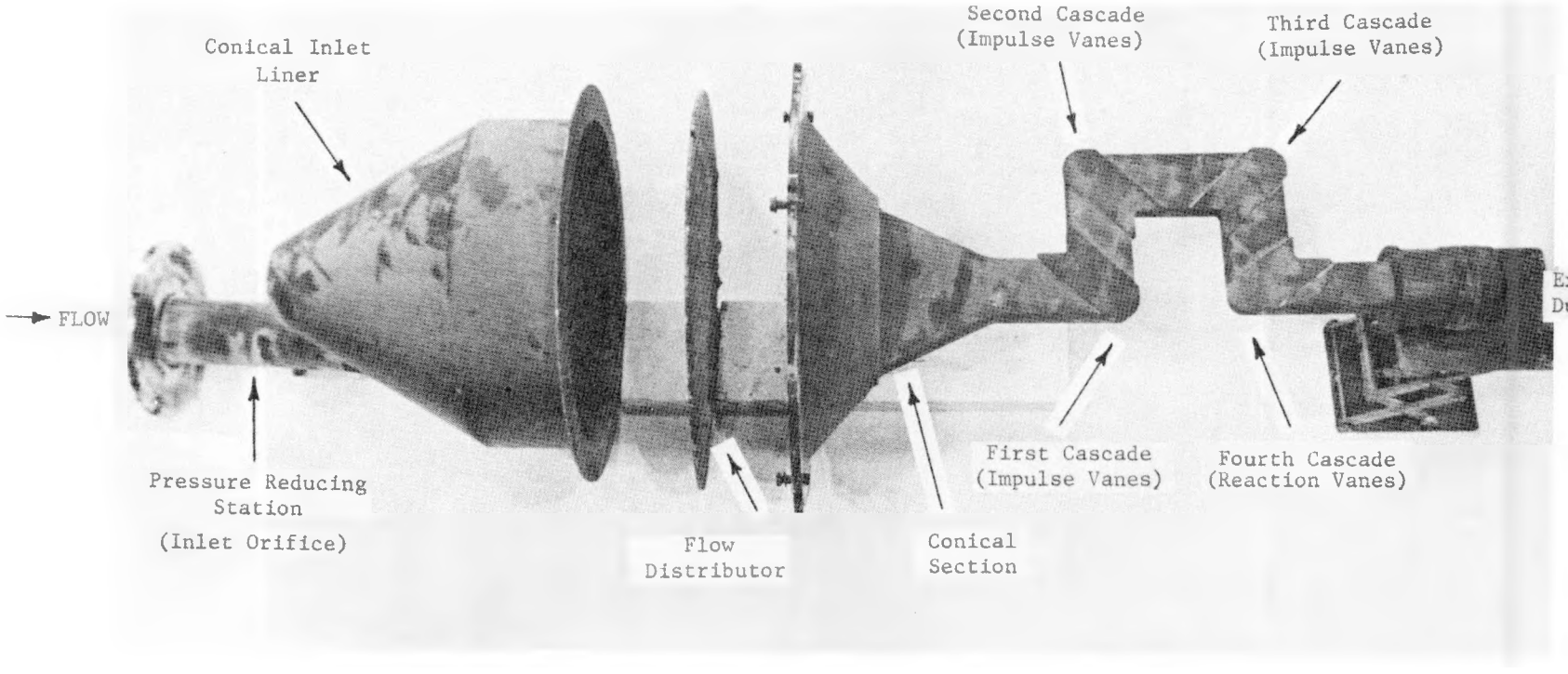
Enclosing the flow duct containing the airfoil specimens is a pressure shell which comprises the GE turbine test section. A pressure reducing section is an integral part of the turbine test section and located just upstream of the test passage. This is intended to adjust the turbine test section pressure so that proper blade velocities will be attained at miniplant test conditions.

The turbine test section was installed in the discharge line immediately downstream of the granular bed filter vessel (now housing the third stage cyclone). A new section of discharge pipe was fabricated and refractory lined to permit the insertion of the turbine test section.

Turbine test section flow control and combustor pressure control is accomplished by diverting a fraction of the flue gas through a by-pass loop around the turbine test section (Figure 2). The by-pass stream is expanded through a choked nozzle, with makeup air supplying the back pressure control. A measuring orifice was installed downstream of the turbine test section, so that turbine mass flow rate can be determined.

Figure 4

Turbine Test Section



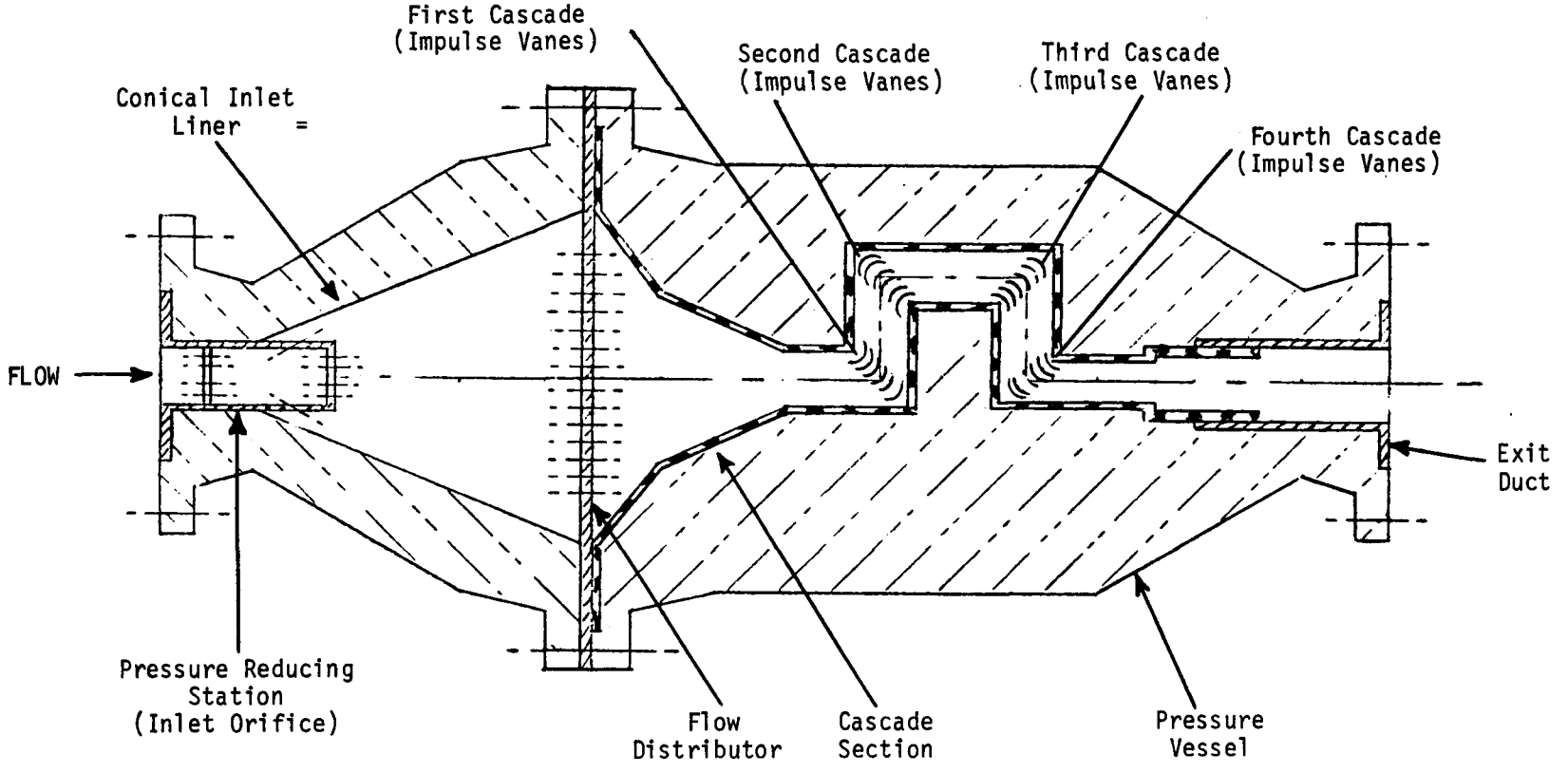


Figure 5

Turbine Test Section Schematic

FLOW CONDITIONS

Pressure - 9 atm

Temperature - 1550°F

Gas Flow Rate - 0.72-0.92 lb/sec
550-722 scfm

The study of turbine blade hot corrosion is deeply concerned with the possible attack of alkali salts on the blade materials. Since a commercial system would be designed to operate at high temperatures, the miniplant system was modified to attempt to maintain the flue gas at a temperature of at least 1550°F at the turbine test section inlet. To satisfy these temperature conditions it was found necessary and practicable to combust some methane in the discharge piping. This will compensate for the thermal losses in the pipe lines and the third cyclone vessel and assure that temperatures upstream of the turbine test section remain above 1550°F, as requested.

A set of "practice" specimens was installed during the 117 hour shakedown test. This set was replaced with a complete test set provided by General Electric prior to the start of the current 250 hour test.

III. 250 HOUR EXPOSURE TEST

Preparation for the first segement of the 1000 hour materials corrosion test program were completed in mid-June 1978. The test commenced on June 19 and was voluntarily terminated on June 30 after 250 hours of successful operations. Superficial inspection of the turbine blade specimens and heat exchanger probes following the run showed no visible signs of erosion or corrosion. Detailed inspections will be made by General Electric and Westinghouse.

Preparations for the 250 hour run included installation of a new bed solids removal system (used to control bed height), and installation of a vapor phase alkali metal sampling system, upstream of the turbine test section.

The combustor was operated at an average temperature of 1700°F throughout the 11 day period, and at a constant 9 atm pressure. Operations had to be interrupted several times due to coal feeding problems caused by line erosion. The total lost time after the unit was lined out was 6 hours. Run conditions were well controlled during the test with mass flow and temperature in the gas turbine test section reasonably steady. Natural gas injection at 5 locations in the flue gas line between the second stage cyclone and the turbine test section maintained the flue gas above 1580°F before entering the test section. Flue gas temperature profiles at three times in the run are shown in Figure 6. Examination of the flue gas piping following the run revealed a large accumulation of fly ash around thermocouple No. 5, resulting in an erroneous gas temperature reading. The thermocouple had become so inbedded in the deposits that it became isolated from the gas stream and was indicating a low temperature. Historical data indicated that the temperature drop across the 2nd cyclone is approximately 25°F. This temperature drop was used to correct the temperature profile. The corrected profile is shown in Figure 6. Correcting for this temperature measurement error, it would take approximately 40 hours before all points in the system were at a minimum of 1550°F.

A summary of the operating conditions and gaseous emissions during the test is given in Tables 3 and 4. The run has been broken down into 10 parts to facilitate the data handling process. Illinois No. 6 coal and Pfizer No. 1337 dolomite were used in this run at a nominal calcium to sulfur molar feed ratio of 1.45. The SO_2 retention levels in the run averaged about 90%. This exceeds slightly the latest new source performance standard of 85% SO_2 removal specified by the EPA.

Several analyses of the coal combusted during Run 78 showed an average moisture content of 13%. This was the first time that coal with such a high moisture content was fed into the combustor, and surprisingly, did not present any feeding problems. The coal had been screened to remove the -50 mesh fines and this was undoubtedly responsible for the lack of feeding problems. Chemical and particle size analyses of the coal and dolomite used in this run is presented in Table 5.

Figure 6

Flue Gas Temperature History - Run 78

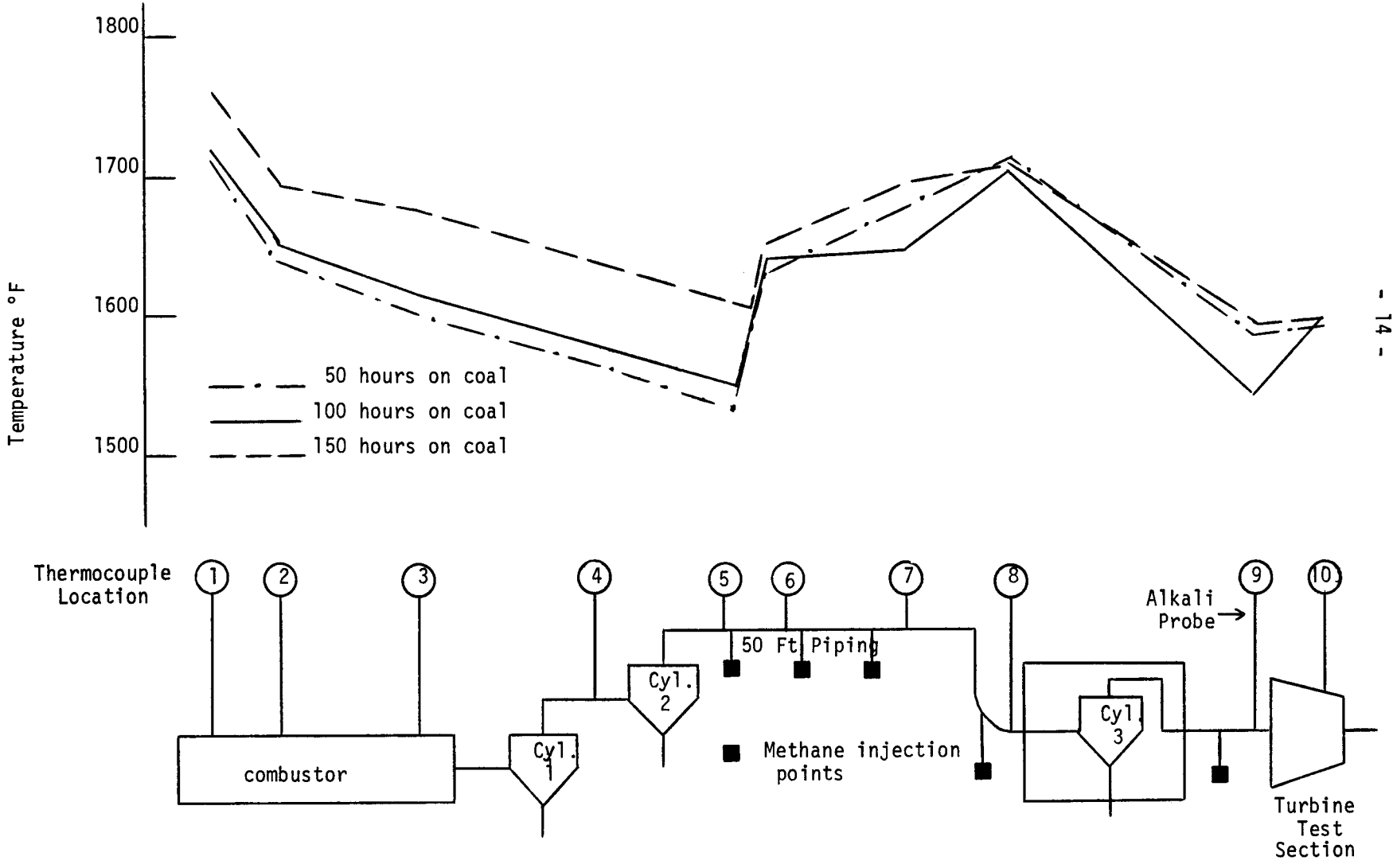


Table 3

Miniplant Operating Conditions and Emissions

Nominal Operating Conditions	Run 78.1	78.2	78.3	78.4	78.5	78.6	78.7	78.8	78.9	78.10
Date	6/19-6/20	6/21	6/22	6/23	6/24	6/25	6/26	6/27	6/28	6/29-6/30
Pressure (psig)	120	120	120	120	120	120	120	120	120	120
Temperature (°F)	1640	1660	1670	1680	1690	1710	1720	1720	1720	1720
Superficial Velocity (ft/sec)	5.9	6.0	6.0	6.0	6.1	6.1	5.8	6.2	5.8	5.9
Expanded Bed Height (ft)	12.4	11.6	9.4	11.2	10.2	10.9	10.7	9.4	9.5	12.4
Excess Air %	34	25	23	21	15	25	15	15	15	34
Coal Feed Rate (lb/hr)	224	266	261	270	245	290	292	288	288	288
Nominal Ca/S Molar Feed Ratio	1.25	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45	1.45
Flue Gas Emissions										
SO_2 (ppm)	286	231	169	157	460	270	113	363	260	286
NO_x (ppm)	45	38	41	42	37	32	28	41	36	15
CO (ppm)*	679	679	613	655	644	667	590	724	596	679
CO_2 (%)	12.5	14.0	13.7	14.3	14.3	15.3	14.0	15.6	16.0	12.5
O_2 (%)	5.5	4.2	4.0	3.7	2.8	4.3	3.2	3.2	2.8	5.5
SO_3 (ppm by wet chemistry)	0.6	--	9.9	--	--	--	12.8	--	--	0.4

---

* CO analyzer appeared to be malfunctioning, reported levels may be high.

Table 4

Gas Chromatographic Analyses of Flue Gas During Run 78

Date	S Analyses of Dry Flue Gas				Hydrocarbon Analyses of Wet Flue Gas		
	SO_2 ppm	H_2S ppm	COS ppm	CS_2 ppm	CH_4 ppm	C_2H_6 ppm	C_3 to C_6 ppm
06-22	117	1	N.D.	N.D.	18	14	N.D.

N.D. = Not Detected

Table 5

Coal and Sorbent Analyses

(Used in Run 78)

Illinois Coal No. 6 Analysis

Condition →	78.1		78.2-78.10	
Basis →	As Received	Dry	As Received	Dry
Volatile Matter, %	39.95	41.25	37.57	43.04
Fixed Carbon, %	45.32	46.80	40.74	46.73
Moisture, %	3.16	--	12.82	--
Ash, %	11.57	11.95	8.88	10.19
Total Carbon, %	65.58	67.65	57.76	65.16
Hydrogen, %	5.63	5.81	5.02	5.66
Sulfur, %	4.17	4.31	3.52	4.04
Nitrogen, %	2.41	2.49	2.26	2.55
Oxygen, %	7.55	7.79	11.00	12.41
Heating Value, BTU/lb.	12,042	12,435	10,988	12,604

Particle Size Distribution

U.S. Sieve #	50	40	30	25	20	8
	% Finer Than					
	0.5	2.7	18.2	27.7	40.5	99.7

Pfizer 1337 Dolomite Calcined Analysis

	CaO	MgO	Cl	Na	K	Fe_2O_3	SiO_2	Al_2O_3	S
Weight Percent	55.31	44.10	0.09	325 ppm	439 ppm	0.23	0.82	0.32	0.17

Particle Size Distribution

U.S. Sieve #	25	20	18	16	12	8
	% Finer Than					
	0.5	0.7	1.5	21.5	38.2	92.2

Variations in
SO_2 Emissions

During the 250 hour run SO_2 emissions fluctuated more than expected. Several areas were investigated for possible causes. It was determined that variations in gas residence time and problems with the flue gas sampling system were accountable for most of the variations observed.

The change in gas residence time was due to a drift in bed height during the run. Selected intervals of time were examined to determine if the changes in SO_2 emissions can be attributed to the changes in bed height. This was found to be true for many of the perturbations. Operating problems with the flue gas sampling system which accounted for most of the remaining variations, were caused by gas dryer leakage and water condensation in the sampling line. When these problems occurred, SO_2 measurements were backed up with wet chemistry analysis. These measurements tend to confirm the steadier SO_2 emission measurements.

Particulate Loadings

Particulate loadings for run 78 ranged from 0.014 to 0.056 gr/SCF (32 to 128 mg/m^3) as shown in Table 6. Samples were taken with Balston total filters and with the SRI (Southern Research Institute) 5-cyclone train. Balston filter samples 1, 2, and 5 were taken at low pressure downstream of the turbine. The three SRI cyclone samples and all the other Balston filter samples were taken at the particulate sampling station at high pressure just upstream of the turbine test section. Figure 7 shows the mean particulate size distribution of the material captured by all of the Balston filter samples. The dashed line represents the standard deviation from the mean. As seen, the mass median particle diameter was 2 ± 1 μm.

The SRI 5-cyclone train catches were analyzed for the three samples taken during run 78. For all three SRI cyclone samples, the particulate loading has been somewhat lower than Balston filter samples taken at similar times. The size distribution of the third SRI sample taken during run 78 was compared with the mean Balston filter size distribution in Figure 7. These SRI 5-cyclone catches were analyzed individually by Coulter Counter and the results were combined mathematically to obtain a total sample size distribution. This total sample size distribution was never more than one standard deviation away from the averaged Balston filter size distribution. However, in general, for these low loadings, (0.014 to 0.025 gr/SCF) the size distribution of material captured by each cyclone in the 5 cyclone set, was not very reproducible.

The reason for these discrepancies is believed due to the small particle sizes, the small amounts of sample captured and the large area over which the sample was distributed within the cyclones. This could lead to uncertainities in the total particulate loading and the particle size distribution.

Table 6

Run 78 Particulate Loading Summary

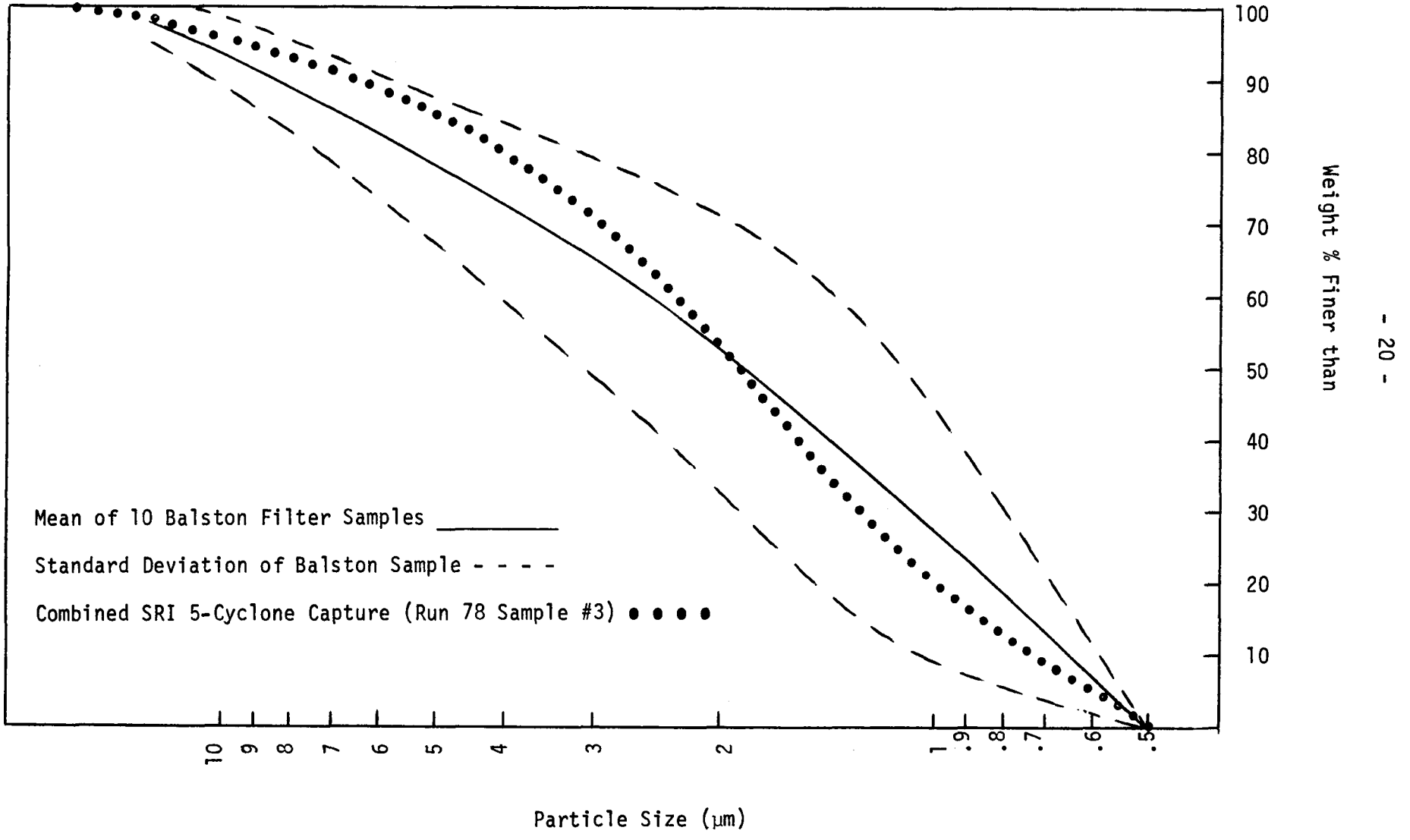
Date	Time	Sampling Method	mg/m^3	Grains/SCF
06-20-78	00:30-02:30	Balston Filter #1*	55	0.024
06-20-78	02:00-10:30	SRI Cyclones #1	46	0.020
06-21-78	05:00-07:00	Balston Filter #2*	76	0.033
06-21-78	21:45-24:00	Balston Filter #3	78	0.034
06-23-78	02:30-04:30	Balston Filter #4	64	0.028
06-23-78	15:00-17:00	Balston Filter #5*	89	0.039
06-23-78	16:15-19:30	SRI Cyclones #2	57	0.025
06-25-78	19:20-20:50	Balston Filter #6	96	0.042
06-26-78	21:20-23:20	Balston Filter #7	128	0.056
06-27-78	18:45-00:15	SRI Cyclones #3	32	0.014
06-28-78	21:00-23:00	Balston Filter #8	103	0.045
06-29-78	14:30-16:30	Balston Filter #9	82	0.036
06-30-78	05:30-07:30	Balston Filter #10	124	0.054

---

* Samples taken downstream of the turbine test section. All other samples were taken just upstream of the turbine test section.

Figure 7

Comparison of Average Balston Filter Particulates with Combined SRI 5-Cyclone Train Particulates (Run 78)



Also in the catch of the first cyclone in the second sample taken during run 78, large (100-400 μm) particles were found. They were analyzed by SEM and found to be large metallic particles. Investigation showed that the large particles originated in the antiseizing compound that was used on the nuts and bolts that secure the cyclone flanges.

Total catch efficiencies were calculated for each cyclone in the SRI train, for all samples taken to date. The total catch efficiency seemed to reach a maximum of between 10% and 35% at sampling rates of 2 to 3 SCFM (0.8 to 1.2 ACFM). Data scatter was large due to the seemingly large effect of sampling duration. Sampling periods were as long as possible (6 hours or until the ΔP across the cyclones became excessive) so that large amounts of sample could be collected and thus reduce the possibility of error. Total catch efficiencies seemed to decrease with increasing sampling duration. This unexpected result may have been due to the fact that two of the cyclones were upside down due to the vertical positioning of the train and re-entrainment may have been significant. A review of the available data indicated that a four hour sampling time seemed to be the best compromise between sample weight and adequate efficiency.

The collection efficiency of the cyclones as a function of particle size was also studied. The variation in cyclone cut diameter which is the diameter of the particle collected with 50% efficiency, with sampling flow rate was investigated. No correlation was found because of data scatter. Also, no consistent trend of decreasing cut point with cyclone number (size) was observed, contrary to the expected performance. For the third sample taken during run 78, no particle size was collected with more than 40% efficiency. Collection efficiencies ranged from 15% to 40% for particles between 0.9 and 10.0 μm. The SRI calibration of the first cyclone in the train with an aerosol (particle density 2.04 gm/cm^3) at 200°C with a flow rate of 28.3 l/min reported the cyclone cut size to be 6.5 μm.[1] The cyclone cut point of this first cyclone at miniplant sampling conditions (900°C, 900 kPa) would seem to be much larger, since collection efficiencies were much lower, even with larger particles.

In conclusion, the SRI 5-cyclone train does not appear suitable for sampling low particulate loadings of small (98% less than 10 μm) particle size distributions under typical miniplant operating conditions. Atmospheric pressure calibration work is being planned to check the published SRI data.[1] Both hot and cold tests may be conducted to determine the effects of temperature on the collection efficiency of each cyclone. The Balston filter method coupled with a Coulter Counter particle size measurement gives satisfactory particulate loading and particle size measurements. Further particulate characterization work will be carried out by Exxon Research under the current EPA PFBC contract. This will include the evaluation of a cascade impactor at high temperature, high pressure conditions. The SRI cyclone will also be evaluated at a point prior to the third stage cyclone where particulate loadings and particle sizes are expected to be more suitable for this device.

---

(1) Development and Laboratory Evaluation of a Five-Stage Cyclone System. EPA-600/7-78-008, Southern Research Institute.

Alkali Probe Train

An alkali probe train was designed and constructed by Exxon Research to enable acquisition of a hot pressurized flow gas sample before entering the General Electric turbine test section. The probe was designed to measure vapor phase Na and K concentrations of the flue gas at 1550°F and 9 atm pressure. Figure 8 is a schematic of the alkali probe train. The temperatures shown are those for test 4 of the 250 hour run.

The hot pressurized flue gas enters the probe at system temperature and pressure and is prefiltered through three layers of astroquartz. Na and K vapors in the flue gas are then condensed on the walls of an air cooled quartz tube, which lowers the flue gas temperature from approximately 1550°F to 400°F. Alkali metals which condense on particulates in the flue gas are collected in a Balston filter after exiting the quartz tube. Flow is manually controlled by a needle valve and measured by a wet test meter.

A number of tests for alkali concentration were performed during the 250 hour run; only one produced satisfactory results. Na and K concentrations measured in the flue gas at 1610°F and 9 atm pressure were 2 ppmw and 0.5 ppmw, respectively.

Table 7 is a breakdown of the alkali concentrations as measured at six different locations in the alkali train. From this data it appears that the greater percent of Na and K condensed on the external surfaces of the flue gas particulates as the gas was cooled in the quartz tube; the particulate were then captured in the Balston filter. This finding should be confirmed in subsequent tests.

Turbine Test Section

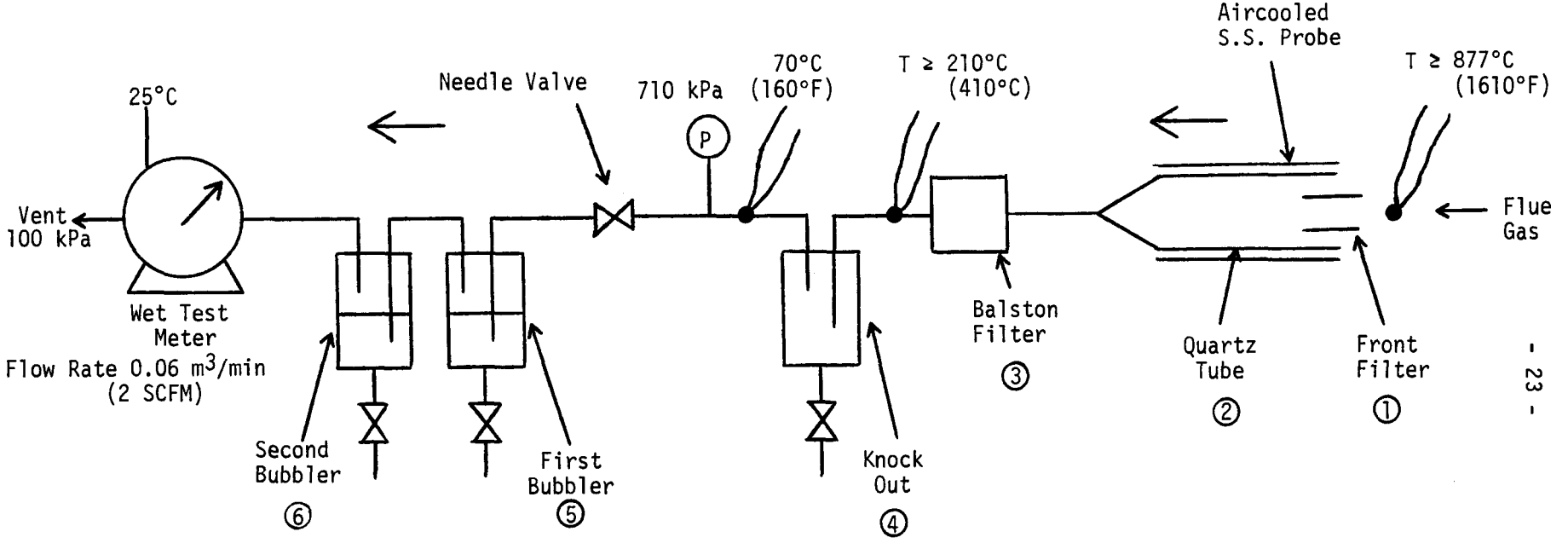
The gas flow rate through the turbine test section was reasonably constant and within the specifications set by General Electric. Figure 9 shows how little the turbine gas flow rate varied throughout the run. Visual examination of the turbine blade specimens following the run revealed no obvious signs of erosion or corrosion. Most noticeable was the flow pattern of deposit build-up, especially on the suction (upper) side of the trailing edge. These deposits were easily removed by gentle brushing. Five of the 24 turbine blade specimens were retained by General Electric for metallurgical examination.

Figures 10 through 13 are views of the leading and trailing edges of the 4 turbine cascades after the 250 hour run. The deposition on the trailing edge can be clearly seen.

The problem of refractory spalling associated with the shakedown run was not experienced in this test. Insertion of liner caps at each pipe flange isolated the refractory from the gas stream and prevented a recurrence of the plugging problem in the turbine pressure reducing station.

Figure 8

Schematic of Alkali Probe Train
Alkali Test 4 During Run 78



① Front filter + particulates
② Quartz tube
③ Balston filter + particulates
④ Knock out solution
⑤ First distilled and deionized water bubbler
⑥ Second distilled and deionized water bubbler

Table 7

Na and K Emission in Flue Gas
(Alkali Probe Test Run 78)

Alkali Train Location (a)	Samples	Wt. % of Total K Collected	Wt. % of Total Na Collected
①	Front Filter + Front Filter Particulates	36.8	6.8
②	Quartz Tube	3.2	0.7
③	Balston Filter Particulates	59.0	88.6
④	Knock Out Solutions	1.0	2.8
⑤	First Bubbler	~0.0	0.7
⑥	Second Bubbler	~0.0	0.4
	Total %	100.0	100.0
	ppmw in Flue Gas	0.54	2.06

(a) See Figure 8.

Figure 9

Turbine Test Section Gas Flow Rate

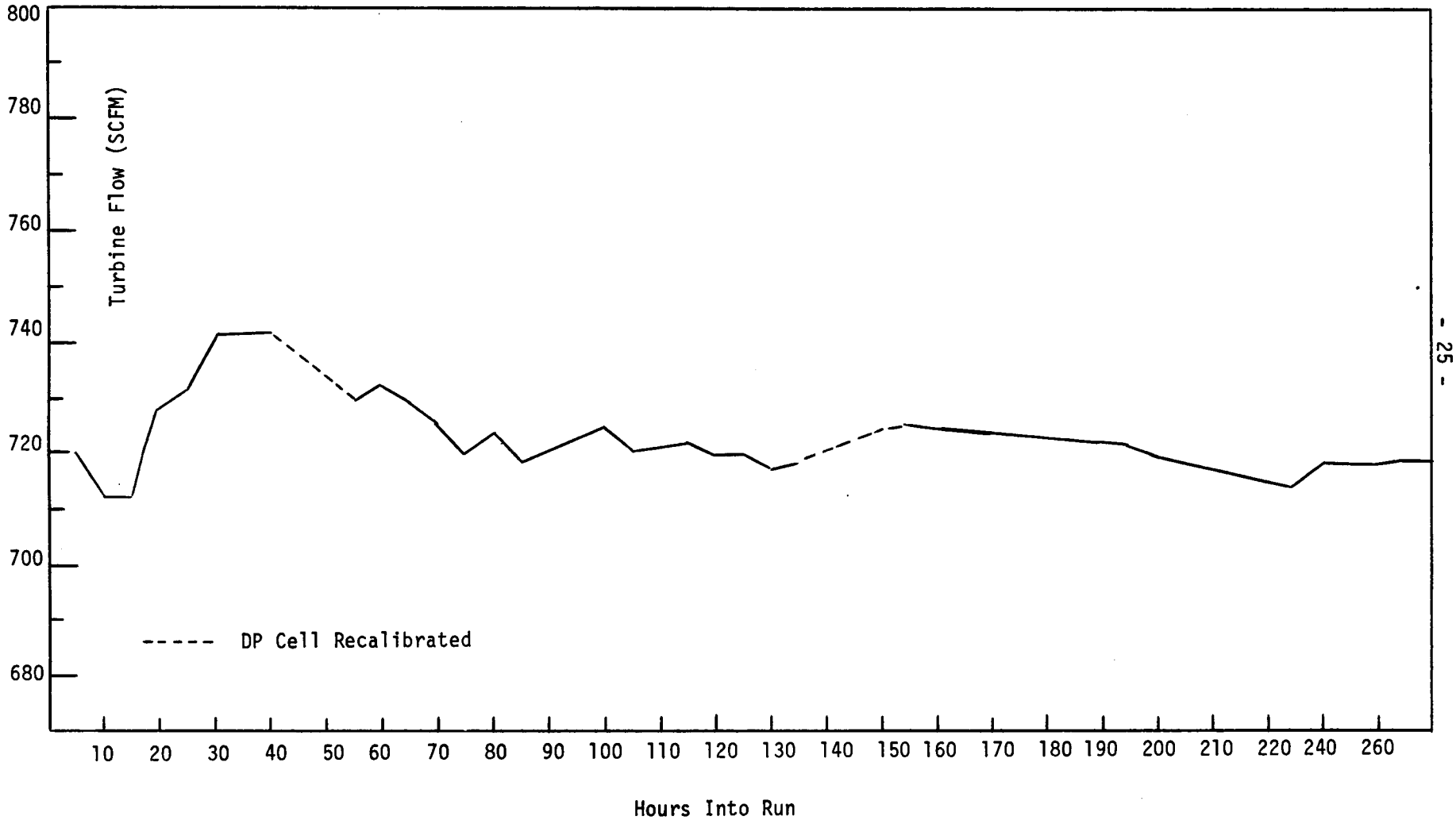


Figure 10

View of the Leading and
Trailing Edges of the First Cascade

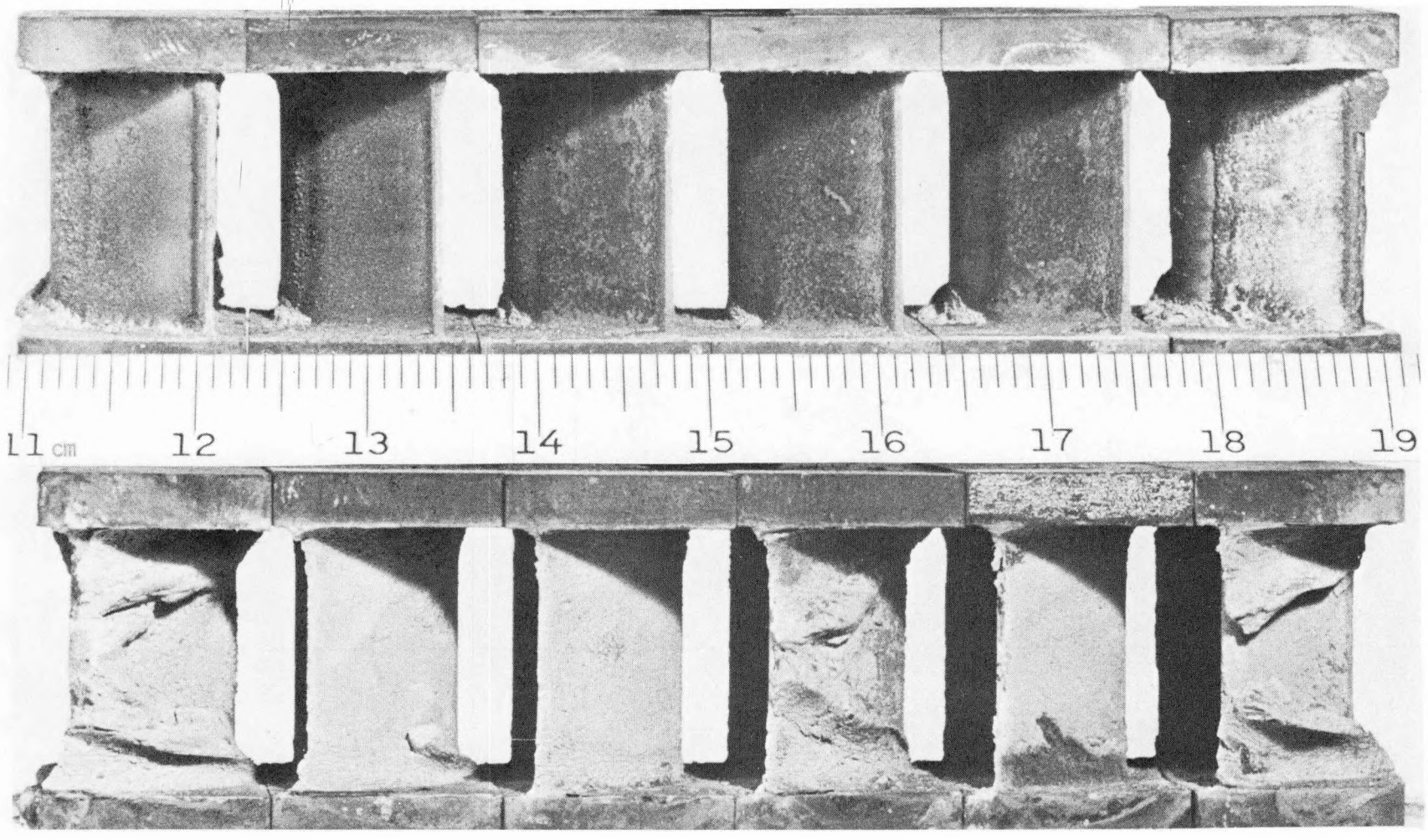


Figure 11

View of the Leading and Trailing
Edges of the Second Cascade

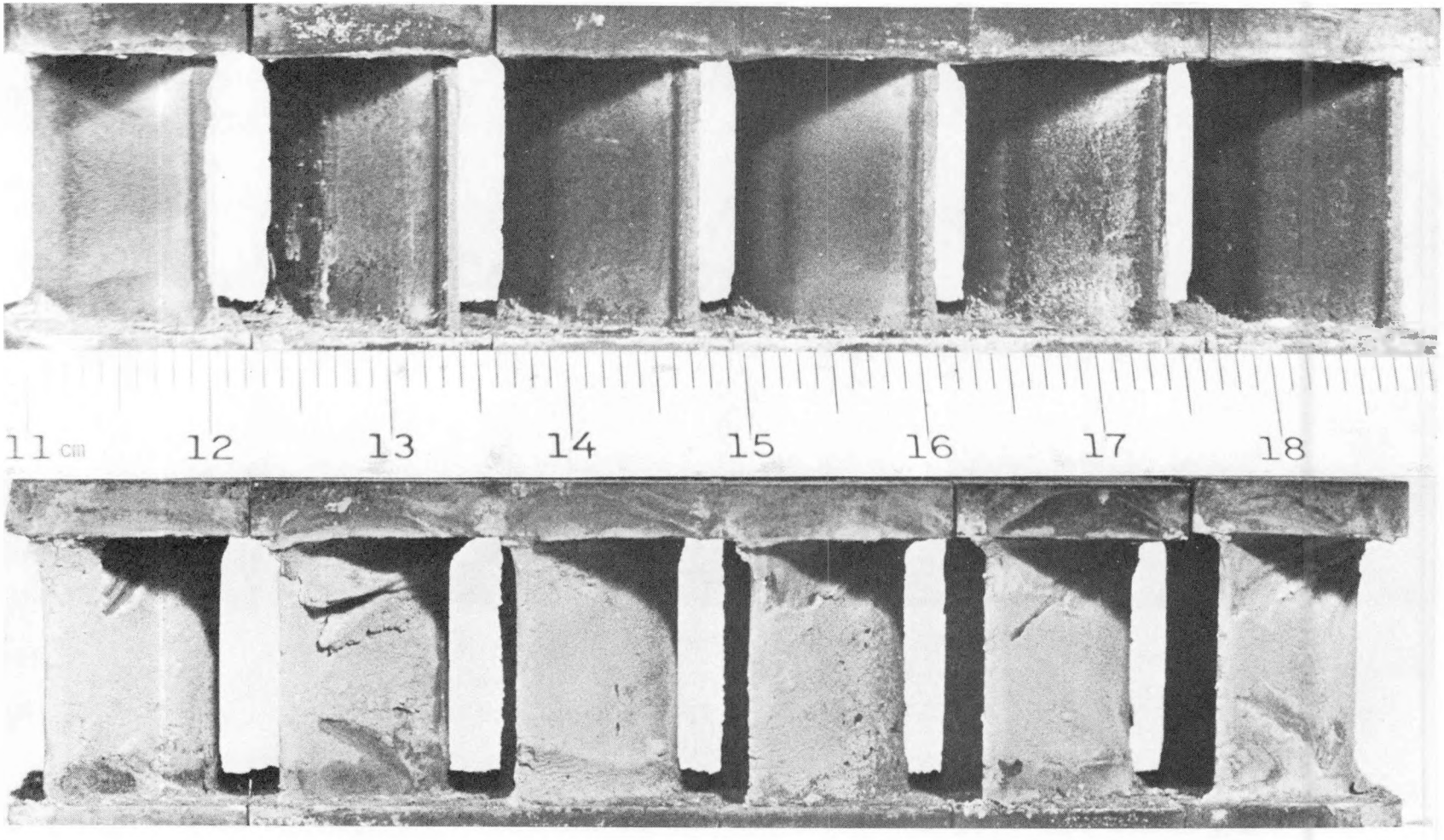


Figure 12

View of the Leading and
Trailing Edges of the Third Cascade

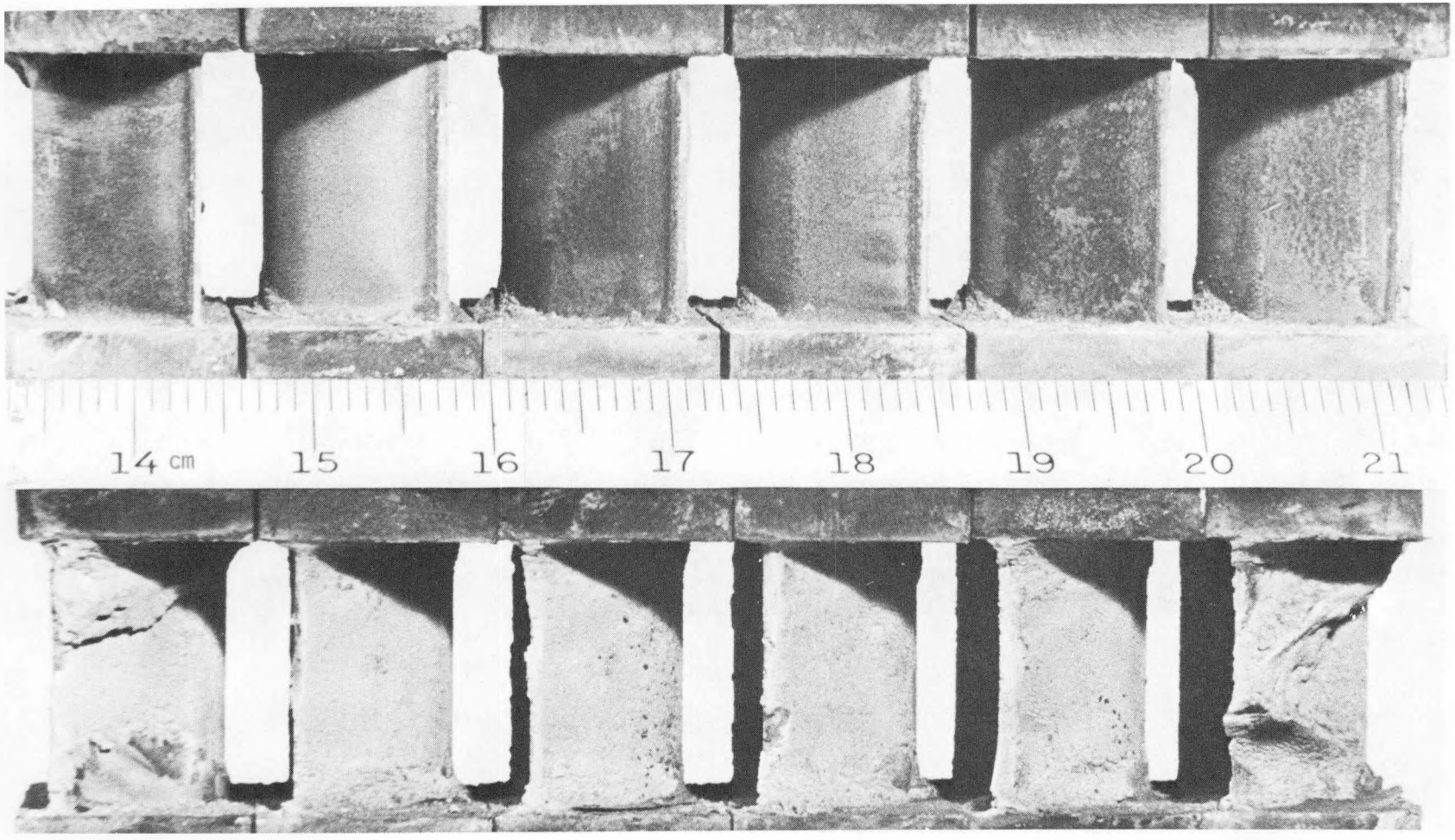
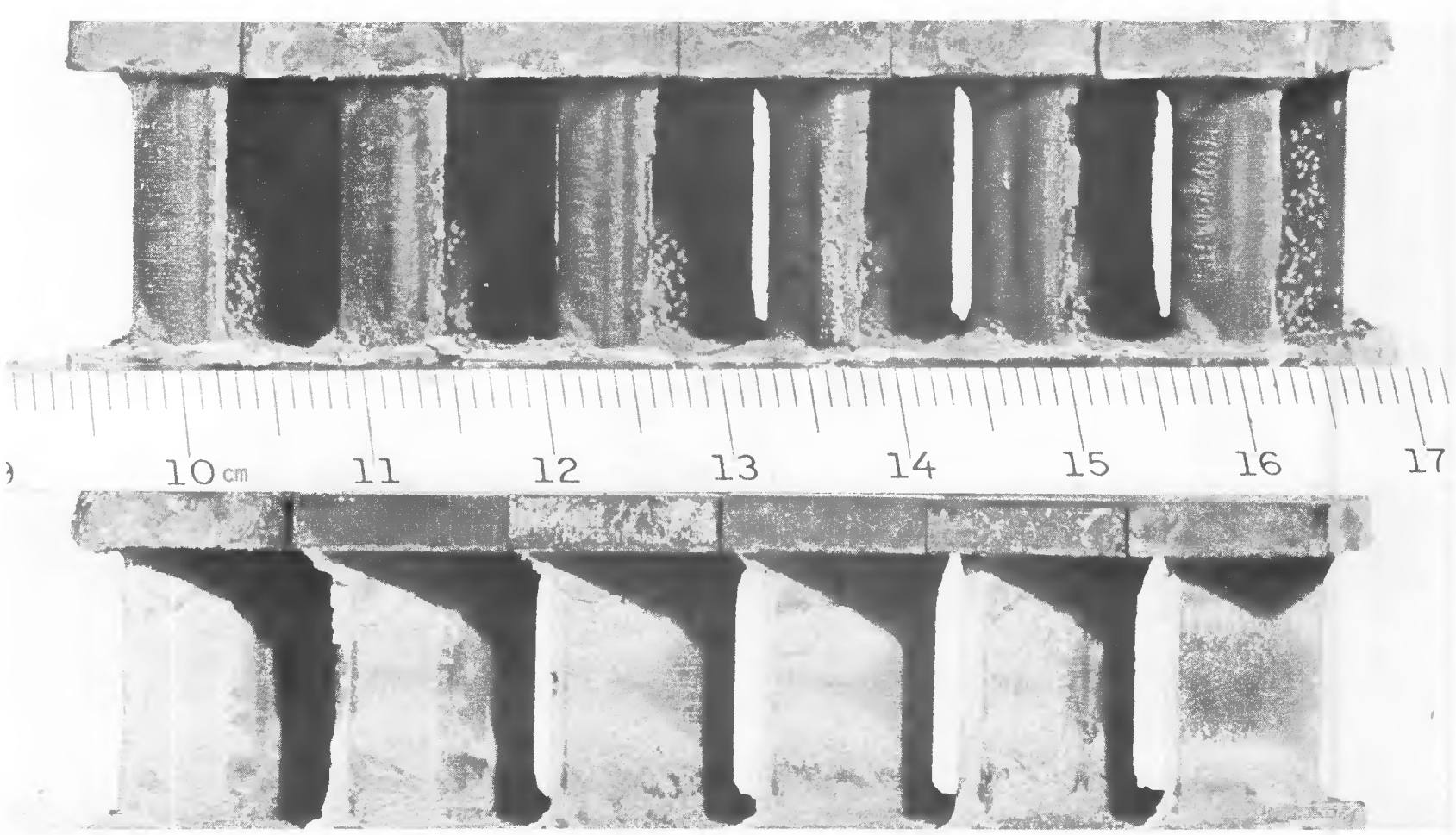


Figure 13

View of the Leading and
Trailing Edges of the Fourth Cascade



Corrosion Discs

During the 1000 hour hot corrosion exposure test, it is intended that combustor and discharge line conditions be constant. This provides an opportunity to obtain extended fireside corrosion data by also locating specimens in the freeboard of the combustor. The same materials used for the turbine airfoil specimens were mounted on a support located inside the combustor. This will permit a comparison of the hot corrosion attack of the same material at two different regions within a PFBCC.

Three sets of alloy discs (4 samples per set) were received from General Electric for exposure in the 1000 hour testing program. The alloys received were U-700, IN-738, and FSX-414. The first two are nickel based alloys similar to those tested in the turbine test section; the latter is a cobalt based alloy. The discs are approximately 1 inch in diameter by 1/16 inch thick. In the 250 hour run, two specimens from each alloy set were exposed in the combustor freeboard region in the vicinity of the heat exchanger probes. A plot of the combustor temperature profile at three times during the run is shown in Figure 14. This figure also shows the location of the corrosion discs and their approximate exposure temperatures. Visual examination of the discs after the run revealed no obvious signs of erosion or corrosion (Figure 15). Three of the discs were taken by General Electric for metallurgical analysis.

Heat Exchanger Probes

Temperature data for the twenty-one (21) heat exchanger probes exposed during the first 250 hour segement run are presented in Appendix Tables A-1 through A-4. Temperatures at two locations in each probe were recorded every 20 minutes during the run. In these tables the recorded temperatures have been averaged for five (5) hour segments of the run. Also listed are the standard deviations for that time period as well as the maximum and minimum temperatures experienced by the specimen material during those five (5) hours.

This collated temperature data generally reveals excellent temperature control of the individual specimens. At steady state condition 60% of the specimens had a temperature deviation from the mean less than 20°F, 90% less than 30°F, and 100% less than 50°F.

Appendix Figures A-1 through A-7 are typical time-temperature histories of the different specimen probes controlled at the four (4) specified temperatures. The figures are as follows:

Figure 14

Miniplant Run 78: Combustor Temperature Profile

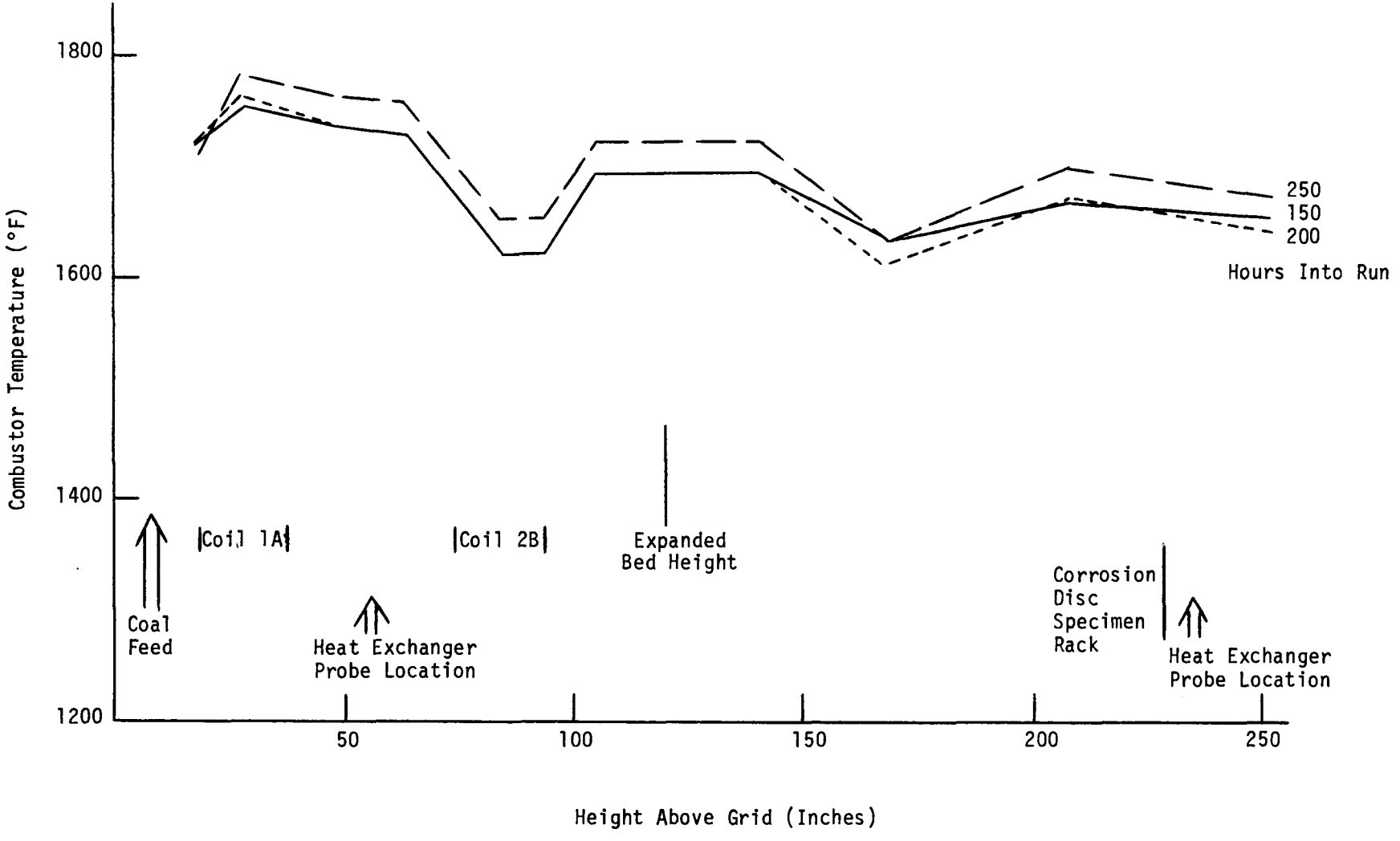


Figure 15

Corrosion Disc Rack

(After 250 Hours of Exposure)

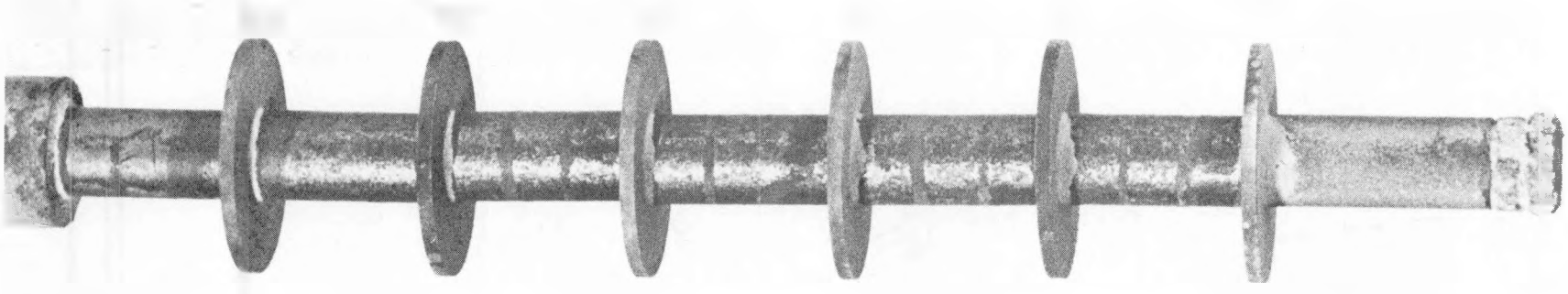


Figure A-1:	Probe 1	1600°F	In Bed
Figure A-2:	Probe 13	1600°F	Above Bed
Figure A-3:	Probe 2	1400°F	In Bed
Figure A-4:	Probe 14	1400°F	Above Bed
Figure A-5:	Probe 11	1200°F	In Bed
Figure A-6:	Probe 20	1200°F	Above Bed
Figure A-7:	Probe 8	1050°F	In Bed

The heat exchanger probes have been photographed in groups of three (3) according to their operating temperatures and location in the combustor. These photographs are presented in the appendix, Figures A-8 through A-14.

As seen in these figures, temperature gradients throughout the length of the probe, i.e., from "inner" to "outer" specimen, continue to exist even after extended exposure times. ("Inner" refers to the tube specimen nearest the center of the combustor.) In almost all cases the "inner" specimen operates at a substantially lower temperature than the "outer" specimen because of the flow distribution of the cooling air (Figure 3).

IV. APPENDICES

Table A-1

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
5 Hour												
Avg. Temp. °F	1584	1555	1476	1531	1540		1575	1577	1593	1573	1589	1563
Std. Dev.	2	7	13	4	4		10	2	2	3	3	4
Hi Temp. °F	1587	1561	1487	1536	1545		1583	1576	1595	1578	1594	1569
Lo Temp. °F	1581	1544	1454	1526	1535		1563	1580	1590	1572	1587	1560
10 Hour												
Avg. Temp. °F	1584	1555	1518	1570	1573		1595	1573	1590	1565	1588	1557
Std. Dev.	4.51	5	17	6	3		12	17	11	19	17	21
Hi Temp. °F	1592	1563	1547	1576	1579		1613	1598	1613	1593	1613	1587
Lo Temp. °F	1579	1551	1451	1531	1537		1581	1564	1576	1546	1570	1534
15 Hour												
Avg. Temp. °F	1581	1552	1517	1568	1571		1591	1565	1587	1557	1581	1549
Std. Dev.	4	2	14	3	2		8	6	7	6	6	6
Hi Temp. °F	1586	1561	1549	1575	1574		1612	1585	1608	1576	1602	1572
Lo Temp. °F	1576	1549	1499	1561	1566		1584	1561	1579	1548	1572	1537
20 Hour												
Avg. Temp. °F	1522	1515	1495	1512	1522		1539	1511	1538	1504	1532	1500
Std. Dev.	130	97	82	122	113		130	136	131	133	129	131
Hi Temp. °F	1587	1567	1549	1576	1574		1610	1588	1615	1589	1618	1582
Lo Temp. °F	972	946	954	978	967		1153	1163	1158	1161	1165	1164

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
25 Hour												
Avg. Temp. °F	1585	1552	1513	1563	1574		1607	1590	1613	1584	1608	1574
Std. Dev.	2	5	11	2	1		12	3	4	5	5	4
Hi Temp. °F	1590	1559	1542	1566	1577		1616	1595	1618	1592	1618	1583
Lo Temp. °F	1583	1540	1495	1559	1511		1582	1573	1605	1577	1602	1569
30 Hour												
Avg. Temp. °F	1579	1553	1510	1557	1571		1586	1587	1595	1581	1593	1573
Std. Dev.	6	4	7	2	3		26	15	10	19	7	22
Hi Temp. °F	1584	1558	1513	1559	1575		1609	1602	1605	1603	1599	1597
Lo Temp. °F	1570	1547	1501	1555	1568		1546	1566	1585	1557	1581	1546
35 Hour												
Avg. Temp. °F	1582	1551	1521	1561	1574		1602	1567	1598	1559	1591	1550
Std. Dev.	4	7	15	4	3		23	23	23	22	22	21
Hi Temp. °F	1586	1560	1539	1565	1577		1615	1582	1611	1569	1604	1563
Lo Temp. °F	1575	1541	1504	1555	1569		1561	1527	1558	1521	1552	1515
40 Hour												
Avg. Temp. °F	1584	1546	1511	1558	1573		1589	1596	1603	1592	1604	1585
Std. Dev.	4	8	18	4	2		22	8	11	10	11	15
Hi Temp. °F	1589	1554	1528	1564	1576		1614	1605	1616	1605	1614	1603
Lo Temp. °F	1578	1533	1491	1553	1571		1565	1589	1587	1583	1587	1573

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
45 Hour												
Avg. Temp. °F	1578	1547	1513	1554	1570		1563	1603	1594	1605	1591	1601
Std. Dev.	2	2	13	6	3		18	2	4	2	4	4
Hi Temp. °F	1580	1549	1525	1560	1575		1583	1606	1598	1608	1596	1606
Lo Temp. °F	1576	1545	1492	1546	1567		1539	1601	1590	1603	1587	1596
50 Hour												
Avg. Temp. °F	1578	1551	1510	1552	1569		1561	1597	1594	1598	1600	1590
Std. Dev.	1	5	18	3	4		15	3	6	4	13	6
Hi Temp. °F	1579	1557	1525	1556	1574		1573	1600	1602	1602	1619	1597
Lo Temp. °F	1576	1546	1486	1550	1564		1543	1593	1588	1593	1489	1583
55 Hour												
Avg. Temp. °F	1576	1549	1509	1551	1569		1598	1585	1611	1581	1610	1568
Std. Dev.	3	10	21	3	1		9	6	3	9	8	8
Hi Temp. °F	1578	1558	1537	1554	1569		1610	1590	1614	1586	1615	1574
Lo Temp. °F	1572	1540	1485	1547	1566		1589	1517	1607	1568	1599	1556
60 Hour												
Avg. Temp. °F	1578	1551	1512	1553	1569		1589	1587	1611	1584	1611	1572
Std. Dev.	4	5	14	3	3		17	2	7	5	3	5
Hi Temp. °F	1582	1554	1535	1558	1572		1610	1590	1620	1589	1615	1578
Lo Temp. °F	1574	1544	1495	1549	1564		1565	1584	1603	1577	1606	1565

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
65 Hour												
Avg. Temp. °F	1577	1546	1503	1552	1568		1585	1587	1611	1584	1611	1711
Std. Dev.	3	4	7	3	3		14	3	7	6	3	7
Hi Temp. °F	1581	1551	1510	1556	1511		1599	1591	1619	1591	1615	1578
Lo Temp. °F	1574	1541	1495	1547	1564		1562	1583	1603	1576	1609	1563
70 Hour												
Avg. Temp. °F	1576	1552	1494	1545	1566		1565	1599	1590	1601	1593	1592
Std. Dev.	4	5	5	4	2		16	2	3	2	3	2
Hi Temp. °F	1580	1560	1503	1550	1568		1582	1600	1595	1602	1598	1594
Lo Temp. °F	1570	1547	1491	1539	1563		1547	1596	1587	1598	1589	1589
75 Hour												
Avg. Temp. °F	1572	1555	1504	1547	1565		1562	1597	1596	1599	1596	1590
Std. Dev.	5	6	10	8	2		17	4	6	5	7	6
Hi Temp. °F	1579	1566	1511	1558	1569		1585	1604	1604	1608	1606	1600
Lo Temp. °F	1567	1550	1487	1539	1563		1542	1592	1589	1593	1586	1582
80 Hour												
Avg. Temp. °F	1572	1545	1506	1547	1563		1573	1583	1593	1583	1590	1571
Std. Dev.	5	3	8	4	6		13	27	20	30	26	30
Hi Temp. °F	1578	1548	1520	1551	1569		1586	1599	1613	1603	1613	1595
Lo Temp. °F	1565	1541	1499	1543	1554		1554	1535	1561	1529	1547	1519

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
85 Hour												
Avg. Temp. °F	1575	1549	1509	1548	1565		1565	1598	1593	1601	1590	1591
Std. Dev.	4	7	20	2	3		22	3	4	4	5	5
Hi Temp. °F	1580	1558	1542	1551	1569		1592	1602	1596	1606	1595	1598
Lo Temp. °F	1569	1544	1493	1546	1560		1541	1595	1587	1597	1583	1586
90 Hour												
Avg. Temp. °F	1568	1549	1503	1541	1552		1555	1602	1588	1605	1583	1599
Std. Dev.	2	9	17	7	12		18	2	8	2	7	3
Hi Temp. °F	1570	1557	1520	1547	1561		1579	1603	1598	1607	1591	1601
Lo Temp. °F	1566	1538	1480	1532	1535		1539	1600	1581	1604	1577	1594
95 Hour												
Avg. Temp. °F	1564	1550	1512	1542	1560		1545	1602	1585	1606	1581	1600
Std. Dev.	6	10	16	6	2		21	1	3	1	3	1
Hi Temp. °F	1569	1561	1525	1549	1563		1567	1604	1589	1608	1585	1602
Lo Temp. °F	1558	1539	1489	1535	1558		1518	1601	1582	1605	1576	1598
100 Hour												
Avg. Temp. °F	1564	1544	1504	1544	1561		1580	1595	1599	1598	1596	1588
Std. Dev.	8	4	20	5	4		7	2	5	3	6	4
Hi Temp. °F	1572	1550	1528	1549	1565		1588	1598	1605	1600	1606	1592
Lo Temp. °F	1554	1539	1488	1539	1554		1570	1592	1592	1593	1590	1581

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
105 Hour												
Avg. Temp. °F	1567	1550	1506	1537	1561		1548	1601	1591	1605	1585	1597
Std. Dev.	4	5	14	4	4		25	3	8	4	9	5
Hi Temp. °F	1570	1554	1525	1543	1566		1582	1603	1603	1608	1600	1601
Lo Temp. °F	1562	1542	1489	1533	1555		1513	1597	1584	1598	1578	1588
110 Hour												
Avg. Temp. °F	1566	1547	1515	1541	1559		1554	1600	1599	1605	1589	1596
Std. Dev.	5	9	13	2	5		26	3	9	4	9	5
Hi Temp. °F	1574	1555	1526	1544	1566		1584	1604	1611	1610	1602	1602
Lo Temp. °F	1560	1533	1497	1538	1552		1524	1595	1587	1598	1579	1587
115 Hour												
Avg. Temp. °F	1571	1551	1514	1546	1564		1579	1595	1609	1594	1599	1582
Std. Dev.	4	8	12	3	3		11	2	6	4	7	5
Hi Temp. °F	1575	1558	1528	1551	1568		1592	1597	1615	1598	1608	1587
Lo Temp. °F	1566	1540	1499	1543	1560		1566	1593	1600	1590	1591	1577
120 Hour												
Avg. Temp. °F	1577	1561	1532	1556	1564		1554	1605	1590	1611	1575	1603
Std. Dev.	9	14	26	14	6		38	4	13	7	15	10
Hi Temp. °F	1586	1573	1565	1568	1573		1595	1610	1603	1621	1590	1618
Lo Temp. °F	1567	1540	1502	1539	1559		1493	1601	1568	1604	1550	1593

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
125 Hour												
Avg. Temp. °F	1576	1564	1551	1564	1575		1510	1610	1564	1620	1551	1618
Std. Dev.	7	9	9	2	4		15	1	7	2	5	3
Hi Temp. °F	1583	1579	1562	1566	1579		1522	1611	1580	1622	1559	1620
Lo Temp. °F	1567	1557	1539	1561	1569		1489	1609	1564	1618	1545	1613
130 Hour												
Avg. Temp. °F	1571	1563	1552	1565	1577		1478	1610	1559	1625	1538	1625
Std. Dev.	7	3	14	13	4		15	2	12	3	13	6
Hi Temp. °F	1580	1566	1572	1580	1584		1491	1612	1570	1629	1551	1632
Lo Temp. °F	1563	1558	1538	1553	1574		1455	1608	1546	1621	1521	1618
135 Hour												
Avg. Temp. °F	1572	1567	1564	1565	1578		1489	1609	1514	1601	1489	1604
Std. Dev.	5	10	18	7	8		61	5	36	15	35	16
Hi Temp. °F	1579	1581	1592	1573	1589		1592	1613	1556	1627	1538	1630
Lo Temp. °F	1566	1559	1549	1555	1567		1441	1600	1484	1588	1457	1585
140 Hour												
Avg. Temp. °F	1572	1572	1551	1561	1580		1485	1611	1505	1600	1473	1601
Std. Dev.	5	7	14	7	5		29	2	9	2	9	2
Hi Temp. °F	1577	1580	1568	1573	1585		1534	1613	1521	1602	1488	1604
Lo Temp. °F	1567	1562	1531	1555	1571		1460	1609	1497	1598	1465	1598

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
145 Hour												
Avg. Temp. °F	1575	1564	1542	1563	1579		1482	1603	1502	1598	1456	1600
Std. Dev.	8	7	10	5	3		8	5	7	2	28	2
Hi Temp. °F	1586	1571	1549	1569	1582		1489	1613	1508	1600	1478	1603
Lo Temp. °F	1566	1556	1524	1557	1574		1469	1607	1492	1595	1462	1597
150 Hour												
Avg. Temp. °F	1573	1575	1553	1567	1578		1477	1610	1520	1606	1456	1602
Std. Dev.	4	17	10	5	7		9	1	40	16	28	1
Hi Temp. °F	1578	1595	1561	1575	1584		1486	1611	1584	1631	1474	1603
Lo Temp. °F	1569	1554	1536	1562	1566		1465	1609	1478	1588	1462	1600
155 Hour												
Avg. Temp. °F	1571	1571	1542	1570	1581		1477	1609	1476	1585	1468	1601
Std. Dev.	4	9	18	5	4		10	2	6	1	8	2
Hi Temp. °F	1578	1581	1566	1576	1586		1490	1611	1485	1586	1480	1602
Lo Temp. °F	1568	1561	1521	1564	1577		1467	1606	1469	1584	1459	1598
160 Hour												
Avg. Temp. °F	1566	1574	1543	1571	1586		1466	1610	1472	1586	1463	1602
Std. Dev.	2	7	16	7	4		10	2	3	2	4	2
Hi Temp. °F	1569	1582	1561	1579	1589		1477	1613	1476	1588	1470	1605
Lo Temp. °F	1563	1566	1528	1565	1581		1454	1608	1468	1584	1458	1600

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
165 Hour												
Avg. Temp. °F	1569	1571	1543	1568	1583		1473	1608	1475	1585	1456	1602
Std. Dev.	3	14	22	8	3		28	2	7	2	29	3
Hi Temp. °F	1572	1582	1575	1577	1585		1502	1610	1482	1587	1475	1605
Lo Temp. °F	1566	1547	1522	1558	1579		1442	1606	1466	1583	1455	1598
170 Hour												
Avg. Temp. °F	1524	1549	1557	1531	1548		1525	1559	1511	1542	1505	1544
Std. Dev.	54	48	48	53	50		57	58	37	53	38	63
Hi Temp. °F	1565	1594	1613	1563	1584		1607	1608	1552	1586	1544	1601
Lo Temp. °F	1441	1468	1480	1447	1465		1454	1475	1470	1464	1458	1454
175 Hour												
Avg. Temp. °F	1568	1567	1557	1572	1572		1461	1608	1473	1587	1466	1603
Std. Dev.	3	13	8	5	5		9	2	2	1	4	1
Hi Temp. °F	1572	1578	1564	1575	1576		1471	1610	1475	1588	1470	1604
Lo Temp. °F	1565	1548	1543	1564	1563		1448	1606	1470	1586	1461	1603
180 Hour												
Avg. Temp. °F	1567	1557	1542	1571	1574		1450	1610	1468	1587	1460	1604
Std. Dev.	2	8	11	7	7		7	1	1	4	2	1
Hi Temp. °F	1570	1570	1553	1580	1577		1460	1611	1470	1590	1462	1605
Lo Temp. °F	1565	1547	1527	1563	1561		1443	1608	1467	1585	1457	1602

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
185 Hour												
Avg. Temp. °F	1560	1567	1551	1566	1573		1510	1594	1499	1574	1492	1583
Std. Dev.	15	15	28	11	3		47	28	42	23	41	33
Hi Temp. °F	1568	1589	1598	1575	1575		1572	1610	1572	1588	1562	1604
Lo Temp. °F	1533	1550	1528	1549	1567		1460	1544	1470	1533	1460	1525
190 Hour												
Avg. Temp. °F	1564	1562	1534	1571	1580		1500	1608	1484	1586	1477	1600
Std. Dev.	2	10	27	5	7		8	2	2	2	5	2
Hi Temp. °F	1567	1580	1572	1576	1586		1514	1610	1486	1588	1483	1604
Lo Temp. °F	1562	1555	1518	1563	1570		1494	1606	1482	1584	1470	1598
195 Hour												
Avg. Temp. °F	1565	1563	1522	1572	1569		1462	1610	1472	1589	1463	1604
Std. Dev.	3	18	15	15	7		38	3	12	3	13	5
Hi Temp. °F	1568	1582	1546	1592	1578		1510	1614	1484	1593	1473	1611
Lo Temp. °F	1561	1542	1509	1555	1559		1415	1608	1457	1587	1447	1600
200 Hour												
Avg. Temp. °F	1563	1565	1524	1579	1571		1491	1609	1470	1587	1473	1601
Std. Dev.	2	14	10	20	6		9	1	1	3	2	2
Hi Temp. °F	1565	1579	1533	1603	1579		1500	1610	1480	1590	1475	1603
Lo Temp. °F	1561	1543	1511	1560	1564		1479	1608	1477	1583	1470	1598

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
205 Hour												
Avg. Temp. °F	1562	1562	1527	1578	1577		1461	1610	1472	1586	1463	1603
Std. Dev.	1	14	22	14	6		14	2	3	1	5	32
Hi Temp. °F	1563	1578	1559	1596	1584		1478	1613	1475	1587	1470	1606
Lo Temp. °F	1560	1543	1505	1567	1567		1444	1608	1464	1584	1457	1602
210 Hour												
Avg. Temp. °F	1565	1560	1534	1566	1582		1460	1610	1468	1587	1460	1605
Std. Dev.	2	11	14	6	5		17	2	5	3	4	3
Hi Temp. °F	1566	1579	1555	1573	1590		1473	1612	1473	1591	1463	1608
Lo Temp. °F	1562	1554	1520	1557	1578		1431	1606	1462	1584	1453	1602
215 Hour												
Avg. Temp. °F	1563	1560	1532	1565	1581		1448	1609	1465	1587	1459	1605
Std. Dev.	4	12	17	6	7		24	2	8	2	5	3
Hi Temp. °F	1567	1573	1560	1574	1591		1484	1612	1476	1588	1467	1609
Lo Temp. °F	1558	1545	1517	1558	1571		1422	1608	1456	1584	1454	1600
220 Hour												
Avg. Temp. °F	1571	1569	1560	1591	1585		1465	1608	1477	1591	1467	1604
Std. Dev.	4	20	25	9	11		26	1	9	4	7	4
Hi Temp. °F	1577	1590	1580	1601	1595		1490	1610	1488	1596	1475	1611
Lo Temp. °F	1566	1542	1527	1578	1569		1423	1607	1466	1585	1453	1600

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
225 Hour												
Avg. Temp. °F	1570	1576	1555	1585	1597		1470	1609	1478	1591	1463	1603
Std. Dev.	2	12	14	4	4		10	1	4	1	5	1
Hi Temp. °F	1572	1588	1579	1591	1603		1481	1611	1484	1591	1469	1604
Lo Temp. °F	1568	1555	1544	1582	1593		1458	1608	1475	1590	1457	1602
230 Hour												
Avg. Temp. °F	1570	1575	1559	1584	1593		1447	1608	1473	1590	1458	1605
Std. Dev.	4	18	12	10	1		24	1	6	1	6	3
Hi Temp. °F	1573	1595	1572	1597	1594		1471	1609	1478	1591	1453	1602
Lo Temp. °F	1566	1553	1541	1572	1592		1415	1607	1464	1589	1453	1602
235 Hour												
Avg. Temp. °F	1569	1571	1555	1588	1594		1454	1608	1476	1592	1460	1605
Std. Dev.	2	11	17	3	8		9	2	3	2	3	2
Hi Temp. °F	1571	1579	1581	1592	1598		1462	1611	1480	1594	1465	1607
Lo Temp. °F	1568	1552	1540	1585	1579		1441	1607	1473	1590	1457	1603
240 Hour												
Avg. Temp. °F	1569	1571	1563	1591	1590		1459	1608	1475	1592	1460	1605
Std. Dev.	4	20	13	7	7		23	2	7	1	7	2
Hi Temp. °F	1575	1592	1574	1598	1598		1478	1610	1481	1593	1467	1608
Lo Temp. °F	1565	1539	1544	1580	1582		1422	1606	1467	1591	1451	1603

Table A-1 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1600°F

Combustor Location:	In Bed						Above Bed					
Port Number	1		3		5		13		15		17	
Hours Into Run / Specimen	X	H	H	X	H	X	X	H	H	X	H	X
245 Hour												
Avg. Temp. °F	1569	1572	1557	1586	1596		1451	1608	1473	1592	1458	1605
Std. Dev.	2	15	17	8	2		23	1	8	2	7	2
Hi Temp. °F	1571	1585	1577	1594	1599		1465	1604	1481	1594	1466	1608
Lo Temp. °F	1566	1547	1538	1575	1593		1411	1607	1459	1590	1448	1603
250 Hour												
Avg. Temp. °F	1558	1572	1556	1577	1582		1514	1590	1508	1574	1495	1581
Std. Dev.	26	9	26	29	17		61	33	39	30	40	39
Hi Temp. °F	1571	1584	1584	1597	1595		1597	1609	1557	1592	1549	1607
Lo Temp. °F	1512	1561	1521	1528	1553		1459	1532	1477	1522	1463	1515
255 Hour												
Avg. Temp. °F	1568	1580	1561	1586	1596		1436	1609	1466	1593	1451	1605
Std. Dev.	2	14	16	8	6		9	1	4	1	5	3
Hi Temp. °F	1570	1593	1574	1600	1602		1444	1611	1473	1594	1458	1603
Lo Temp. °F												
Hour												
Avg. Temp. °F												
Std. Dev.												
Hi Temp. °F												
Lo Temp. °F												

Table A-2

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
5 Hour												
Avg. Temp. °F	1159	1373	1142	1300	1185	1186	1383	1302	1337	1357	1291	1333
Std. Dev.	66	56	101	45	67	66	55	54	83	38	57	53
Hi Temp. °F	1205	1410	1235	1337	1265	1240	1465	1355	1442	1394	1343	1379
Lo Temp. °F	1045	1274	975	1221	1079	1071	1304	1219	1214	1300	1200	1254
10 Hour												
Avg. Temp. °F	1226	1401	1289	1376	1342	1337	1304	1404	1297	1440	1283	1425
Std. Dev.	11	4	18	4	46	48	5	4	15	11	11	4
Hi Temp. °F	1244	1406	1333	1387	1393	1396	1318	1410	1318	1452	1299	1461
Lo Temp. °F	1218	1395	1266	1371	1274	1278	1297	1399	1281	1426	1264	1402
15 Hour												
Avg. Temp. °F	1230	1399	1302	1376	1378	1371	1308	1401	1305	1432	1292	1418
Std. Dev.	11	2	17	6	18	17	2	8	14	3	8	4
Hi Temp. °F	1240	1404	1324	1386	1407	1402	1311	1405	1324	1436	1309	1430
Lo Temp. °F	1215	1391	1280	1368	1364	1358	1302	1388	1281	1420	1284	1413
20 Hour												
Avg. Temp. °F	1256	1389	1312	1368	1382	1380	1309	1373	1303	1400	1290	1381
Std. Dev.	64	22	44	15	10	8	2	62	12	70	9	77
Hi Temp. °F	1370	1412	1371	1389	1410	1407	1311	1408	1308	1446	1308	1423
Lo Temp. °F	940	955	940	953	946	946	1138	1146	1151	1142	1149	1145

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure
(Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run \ Specimen	8	X	X	8	X	8	X	8	X	8	8	X
25 Hour												
Avg. Temp. °F	1213	1403	1267	1360	1358	1358	1303	1392	1274	1438	1294	1411
Std. Dev.	7	2	20	7	9	11	2	4	18	2	2	2
Hi Temp. °F	1221	1406	1295	1368	1369	1376	1306	1397	1297	1441	1295	1414
Lo Temp. °F	1203	1393	1247	1351	1348	1346	1301	1387	1254	1435	1291	1410
30 Hour												
Avg. Temp. °F	1199	1396	1274	1354	1363	1365	1295	1382	1262	1437	1289	1411
Std. Dev.	15	7	23	4	17	20	7	6	24	9	8	3
Hi Temp. °F	1222	1402	1305	1358	1383	1389	1304	1389	1302	1449	1298	1415
Lo Temp. °F	1195	1388	1241	1347	1346	1338	1286	1376	1244	1425	1279	1407
35 Hour												
Avg. Temp. °F	1203	1396	1267	1357	1367	1369	1300	1376	1269	1426	1299	1420
Std. Dev.	8	3	27	7	17	13	4	5	7	7	11	6
Hi Temp. °F	1211	1399	1306	1365	1381	1387	1304	1384	1281	1435	1318	1428
Lo Temp. °F	1194	1393	1243	1348	1342	1350	1294	1371	1264	1415	1288	1411
40 Hour												
Avg. Temp. °F	1192	1396	1273	1354	1365	1365	1296	1387	1250	1441	1280	1406
Std. Dev.	4	5	10	5	11	16	7	15	12	7	10	8
Hi Temp. °F	1197	1400	1285	1361	1377	1384	1304	1405	1263	1449	1293	1415
Lo Temp. °F	1187	1389	1259	1350	1351	1345	1289	1371	1232	1434	1269	1398

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure
(Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
45 Hour												
Avg. Temp. °F	1196	1395	1250	1354	1358	1360	1293	1394	1248	1448	1268	1404
Std. Dev.	11	4	26	7	8	10	9	10	5	5	15	6
Hi Temp. °F	1213	1399	1281	1362	1368	1368	1307	1404	1254	1456	1290	1410
Lo Temp. °F	1186	1388	1226	1348	1348	1346	1284	1378	1241	1442	1249	1396
50 Hour												
Avg. Temp. °F	1185	1393	1268	1353	1354	1352	1287	1371	1239	1440	1282	1422
Std. Dev.	6	3	17	6	10	6	3	7	4	3	5	7
Hi Temp. °F	1193	1395	1278	1359	1365	1359	1291	1382	1244	1443	1288	1431
Lo Temp. °F	1178	1388	1242	1346	1343	1344	1285	1367	1234	1437	1278	1413
55 Hour												
Avg. Temp. °F	1189	1388	1274	1346	1370	1368	1293	1370	1254	1433	1281	1426
Std. Dev.	3	9	35	7	19	15	7	3	11	3	3	3
Hi Temp. °F	1192	1398	1297	1355	1390	1385	1297	1371	1261	1436	1284	1429
Lo Temp. °F	1185	1377	1222	1338	1348	1354	1282	1366	1239	1429	1278	1421
60 Hour												
Avg. Temp. °F	1183	1390	1274	1341	1356	1361	1297	1374	1239	1430	1279	1431
Std. Dev.	6	6	29	8	9	9	2	1	7	2	9	2
Hi Temp. °F	1189	1397	1301	1352	1366	1370	1298	1375	1247	1432	1292	1434
Lo Temp. °F	1174	1382	1231	1332	1346	1351	1294	1373	1229	1428	1269	1430

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
65 Hour												
Avg. Temp. °F	1185	1391	1239	1338	1370	1371	1297	1374	1231	1428	1286	1435
Std. Dev.	5	4	12	4	11	12	3	1	2	3	6	4
Hi Temp. °F	1191	1396	1257	1340	1384	1381	1300	1376	1234	1432	1291	1439
Lo Temp. °F	1178	1384	1225	1333	1358	1352	1293	1372	1228	1424	1279	1428
70 Hour												
Avg. Temp. °F	1185	1388	1258	1345	1360	1356	1291	1372	1225	1432	1278	1425
Std. Dev.	2	6	25	6	11	12	5	5	7	1	3	3
Hi Temp. °F	1188	1397	1287	1353	1373	1372	1295	1379	1234	1433	1282	1428
Lo Temp. °F	1182	1382	1229	1337	1344	1340	1285	1368	1216	1430	1274	1421
75 Hour												
Avg. Temp. °F	1187	1387	1248	1341	1355	1356	1295	1374	1228	1432	1277	1426
Std. Dev.	2	3	31	7	17	17	4	1	3	3	5	1
Hi Temp. °F	1189	1392	1291	1353	1370	1379	1300	1375	1231	1437	1285	1428
Lo Temp. °F	1183	1383	1217	1334	1329	1337	1291	1373	1225	1429	1271	1425
80 Hour												
Avg. Temp. °F	1191	1388	1259	1344	1365	1362	1310	1384	1232	1427	1280	1423
Std. Dev.	17	6	18	5	11	9	14	12	15	7	7	3
Hi Temp. °F	1221	1393	1281	1349	1377	1375	1324	1400	1247	1432	1287	1427
Lo Temp. °F	1179	1377	1235	1338	1350	1353	1296	1372	1208	1414	1272	1420

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
85 Hour												
Avg. Temp. °F	1190	1390	1270	1342	1358	1358	1319	1392	1219	1430	1275	1423
Std. Dev.	8	4	28	8	14	16	7	3	8	2	6	2
Hi Temp. °F	1201	1394	1287	1355	1371	1371	1328	1395	1226	1433	1280	1427
Lo Temp. °F	1181	1384	1221	1336	1334	1330	1308	1388	1206	1428	1265	1421
90 Hour												
Avg. Temp. °F	1183	1375	1266	1347	1363	1358	1305	1376	1220	1432	1271	1425
Std. Dev.	11	3	40	10	15	15	46	35	5	3	4	4
Hi Temp. °F	1198	1379	1297	1353	1385	1381	1373	1429	1224	1437	1275	1430
Lo Temp. °F	1173	1372	1208	1333	1354	1349	1278	1355	1215	1430	1267	1421
95 Hour												
Avg. Temp. °F	1186	1385	1244	1341	1352	1355	1283	1361	1213	1430	1265	1420
Std. Dev.	5	5	27	4	14	14	3	3	5	3	3	4
Hi Temp. °F	1191	1392	1282	1347	1375	1373	1284	1363	1221	1434	1269	1424
Lo Temp. °F	1181	1381	1211	1334	1337	1334	1278	1358	1208	1428	1261	1415
100 Hour												
Avg. Temp. °F	1191	1381	1254	1342	1348	1352	1290	1365	1226	1428	1272	1421
Std. Dev.	4	10	29	6	14	14	7	6	5	2	5	3
Hi Temp. °F	1197	1391	1299	1348	1363	1372	1300	1373	1232	1430	1280	1425
Lo Temp. °F	1187	1365	1219	1334	1333	1337	1281	1359	1217	1426	1266	1418

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
105 Hour												
Avg. Temp. °F	1183	1378	1244	1341	1354	1357	1281	1361	1210	1430	1262	1421
Std. Dev.	12	3	30	10	15	12	11	4	10	2	6	3
Hi Temp. °F	1200	1380	1288	1352	1366	1370	1292	1366	1223	1432	1270	1424
Lo Temp. °F	1174	1374	1219	1332	1330	1337	1266	1356	1198	1427	1256	1417
110 Hour												
Avg. Temp. °F	1187	1376	1273	1347	1344	1346	1285	1364	1220	1430	1267	1420
Std. Dev.	7	9	21	7	13	12	5	2	7	3	4	3
Hi Temp. °F	1198	1387	1295	1353	1361	1361	1288	1367	1232	1434	1271	1424
Lo Temp. °F	1180	1368	1240	1338	1327	1330	1276	1361	1215	1428	1262	1418
115 Hour												
Avg. Temp. °F	1199	1384	1271	1342	1349	1350	1294	1370	1222	1424	1271	1422
Std. Dev.	6	6	26	9	9	9	8	3	8	2	5	3
Hi Temp. °F	1204	1391	1292	1351	1364	1361	1306	1373	1230	1426	1278	1428
Lo Temp. °F	1191	1375	1238	1329	1341	1340	1287	1367	1213	1420	1266	1420
120 Hour												
Avg. Temp. °F	1189	1382	1249	1340	1344	1347	1277	1358	1213	1433	1266	1422
Std. Dev.	3	13	13	6	17	18	10	8	11	4	4	4
Hi Temp. °F	1192	1390	1263	1346	1364	1363	1293	1367	1228	1439	1270	1428
Lo Temp. °F	1185	1360	1230	1334	1319	1317	1267	1347	1199	1429	1261	1417

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure
(Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run \ Specimen	8	X	X	8	X	8	X	8	X	8	8	X
125 Hour												
Avg. Temp. °F	1174	1377	1252	1349	1329	1329	1269	1349	1191	1439	1255	1416
Std. Dev.	4	7	15	6	9	10	15	11	7	2	2	3
Hi Temp. °F	1179	1386	1278	1357	1338	1337	1287	1364	1202	1441	1257	1420
Lo Temp. °F	1167	1368	1239	1341	1316	1315	1254	1340	1184	1436	1252	1412
130 Hour												
Avg. Temp. °F	1168	1374	1270	1362	1324	1325	1285	1357	1181	1440	1245	1416
Std. Dev.	11	5	35	8	15	15	6	5	8	3	13	2
Hi Temp. °F	1179	1380	1304	1367	1341	1337	1292	1362	1191	1443	1259	1419
Lo Temp. °F	1166	1368	1230	1349	1300	1298	1278	1350	1173	1436	1229	1413
135 Hour												
Avg. Temp. °F	1181	1382	1271	1369	1330	1314	1280	1355	1179	1435	1296	1386
Std. Dev.	21	8	26	6	36	16	16	3	13	11	35	25
Hi Temp. °F	1216	1391	1314	1368	1391	1339	1307	1361	1198	1443	1238	1410
Lo Temp. °F	1164	1370	1252	1352	1299	1298	1266	1353	1164	1416	1144	1347
140 Hour												
Avg. Temp. °F	1185	1380	1267	1360	1319	1318	1287	1357	1183	1438	1207	1396
Std. Dev.	13	8	41	8	9	10	9	3	11	3	7	7
Hi Temp. °F	1195	1393	1318	1370	1331	1332	1299	1360	1194	1441	1212	1404
Lo Temp. °F	1167	1375	1229	1350	1306	1305	1274	1353	1169	1433	1195	1386

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
145 Hour												
Avg. Temp. °F	1182	1380	1266	1363	1312	1313	1274	1350	1179	1440	1212	1398
Std. Dev.	6	6	28	13	10	8	11	5	6	2	15	11
Hi Temp. °F	1189	1388	1298	1377	1326	1324	1289	1358	1184	1442	1220	1408
Lo Temp. °F	1175	1372	1242	1346	1302	1304	1262	1345	1172	1438	1186	1380
150 Hour												
Avg. Temp. °F	1194	1378	1272	1355	1314	1313	1283	1352	1184	1441	1219	1403
Std. Dev.	6	7	31	6	15	15	7	6	5	3	9	4
Hi Temp. °F	1203	1389	1321	1362	1335	1333	1292	1359	1190	1444	1234	1407
Lo Temp. °F	1188	1372	1247	1347	1297	1297	1272	1346	1178	1438	1209	1397
155 Hour												
Avg. Temp. °F	1198	1383	1259	1354	1327	1326	1293	1352	1186	1440	1223	1403
Std. Dev.	5	6	24	11	16	14	6	4	8	2	11	5
Hi Temp. °F	1204	1388	1296	1370	1344	1340	1301	1357	1198	1443	1230	1408
Lo Temp. °F	1193	1374	1238	1346	1304	1304	1287	1348	1179	1437	1205	1397
160 Hour												
Avg. Temp. °F	1192	1377	1383	1363	1308	1309	1285	1350	1183	1442	1230	1411
Std. Dev.	8	7	43	9	6	7	7	4	6	4	7	6
Hi Temp. °F	1203	1384	1316	1373	1313	1316	1296	1355	1192	1445	1238	1421
Lo Temp. °F	1183	1366	1226	1350	1299	1298	1279	1346	1175	1434	1221	1406

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
165 Hour												
Avg. Temp. °F	1194	1375	1255	1366	1317	1321	1285	1353	1180	1442	1220	1406
Std. Dev.	6	10	46	6	17	15	10	7	15	3	18	13
Hi Temp. °F	1200	1386	1307	1374	1347	1344	1297	1361	1205	1447	1237	1416
Lo Temp. °F	1184	1362	1237	1358	1301	1508	1272	1343	1169	1439	1190	1383
170 Hour												
Avg. Temp. °F	1229	1372	1297	1354	1360	1359	1328	1367	1251	1417	1129	1323
Std. Dev.	46	11	67	9	45	44	56	21	62	24	84	79
Hi Temp. °F	1310	1382	1389	1368	1416	1415	1413	1388	1334	1441	1217	1411
Lo Temp. °F	1201	1353	1237	1343	1314	1313	1278	1346	1170	1386	1013	1220
175 Hour												
Avg. Temp. °F	1196	1386	1266	1356	1339	1337	1293	1359	1190	1444	1212	1399
Std. Dev.	4	9	35	9	25	24	9	4	10	4	7	3
Hi Temp. °F	1199	1394	1312	1367	1368	1369	1303	1365	1203	1447	1218	1403
Lo Temp. °F	1191	1372	1226	1344	1301	1303	1285	1355	1177	1438	1201	1396
180 Hour												
Avg. Temp. °F	1196	1386	1264	1352	1347	1344	1289	1359	1191	1446	1209	1405
Std. Dev.	8	7	29	9	12	13	8	4	12	4	3	1
Hi Temp. °F	1209	1393	1300	1363	1362	1361	1297	1364	1202	1450	1213	1406
Lo Temp. °F	1189	1375	1230	1340	1328	1325	1276	1354	1175	1440	1204	1404

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
185 Hour												
Avg. Temp. °F	1209	1385	1285	1356	1361	1359	1298	1361	1215	1437	1154	1360
Std. Dev.	25	5	22	8	21	25	14	16	19	18	70	62
Hi Temp. °F	1251	1391	1302	1365	1396	1402	1324	1388	1249	1451	1206	1408
Lo Temp. °F	1190	1378	1249	1346	1345	1342	1291	1345	1203	1407	1037	1254
190 Hour												
Avg. Temp. °F	1195	1378	1272	1356	1368	1368	1304	1364	1200	1442	1176	1379
Std. Dev.	6	5	37	9	20	20	12	13	10	3	12	5
Hi Temp. °F	1203	1384	1313	1362	1396	1392	1319	1380	1217	1446	1190	1385
Lo Temp. °F	1189	1372	1228	1340	1341	1337	1291	1352	1190	1439	1167	1374
195 Hour												
Avg. Temp. °F	1193	1380	1283	1372	1359	1361	1312	1376	1188	1446	1180	1391
Std. Dev.	11	78	36	11	17	19	10	6	17	6	15	17
Hi Temp. °F	1207	1391	1329	1384	1385	1393	1323	1384	1209	1454	1205	1417
Lo Temp. °F	1178	1372	1238	1358	1343	1344	1301	1371	1163	1439	1163	1371
200 Hour												
Avg. Temp. °F	1199	1375	1296	1372	1379	1375	1320	1379	1201	1444	1171	1377
Std. Dev.	8	9	32	6	8	7	8	5	6	2	6	3
Hi Temp. °F	1210	1388	1336	1381	1390	1384	1333	1386	1209	1447	1176	1380
Lo Temp. °F	1191	1366	1258	1364	1368	1364	1313	1374	1195	1442	1162	1372

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
205 Hour												
Avg. Temp. °F	1204	1383	1305	1375	1377	1376	1311	1376	1198	1452	1191	1392
Std. Dev.	8	8	28	11	8	11	13	6	12	2	10	10
Hi Temp. °F	1215	1391	1332	1386	1390	1390	1327	1386	1214	1455	1207	1408
Lo Temp. °F	1193	1371	1261	1359	1370	1366	1297	1369	1184	1450	1181	1383
210 Hour												
Avg. Temp. °F	1198	1377	1312	1369	1372	1372	1301	1368	1186	1450	1190	1396
Std. Dev.	9	5	11	5	9	7	6	3	7	2	7	4
Hi Temp. °F	1211	1383	1323	1376	1382	1382	1310	1371	1194	1453	1196	1400
Lo Temp. °F	1189	1371	1301	1364	1360	1364	1293	1364	1178	1449	1181	1392
215 Hour												
Avg. Temp. °F	1199	1382	1287	1370	1375	1377	1300	1372	1182	1452	1186	1397
Std. Dev.	7	8	24	8	17	14	3	4	6	2	12	6
Hi Temp. °F	1207	1388	1318	1379	1389	1391	1303	1377	1191	1455	1200	1404
Lo Temp. °F	1189	1370	1254	1361	1347	1353	1297	1368	1175	1450	1169	1388
220 Hour												
Avg. Temp. °F	1207	1392	1292	1405	1370	1369	1324	1387	1164	1431	1175	1386
Std. Dev.	10	10	31	30	15	15	12	8	28	9	15	13
Hi Temp. °F	1217	1402	1347	1432	1385	1382	1339	1396	1207	1455	1191	1399
Lo Temp. °F	1194	1378	1270	1361	1346	1346	1310	1375	1141	1422	1154	1366

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
225 Hour												
Avg. Temp. °F	1206	1380	1267	1416	1391	1392	1322	1388	1140	1423	1175	1385
Std. Dev.	12	6	8	7	13	12	8	5	5	2	6	5
Hi Temp. °F	1223	1387	1278	1425	1405	1407	1330	1395	1146	1426	1184	1393
Lo Temp. °F	1194	1371	1258	1409	1374	1377	1313	1382	1132	1420	1169	1381
230 Hour												
Avg. Temp. °F	1208	1385	1274	1416	1382	1377	1323	1382	1138	1426	1181	1390
Std. Dev.	3	5	8	5	16	15	7	4	9	3	12	8
Hi Temp. °F	1210	1390	1281	1423	1398	1391	1330	1387	1147	1428	1194	1400
Lo Temp. °F	1203	1378	1261	1411	1364	1360	1315	1377	1127	1422	1168	1382
235 Hour												
Avg. Temp. °F	1207	1387	1264	1417	1373	1376	1322	1383	1153	1432	1182	1391
Std. Dev.	6	5	7	4	6	9	7	2	6	3	4	2
Hi Temp. °F	1216	1393	1270	1420	1381	1390	1330	1386	1159	1436	1185	1394
Lo Temp. °F	1200	1380	1253	1411	1365	1368	1313	1381	1144	1427	1178	1388
240 Hour												
Avg. Temp. °F	1202	1380	1258	1414	1384	1383	1326	1387	1147	1430	1178	1388
Std. Dev.	8	6	11	6	12	12	5	2	11	6	16	11
Hi Temp. °F	1212	1391	1271	1422	1397	1394	1331	1391	1165	1437	1199	1405
Lo Temp. °F	1191	1378	1243	1407	1366	1362	1318	1385	1137	1422	1163	1378

Table A-2 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 HR Exposure (Miniplant Run 78)

Control Temperature: 1400°F

Combustor Location:	In Bed						Above Bed					
Port Number	2		4		6		14		16		18	
Hours Into Run / Specimen	8	X	X	8	X	8	X	8	X	8	8	X
245 Hour												
Avg. Temp. °F	1200	1380	1265	1415	1377	1380	1322	1384	1150	1430	1184	1394
Std. Dev.	10	16	11	2	16	15	3	3	8	5	11	10
Hi Temp. °F	1214	1396	1282	1418	1393	1396	1326	1387	1158	1438	1203	1411
Lo Temp. °F	1188	1362	1257	1413	1353	1363	1319	1380	1140	1424	1178	1387
250 Hour												
Avg. Temp. °F	1220	1388	1295	1418	1406	1403	1348	1398	1176	1414	1124	1357
Std. Dev.	16	5	25	5	41	41	34	17	32	21	74	66
Hi Temp. °F	1241	1392	1329	1426	1465	1458	1402	1425	1221	1430	1191	1398
Lo Temp. °F	1208	1380	1271	1413	1376	1371	1322	1384	1142	1381	1014	1241
255 Hour												
Avg. Temp. °F	1204	1376	1266	1414	1379	1382	1310	1376	1139	1430	1176	1393
Std. Dev.	6	13	2	2	13	15	5	3	6	2	7	5
Hi Temp. °F	1210	1394	1268	1417	1391	1397	1318	1379	1147	1432	1186	1398
Lo Temp. °F	1198	1359	1264	1412	1361	1358	1305	1373	1133	1428	1169	1386
Hour												
Avg. Temp. °F												
Std. Dev.												
Hi Temp. °F												
Lo Temp. °F												

Table A-3

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
5 Hour												
Avg. Temp. °F	1034	1160	1043	1046	997	1089	1166	1168	1100	1283	724	1295
Std. Dev.	7	19	12	12	51	14	34	33	116	75	156	76
Hi Temp. °F	1043	1171	1063	1060	1077	1104	1226	1227	1224	1365	893	1366
Lo Temp. °F	1023	1139	1032	1026	937	1073	1146	1147	911	1162	586	1168
10 Hour												
Avg. Temp. °F	1036	1180	1060	1064	957	1120	1124	1124	972	972	542	542
Std. Dev.	12	15	11	6	12	31	14	15	23	23	8	8
Hi Temp. °F	1055	1194	1072	1071	966	1148	1134	1133	1008	1006	550	550
Lo Temp. °F	1023	1162	1046	1056	938	1066	1099	1097	942	942	530	530
15 Hour												
Avg. Temp. °F	1029	1177	1054	1070	963	1125	1140	1140	929	929	541	541
Std. Dev.	11	13	8	6	10	9	7	7	27	27	4	5
Hi Temp. °F	1046	1189	1063	1077	972	1133	1151	1151	958	960	546	547
Lo Temp. °F	1020	1155	1044	1063	952	1109	1133	1134	886	886	536	535
20 Hour												
Avg. Temp. °F	1062	1186	1063	1065	978	1115	1171	1171	870	869	577	577
Std. Dev.	46	11	23	12	54	9	74	74	140	137	45	45
Hi Temp. °F	1138	1202	1098	1081	1074	1124	1302	1303	950	950	656	656
Lo Temp. °F	1019	1175	1042	1050	951	1104	1129	1128	626	626	552	551

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
25 Hour												
Avg. Temp. °F	1027	1143	1052	1022	937	1087	1131	1130	965	965	551	551
Std. Dev.	16	23	21	12	8	7	8	8	14	15	3	3
Hi Temp. °F	1050	1164	1077	1041	945	1095	1140	1140	988	989	555	555
Lo Temp. °F	1010	1107	1034	1011	927	1080	1122	1122	951	950	546	546
30 Hour												
Avg. Temp. °F	1027	1120	1057	1020	933	1071	1109	1108	964	963	543	543
Std. Dev.	12	41	22	16	13	10	8	8	18	18	3	3
Hi Temp. °F	1036	1152	1084	1035	947	1087	1122	1121	984	983	547	547
Lo Temp. °F	1007	1050	1031	998	915	1062	1103	1102	936	936	540	539
35 Hour												
Avg. Temp. °F	1080	1177	1097	1072	1002	1127	1174	1174	912	912	658	658
Std. Dev.	46	34	54	63	60	47	45	45	48	48	107	106
Hi Temp. °F	1043	1216	1148	1125	1069	1163	1212	1213	966	966	765	764
Lo Temp. °F	1107	1142	1029	1001	937	1071	1118	1118	848	848	543	543
40 Hour												
Avg. Temp. °F	1087	1190	1140	1105	1025	1160	1005	1246	962	1241	546	1295
Std. Dev.	16	23	11	16	9	7	29	32	43	46	10	51
Hi Temp. °F	1101	1211	1153	1123	1038	1167	1050	1291	1010	1298	557	1361
Lo Temp. °F	1069	1159	1123	1079	1017	1149	981	1221	914	1193	536	1246

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78 Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
45 Hour												
Avg. Temp. °F	1073	1175	1157	1103	1027	1168	1032	1267	989	1275	554	1331
Std. Dev.	20	13	12	8	8	7	50	24	35	32	11	35
Hi Temp. °F	1102	1189	1169	1113	1037	1175	1107	1299	1043	1321	571	1371
Lo Temp. °F	1050	1158	1140	1094	1019	1158	972	1232	946	1232	541	1284
50 Hour												
Avg. Temp. °F	1072	1127	1159	1098	1019	1153	972	1233	957	1234	538	1276
Std. Dev.	7	26	14	19	5	11	16	8	5	7	3	5
Hi Temp. °F	1077	1160	1174	1125	1025	1167	983	1239	963	1245	541	1282
Lo Temp. °F	1062	1097	1140	1082	1014	1142	948	1222	952	1230	535	1272
55 Hour												
Avg. Temp. °F	1091	1163	1145	1093	1042	1146	972	1222	915	1199	545	1254
Std. Dev.	17	28	21	13	13	11	5	5	17	14	9	14
Hi Temp. °F	1096	1186	1175	1106	1055	1155	978	1226	934	1212	542	1270
Lo Temp. °F	1106	1122	1128	1078	1029	1131	968	1215	893	1180	525	1237
60 Hour												
Avg. Temp. °F	1073	1151	1166	1124	1072	1176	976	1226	909	1192	524	1238
Std. Dev.	8	14	16	11	14	8	5	1	8	6	1	3
Hi Temp. °F	1081	1171	1185	1139	1086	1187	984	1227	916	1200	524	1241
Lo Temp. °F	1063	1133	1149	1112	1053	1166	972	1224	896	1186	523	1234

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run / Specimen	3	8	8	3	8	3	8	3	3	8	8	3
65 Hour												
Avg. Temp. °F	1072	1149	1174	1116	1062	1180	978	1229	915	1199	529	1243
Std. Dev.	11	20	18	14	26	8	4	6	8	7	4	5
Hi Temp. °F	1083	1174	1195	1133	1093	1187	983	1237	924	1207	534	1250
Lo Temp. °F	1057	1124	1149	1098	1028	1168	972	1221	902	1188	524	1236
70 Hour												
Avg. Temp. °F	1071	1160	1170	1109	1052	1174	972	1235	949	1230	522	1262
Std. Dev.	13	9	14	14	18	8	6	6	7	4	8	13
Hi Temp. °F	1085	1167	1188	1132	1067	1181	982	1244	957	1236	533	1273
Lo Temp. °F	1057	1149	1157	1096	1023	1163	967	1229	942	1225	511	1242
75 Hour												
Avg. Temp. °F	1075	1156	1152	1102	1049	1154	978	1240	954	1233	522	1270
Std. Dev.	20	24	9	11	19	49	17	18	14	12	10	21
Hi Temp. °F	1106	1188	1162	1117	1074	1190	1005	1269	976	1253	541	1306
Lo Temp. °F	1054	1130	1142	1088	1023	1069	959	1223	938	1219	516	1252
80 Hour												
Avg. Temp. °F	1072	1157	1174	1105	1055	1165	969	1232	917	1199	511	1250
Std. Dev.	12	22	20	16	20	7	5	9	41	41	4	24
Hi Temp. °F	1085	1189	1200	1124	1080	1173	978	1243	948	1226	513	1216
Lo Temp. °F	1056	1134	1146	1084	1037	1159	964	1221	847	1127	504	1212

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run / Specimen	3	8	8	3	8	3	8	3	3	8	8	3
85 Hour												
Avg. Temp. °F	1077	1146	1185	1096	1047	1160	970	1233	920	1207	515	1243
Std. Dev.	23	31	21	16	11	9	6	5	15	12	8	8
Hi Temp. °F	1102	1176	1214	1116	1063	1172	978	1241	938	1223	525	1254
Lo Temp. °F	1048	1110	1166	1076	1034	1151	965	1228	904	1197	507	1235
90 Hour												
Avg. Temp. °F	1060	1121	1181	1093	1033	1167	1093	1255	940	1227	525	1269
Std. Dev.	10	18	20	32	12	2	24	20	19	16	12	17
Hi Temp. °F	1071	1143	1209	1125	1046	1169	1016	1271	956	1239	536	1286
Lo Temp. °F	1047	1100	1164	1065	1021	1165	962	1227	912	1204	512	1245
95 Hour												
Avg. Temp. °F	1071	1113	1162	1089	1045	1161	987	1252	942	1230	525	1269
Std. Dev.	17	14	10	17	12	5	33	3	2	2	12	4
Hi Temp. °F	1092	1134	1171	1105	1061	1169	991	1258	945	1232	531	1272
Lo Temp. °F	1051	1096	1148	1066	1027	1158	983	1249	940	1227	523	1263
100 Hour												
Avg. Temp. °F	1071	1120	1180	1095	1054	1161	967	1236	922	1205	514	1252
Std. Dev.	18	18	12	19	17	4	9	4	5	7	5	8
Hi Temp. °F	1097	1142	1197	1114	1078	1167	982	1241	928	1214	519	1260
Lo Temp. °F	1055	1103	1166	1074	1029	1157	959	1231	916	1198	508	1243

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
105 Hour												
Avg. Temp. °F	1076	1139	1174	1083	1034	1162	970	1242	916	1206	494	1254
Std. Dev.	17	16	18	13	8	7	9	6	7	8	4	9
Hi Temp. °F	1094	1166	1197	1095	1040	1170	981	1251	922	1216	499	1265
Lo Temp. °F	1052	1124	1167	1061	1020	1155	962	1237	904	1193	489	1241
110 Hour												
Avg. Temp. °F	1057	1129	1178	1090	1043	1156	963	1238	918	1204	493	1252
Std. Dev.	5	14	22	10	8	8	13	9	12	14	10	12
Hi Temp. °F	1062	1153	1206	1101	1055	1168	975	1247	933	1220	503	1262
Lo Temp. °F	1050	1117	1147	1076	1034	1148	941	1223	900	1183	481	1234
115 Hour												
Avg. Temp. °F	1070	1136	1178	1102	1048	1159	968	1236	894	1180	488	1234
Std. Dev.	23	20	10	11	14	4	9	4	4	4	13	8
Hi Temp. °F	1098	1166	1190	1114	1059	1162	975	1241	899	1184	510	1242
Lo Temp. °F	1045	1117	1164	1090	1023	1154	952	1231	890	1174	476	1223
120 Hour												
Avg. Temp. °F	1080	1147	1177	1087	1048	1167	1002	1264	941	1230	533	1281
Std. Dev.	15	28	15	10	8	12	32	24	24	23	12	36
Hi Temp. °F	1090	1185	1197	1096	1056	1181	970	1299	974	1265	553	1331
Lo Temp. °F	1061	1114	1162	1074	1036	1150	1054	1238	909	1203	520	1240

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78 Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run / Specimen	3	8	8	3	8	3	8	3	3	8	8	3
125 Hour												
Avg. Temp. °F	1095	1191	1180	1095	1040	1177	1065	1305	986	1270	551	1345
Std. Dev.	9	44	31	12	14	12	9	6	6	6	6	8
Hi Temp. °F	1104	1253	1227	1109	1059	1190	1074	1311	994	1276	557	1351
Lo Temp. °F	1085	1131	1144	1083	1026	1159	1052	1295	977	1261	544	1331
130 Hour												
Avg. Temp. °F	1087	1227	1178	1091	1027	1158	1106	1332	1017	1299	557	1371
Std. Dev.	20	25	20	14	8	8	31	18	24	20	9	17
Hi Temp. °F	1121	1264	1200	1111	1034	1168	1150	1355	1049	1325	569	1397
Lo Temp. °F	1076	1206	1146	1079	1014	1148	1069	1313	991	1276	547	1355
135 Hour												
Avg. Temp. °F	1090	1199	1175	1081	1032	1159	1113	1328	1025	1300	561	1375
Std. Dev.	13	10	12	6	11	12	54	40	47	40	18	38
Hi Temp. °F	1097	1214	1191	1086	1047	1170	1156	1357	1062	1333	579	1406
Lo Temp. °F	1067	1185	1161	1074	1016	1142	1024	1260	949	1235	551	1314
140 Hour												
Avg. Temp. °F	1084	1193	1171	1083	1033	1170	1124	1339	1033	1310	568	1389
Std. Dev.	9	24	15	9	19	13	16	12	18	11	5	12
Hi Temp. °F	1100	1215	1192	1091	1057	1183	1144	1354	1053	1322	576	1402
Lo Temp. °F	1078	1153	1151	1067	1013	1148	1103	1320	1005	1292	561	1369

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run / Specimen	3	8	8	3	8	3	8	3	3	8	8	3
145 Hour												
Avg. Temp. °F	1079	1218	1169	1081	1042	1172	1110	1334	1031	1307	575	1381
Std. Dev.	8	17	19	13	2	13	17	10	14	10	16	9
Hi Temp. °F	1088	1244	1192	1097	1045	1182	1132	1342	1050	1317	599	1392
Lo Temp. °F	1069	1195	1146	1065	1039	1151	1088	1321	1016	1297	561	1368
150 Hour												
Avg. Temp. °F	1100	1195	1178	1082	1034	1160	1109	1331	1027	1309	595	1386
Std. Dev.	12	44	21	13	11	12	13	8	11	8	4	10
Hi Temp. °F	1116	1256	1202	1098	1047	1170	1122	1341	1041	1318	599	1399
Lo Temp. °F	1094	1226	1179	1084	1037	1161	1111	1332	1030	1307	585	1385
155 Hour												
Avg. Temp. °F	7	45	15	4	9	6	9	11	12	12	7	15
Std. Dev.	1100	1282	1195	1091	1046	1168	1117	1340	1039	1317	593	1398
Hi Temp. °F	1083	1170	1158	1081	1024	1152	1095	1315	1011	1288	576	1360
Lo Temp. °F												
160 Hour												
Avg. Temp. °F	1093	1261	1168	1082	1037	1159	1127	1340	1044	1315	584	1398
Std. Dev.	19	26	16	11	9	5	22	10	17	13	7	15
Hi Temp. °F	1116	1301	1188	1095	1049	1163	1163	1355	1071	1333	594	1415
Lo Temp. °F	1068	1231	1154	1066	1023	1151	1105	1331	1027	1302	577	1379

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
165 Hour												
Avg. Temp. °F	1086	1249	1180	1084	1032	1154	1115	1339	1034	1311	581	1393
Std. Dev.	20	20	12	5	13	10	23	19	26	21	11	20
Hi Temp. °F	1120	1267	1200	1090	1043	1163	1137	1359	1060	1336	593	1423
Lo Temp. °F	1072	1221	1170	1077	1011	1143	1080	1314	1001	1283	566	1383
170 Hour												
Avg. Temp. °F	1138	1212	1189	1106	1064	1152	1033	1257	899	1185	578	1327
Std. Dev.	29	36	11	25	44	9	59	62	119	112	10	48
Hi Temp. °F	1171	1258	1204	1143	1140	1161	1103	1336	1025	1308	592	1391
Lo Temp. °F	1100	1165	1180	1082	1033	1141	959	1206	730	1037	566	1271
175 Hour												
Avg. Temp. °F	1093	1164	1175	1091	1024	1151	1105	1331	1021	1302	580	1383
Std. Dev.	13	15	12	11	13	8	10	6	11	7	5	6
Hi Temp. °F	1113	1185	1187	1105	1043	1161	1120	1338	1035	1312	587	1390
Lo Temp. °F	1079	1151	1155	1076	1011	1142	1092	1322	1006	1294	574	1375
180 Hour												
Avg. Temp. °F	1092	1139	1171	1084	1029	1154	1117	1340	1031	1037	585	1391
Std. Dev.	16	16	15	10	8	7	9	3	8	6	2	6
Hi Temp. °F	1117	1157	1186	1098	1040	1163	1129	1345	1042	1317	587	1401
Lo Temp. °F	1074	1114	1152	1072	1018	1144	1106	1337	1023	1303	583	1387

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
185 Hour												
Avg. Temp. °F	1110	1183	1186	1094	1047	1152	1058	1292	969	1251	575	1357
Std. Dev.	29	34	18	10	14	8	41	42	77	75	11	33
Hi Temp. °F	1155	1234	1203	1106	1066	1159	1104	1331	1025	1304	589	1384
Lo Temp. °F	1080	1147	1165	1079	1028	1141	994	1226	835	1120	560	1301
190 Hour												
Avg. Temp. °F	1104	1190	1168	1094	1028	1153	1064	1292	996	1280	570	1357
Std. Dev.	19	17	22	5	13	15	14	17	9	8	8	13
Hi Temp. °F	1126	1218	1199	1100	1048	1169	1081	1307	1006	1289	579	1371
Lo Temp. °F	1081	1174	1146	1086	1015	1134	1047	1265	988	1273	561	1343
195 Hour												
Avg. Temp. °F	1088	1163	1176	1072	1048	1160	1093	1320	1025	1302	577	1388
Std. Dev.	15	39	9	16	12	7	38	29	40	34	16	31
Hi Temp. °F	1107	1226	1190	1096	1056	1166	1150	1366	1084	1354	601	1438
Lo Temp. °F	1068	1126	1168	1058	1027	1148	1058	1298	984	1268	560	1366
200 Hour												
Avg. Temp. °F	1101	1141	1187	1086	1030	1157	1155	1293	989	1277	558	1361
Std. Dev.	19	25	18	24	7	5	2	4	6	4	5	7
Hi Temp. °F	1114	1173	1206	1111	1037	1165	1057	1299	994	1282	564	1373
Lo Temp. °F	1068	1111	1166	1055	1022	1151	1053	1288	982	1271	551	1353

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run / Specimen	3	8	8	3	8	3	8	3	3	8	8	3
205 Hour												
Avg. Temp. °F	1096	1189	1179	1086	1039	1160	1093	1316	1024	1302	568	1381
Std. Dev.	8	20	30	13	15	7	19	13	15	12	9	6
Hi Temp. °F	1107	1217	1212	1105	1054	1168	1118	1335	1041	1318	582	1387
Lo Temp. °F	1088	1163	1138	1074	1019	1154	1075	1300	1003	1284	558	1373
210 Hour												
Avg. Temp. °F	1109	1221	1190	1085	1034	1154	1106	1329	1032	1311	545	1391
Std. Dev.	18	22	14	7	9	5	16	10	11	8	15	9
Hi Temp. °F	1124	1249	1206	1091	1044	1160	1123	1336	1041	1320	566	1400
Lo Temp. °F	1079	1194	1173	1073	1025	1147	1087	1312	1013	1303	525	1380
215 Hour												
Avg. Temp. °F	1096	1223	1196	1091	1049	1157	1096	1328	1024	1307	528	1386
Std. Dev.	9	27	13	6	10	5	17	12	21	11	9	13
Hi Temp. °F	1107	1256	1214	1097	1058	1162	1117	1344	1056	1323	538	1405
Lo Temp. °F	1081	1182	1182	1082	1037	1149	1074	1311	1003	1293	520	1373
220 Hour												
Avg. Temp. °F	1119	1180	1188	1078	1060	1167	1084	1313	1014	1294	533	1376
Std. Dev.	19	26	19	9	7	13	30	20	31	22	18	23
Hi Temp. °F	1133	1209	1211	1092	1069	1186	1127	1343	1062	1327	560	1410
Lo Temp. °F	1087	1155	1164	1070	1052	1152	1044	1288	979	1265	513	1349

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
225 Hour												
Avg. Temp. °F	1116	1225	1193	1091	1063	1182	1082	1305	1002	1288	536	1373
Std. Dev.	13	40	17	11	14	5	6	5	8	5	7	7
Hi Temp. °F	1134	1269	1219	1105	1076	1186	1090	1310	1013	1292	545	1382
Lo Temp. °F	1101	1177	1173	1079	1043	1174	1075	1298	993	1281	528	1364
230 Hour												
Avg. Temp. °F	1120	1201	1188	1080	1065	1180	1086	1312	1014	1296	529	1376
Std. Dev.	14	29	19	15	8	4	11	10	7	8	13	13
Hi Temp. °F	1137	1235	1218	1094	1073	1186	1103	1323	1021	1306	545	1393
Lo Temp. °F	1105	1168	1170	1063	1053	1176	1076	1301	1006	1287	517	1359
235 Hour												
Avg. Temp. °F	1115	1218	1191	1075	1053	1174	1078	1309	1017	1294	542	1374
Std. Dev.	4	20	17	16	7	9	11	4	5	4	5	4
Hi Temp. °F	1120	1235	1205	1098	1060	1183	1090	1313	1023	1299	550	1380
Lo Temp. °F	1110	1195	1165	1057	1043	1161	1065	1304	1010	1288	536	1370
240 Hour												
Avg. Temp. °F	1118	1205	1195	1077	1064	1176	1085	1311	1012	1293	537	1375
Std. Dev.	16	25	17	11	10	8	20	16	22	16	17	17
Hi Temp. °F	1134	1242	1216	1088	1074	1185	1117	1335	1047	1317	556	1400
Lo Temp. °F	1094	1181	1178	1064	1053	1164	1068	1299	990	1281	513	1354

Table A-3 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 hr. exposure (miniplant run 78)

Control Temperature: 1200°F

Combustor Location:	In Bed						Above Bed					
Port Number	7		9		11		19		20		22	
Hours Into Run \ Specimen	3	8	8	3	8	3	8	3	3	8	8	3
245 Hour												
Avg. Temp. °F	1126	1179	1179	1082	1066	1175	1084	1316	1127	1302	553	1381
Std. Dev.	6	7	18	14	10	6	27	19	25	20	10	19
Hi Temp. °F	1133	1187	1202	1100	1077	1183	1123	1348	1071	1337	570	1414
Lo Temp. °F	1118	1168	1157	1061	1055	1166	1067	1299	1011	1289	544	1369
250 Hour												
Avg. Temp. °F	1134	1192	1189	1090	1068	1164	1021	1259	947	1224	539	1324
Std. Dev.	13	13	18	22	15	8	64	57	83	84	7	36
Hi Temp. °F	1152	1206	1215	1117	1086	1173	1076	1308	1013	1291	547	1374
Lo Temp. °F	1117	1187	1164	1064	1051	1155	950	1187	822	1098	528	1291
255 Hour												
Avg. Temp. °F	1121	1193	1178	1084	1071	1182	1090	1322	1024	1305	536	1387
Std. Dev.	8	34	15	12	11	7	21	11	8	9	12	11
Hi Temp. °F	1132	1232	1204	1102	1077	1188	1110	1331	1030	1313	545	1398
Lo Temp. °F	1112	1138	1165	1074	1052	1171	1066	1308	1015	1295	517	1373
260 Hour												
Avg. Temp. °F												
Std. Dev.												
Hi Temp. °F												
Lo Temp. °F												

Table A-4

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
5 Hour												
Avg. Temp. °F	628	745	687		687							
Std. Dev.	25	55	8		7							
Hi Temp. °F	665	835	698		696							
Lo Temp. °F	597	698	676		678							
10 Hour												
Avg. Temp. °F	802	889	836		835							
Std. Dev.	88	90	57		60							
Hi Temp. °F	893	978	887		889							
Lo Temp. °F	672	762	768		764							
15 Hour												
Avg. Temp. °F	821	925	886		887							
Std. Dev.	28	35	5		7							
Hi Temp. °F	866	984	895		897							
Lo Temp. °F	800	895	881		878							
20 Hour												
Avg. Temp. °F	831	958	913		913							
Std. Dev.	50	47	36		36							
Hi Temp. °F	919	1025	976		977							
Lo Temp. °F	802	920	891		892							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run / Specimen	2	9	9		9							
25 Hour												
Avg. Temp. °F	790	924	892		895							
Std. Dev.	41	34	15		15							
Hi Temp. °F	861	982	908		914							
Lo Temp. °F	759	893	874		876							
30 Hour												
Avg. Temp. °F	748	913	909		908							
Std. Dev.	14	21	18		18							
Hi Temp. °F	767	944	932		929							
Lo Temp. °F	732	892	887		883							
35 Hour												
Avg. Temp. °F	825	996	983		984							
Std. Dev.	57	83	97		97							
Hi Temp. °F	890	1075	1069		1069							
Lo Temp. °F	750	888	865		864							
40 Hour												
Avg. Temp. °F	853	1017	1013		1013							
Std. Dev.	36	47	34		32							
Hi Temp. °F	909	1098	1057		1052							
Lo Temp. °F	808	975	983		985							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
45 Hour												
Avg. Temp. °F	784	972	997		994							
Std. Dev.	3	12	9		10							
Hi Temp. °F	787	984	1005		1005							
Lo Temp. °F												
50 Hour												
Avg. Temp. °F	788	977	994		997							
Std. Dev.	21	12	16		17							
Hi Temp. °F	819	995	1016		1019							
Lo Temp. °F	775	969	978		984							
55 Hour												
Avg. Temp. °F	780	999	1020		1024							
Std. Dev.	14	15	20		17							
Hi Temp. °F	818	1019	1032		1035							
Lo Temp. °F	785	986	990		998							
60 Hour												
Avg. Temp. °F	799	993	1014		1016							
Std. Dev.	21	29	17		16							
Hi Temp. °F	817	1018	1042		1041							
Lo Temp. °F	769	948	999		1002							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
65 Hour												
Avg. Temp. °F	799	997	1018		1019							
Std. Dev.	19	23	23		27							
Hi Temp. °F	828	1023	1048		1056							
Lo Temp. °F	785	972	999		998							
70 Hour												
Avg. Temp. °F	790	1001	1008		1009							
Std. Dev.	9	19	29		28							
Hi Temp. °F	798	1024	1043		1044							
Lo Temp. °F	780	982	977		979							
75 Hour												
Avg. Temp. °F	789	1010	1013		1010							
Std. Dev.	12	15	16		17							
Hi Temp. °F	805	1029	1032		1036							
Lo Temp. °F	776	990	977		996							
80 Hour												
Avg. Temp. °F	795	1014	1013		1012							
Std. Dev.	18	26	21		21							
Hi Temp. °F	820	1053	1041		1042							
Lo Temp. °F	769	991	987		986							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
85 Hour												
Avg. Temp. °F	773	1006	1018		1017							
Std. Dev.	9	6	13		13							
Hi Temp. °F	785	1014	1032		1030							
Lo Temp. °F	761	1000	999		997							
90 Hour												
Avg. Temp. °F	779	1020	1027		1021							
Std. Dev.	29	26	8		9							
Hi Temp. °F	816	1057	1036		1039							
Lo Temp. °F	746	996	1019		1020							
95 Hour												
Avg. Temp. °F	775	1037	1023		1024							
Std. Dev.	20	23	10		10							
Hi Temp. °F	810	1076	1031		1034							
Lo Temp. °F	760	1017	1011		1012							
100 Hour												
Avg. Temp. °F	785	1044	1030		1029							
Std. Dev.	13	28	16		16							
Hi Temp. °F	800	1073	1047		1050							
Lo Temp. °F	772	998	1012		1010							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
105 Hour												
Avg. Temp. °F	778	1030	1029		1031							
Std. Dev.	36	28	11		11							
Hi Temp. °F	835	1075	1038		1039							
Lo Temp. °F	741	1006	1016		1015							
110 Hour												
Avg. Temp. °F	769	1036	1036		1037							
Std. Dev.	11	8	21		19							
Hi Temp. °F	783	1049	1053		1057							
Lo Temp. °F	758	1029	1011		1013							
115 Hour												
Avg. Temp. °F	794	1030	1022		1024							
Std. Dev.	31	37	16		14							
Hi Temp. °F	848	1096	1043		1041							
Lo Temp. °F	771	1007	1007		1008							
120 Hour												
Avg. Temp. °F	759	1034	1056		1061							
Std. Dev.	9	19	33		40							
Hi Temp. °F	769	1062	1112		1127							
Lo Temp. °F	754	1013	1035		1034							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
125 Hour												
Avg. Temp. °F	783	1059	1038		1040							
Std. Dev.	9	17	12		13							
Hi Temp. °F	792	1074	1050		1053							
Lo Temp. °F	772	1036	1020		1031							
130 Hour												
Avg. Temp. °F	1023	1023	1028		1029							
Std. Dev.	36	37	7		7							
Hi Temp. °F	786	1081	1034		1036							
Lo Temp. °F	701	990	1020		1021							
135 Hour												
Avg. Temp. °F	707	1014	1033		1025							
Std. Dev.	11	19	18		20							
Hi Temp. °F	722	1029	1053		1055							
Lo Temp. °F	693	984	1024		1023							
140 Hour												
Avg. Temp. °F	719	1027	1049		1050							
Std. Dev.	10	21	13		13							
Hi Temp. °F	735	1054	1064		1067							
Lo Temp. °F	707	998	1036		1034							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
145 Hour												
Avg. Temp. °F	710	1015	1047		1047							
Std. Dev.	7	8	17		16							
Hi Temp. °F	719	1025	1069		1069							
Lo Temp. °F	702	1004	1027		1027							
150 Hour												
Avg. Temp. °F	721	1005	1006		1008							
Std. Dev.	24	25	13		12							
Hi Temp. °F	758	1044	1017		1017							
Lo Temp. °F	693	979	985		989							
155 Hour												
Avg. Temp. °F	711	1011	1007		1007							
Std. Dev.	17	30	39		38							
Hi Temp. °F	738	1052	1065		1064							
Lo Temp. °F	694	984	964		961							
160 Hour												
Avg. Temp. °F	716	1015	977		976							
Std. Dev.	13	20	11		14							
Hi Temp. °F	729	1044	986		988							
Lo Temp. °F	698	995	958		953							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
165 Hour												
Avg. Temp. °F	710	993	973		972							
Std. Dev.	15	22	11		10							
Hi Temp. °F	725	1017	986		982							
Lo Temp. °F	694	972	960		959							
170 Hour												
Avg. Temp. °F	747	1024	1041		1040							
Std. Dev.	68	50	100		102							
Hi Temp. °F	865	1112	1213		1217							
Lo Temp. °F	692	1001	969		969							
175 Hour												
Avg. Temp. °F	703	1001	973		974							
Std. Dev.	15	19	26		28							
Hi Temp. °F	727	1031	1005		1012							
Lo Temp. °F	689	978	934		935							
180 Hour												
Avg. Temp. °F	729	1025	964		965							
Std. Dev.	26	30	14		16							
Hi Temp. °F	760	1063	982		988							
Lo Temp. °F	708	990	947		946							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run / Specimen	2	9	9		9							
185 Hour												
Avg. Temp. °F	718	1008	998		997							
Std. Dev.	29	19	18		20							
Hi Temp. °F	765	1036	1028		1030							
Lo Temp. °F	692	987	980		983							
190 Hour												
Avg. Temp. °F	707	1009	1005		1008							
Std. Dev.	4	16	24		21							
Hi Temp. °F	713	1029	1023		1022							
Lo Temp. °F	702	995	964		971							
195 Hour												
Avg. Temp. °F	708	1020	998		999							
Std. Dev.	15	16	10		11							
Hi Temp. °F	729	1038	1006		1008							
Lo Temp. °F	694	1001	982		980							
200 Hour												
Avg. Temp. °F	703	1010	991		991							
Std. Dev.	21	26	15		12							
Hi Temp. °F	2727	1039	1008		1007							
Lo Temp. °F	677	984	974		980							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run / Specimen	2	9	9		9							
205 Hour												
Avg. Temp. °F	709	1014	998		998							
Std. Dev.	9	17	16		16							
Hi Temp. °F	721	1004	1013		1014							
Lo Temp. °F	698	1001	973		973							
210 Hour												
Avg. Temp. °F	719	1010	1017		1017							
Std. Dev.	16	16	31		24							
Hi Temp. °F	738	1034	1067		1055							
Lo Temp. °F	696	996	984		990							
215 Hour												
Avg. Temp. °F	718	1019	1011		1014							
Std. Dev.	9	4	8		9							
Hi Temp. °F	725	1024	1023		1027							
Lo Temp. °F	711	1014	1002		1003							
220 Hour												
Avg. Temp. °F	724	1038	1024		1024							
Std. Dev.	22	25	24		25							
Hi Temp. °F	777	1075	1048		1043							
Lo Temp. °F	713	1016	990		989							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run \ Specimen	2	9	9		9							
225 Hour												
Avg. Temp. °F	740	1051	1031		1030							
Std. Dev.	19	28	38		38							
Hi Temp. °F	764	1070	1092		1093							
Lo Temp. °F	713	1003	988		999							
230 Hour												
Avg. Temp. °F	722	1033	1021		1021							
Std. Dev.	18	17	13		17							
Hi Temp. °F	755	1051	1033		1036							
Lo Temp. °F	712	1007	1006		1003							
235 Hour												
Avg. Temp. °F	715	1025	1018		1016							
Std. Dev.	19	23	12		11							
Hi Temp. °F	746	1059	1031		1030							
Lo Temp. °F	694	1003	1000		1000							
240 Hour												
Avg. Temp. °F	717	1031	1024		1028							
Std. Dev.	12	23	16		20							
Hi Temp. °F	730	1058	1044		1049							
Lo Temp. °F	701	998	1006		1002							

Table A-4 (Continued)

WESTINGHOUSE HOT CORROSION PROBES

Date: 6/19/78 - 6/30/78

Run: 250 Hour Exposure (Miniplant Run 78)

Control Temperature: 1050°F

Combustor Location:	In Bed						Above Bed					
Port Number	8		12		10							
Hours Into Run / Specimen	2	9	9		9							
245 Hour												
Avg. Temp. °F	730	1045	1031		1033							
Std. Dev.	17	20	9		9							
Hi Temp. °F	746	1065	1041		1043							
Lo Temp. °F	701	1024	1018		1022							
250 Hour												
Avg. Temp. °F	738	1055	1058		1058							
Std. Dev.	37	20	44		43							
Hi Temp. °F	781	1080	1121		1123							
Lo Temp. °F	707	1032	1016		1017							
255 Hour												
Avg. Temp. °F	715	1036	1045		1046							
Std. Dev.	13	21	10		8							
Hi Temp. °F	727	1068	1055		1054							
Lo Temp. °F	693	1006	1026		1033							
260 Hour												
Avg. Temp. °F												
Std. Dev.												
Hi Temp. °F												
Lo Temp. °F												

Figure A-2

Probe #13 1600°F Above Bed

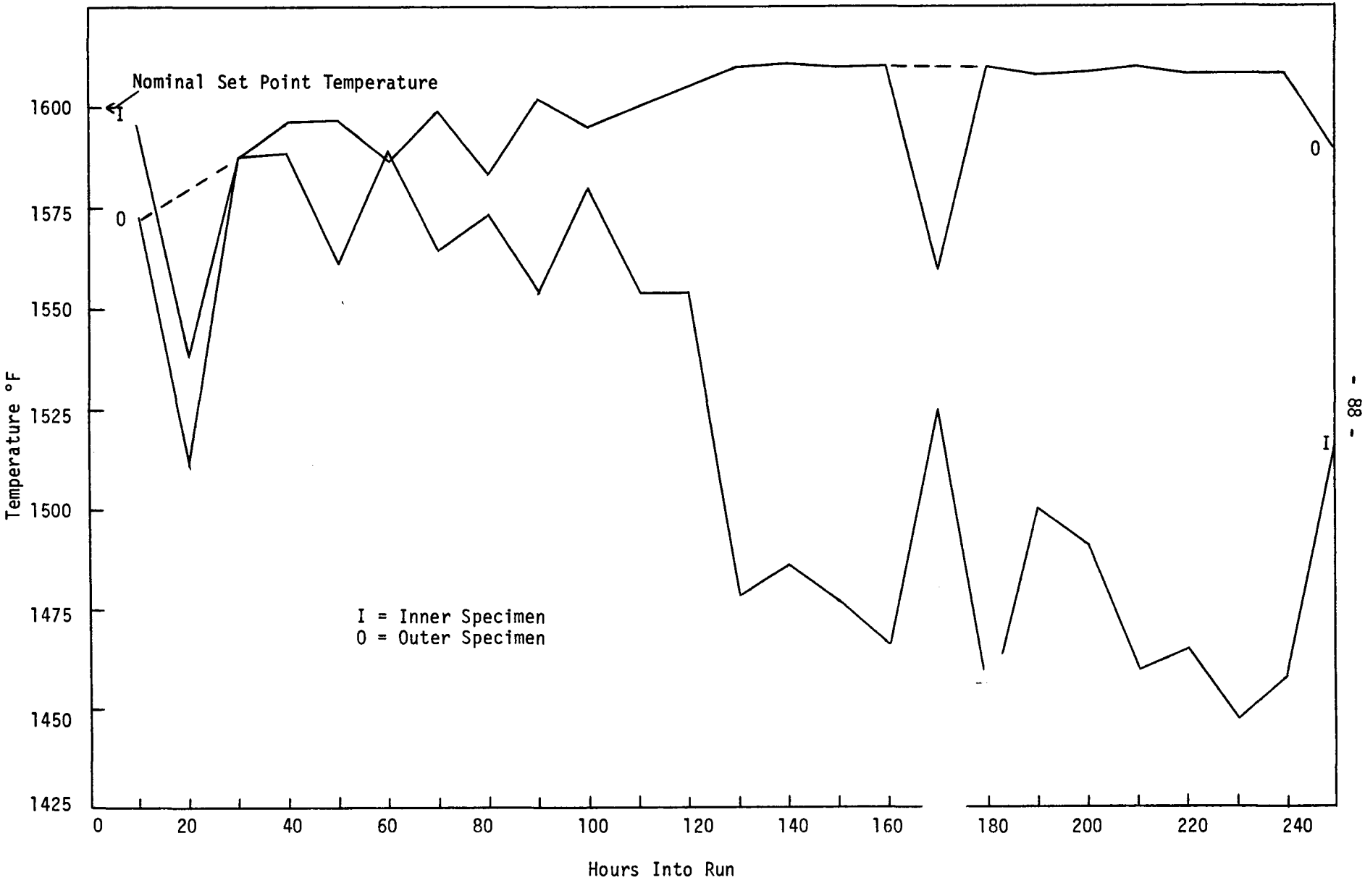


Figure A-1

Probe #1 1600°F In Bed

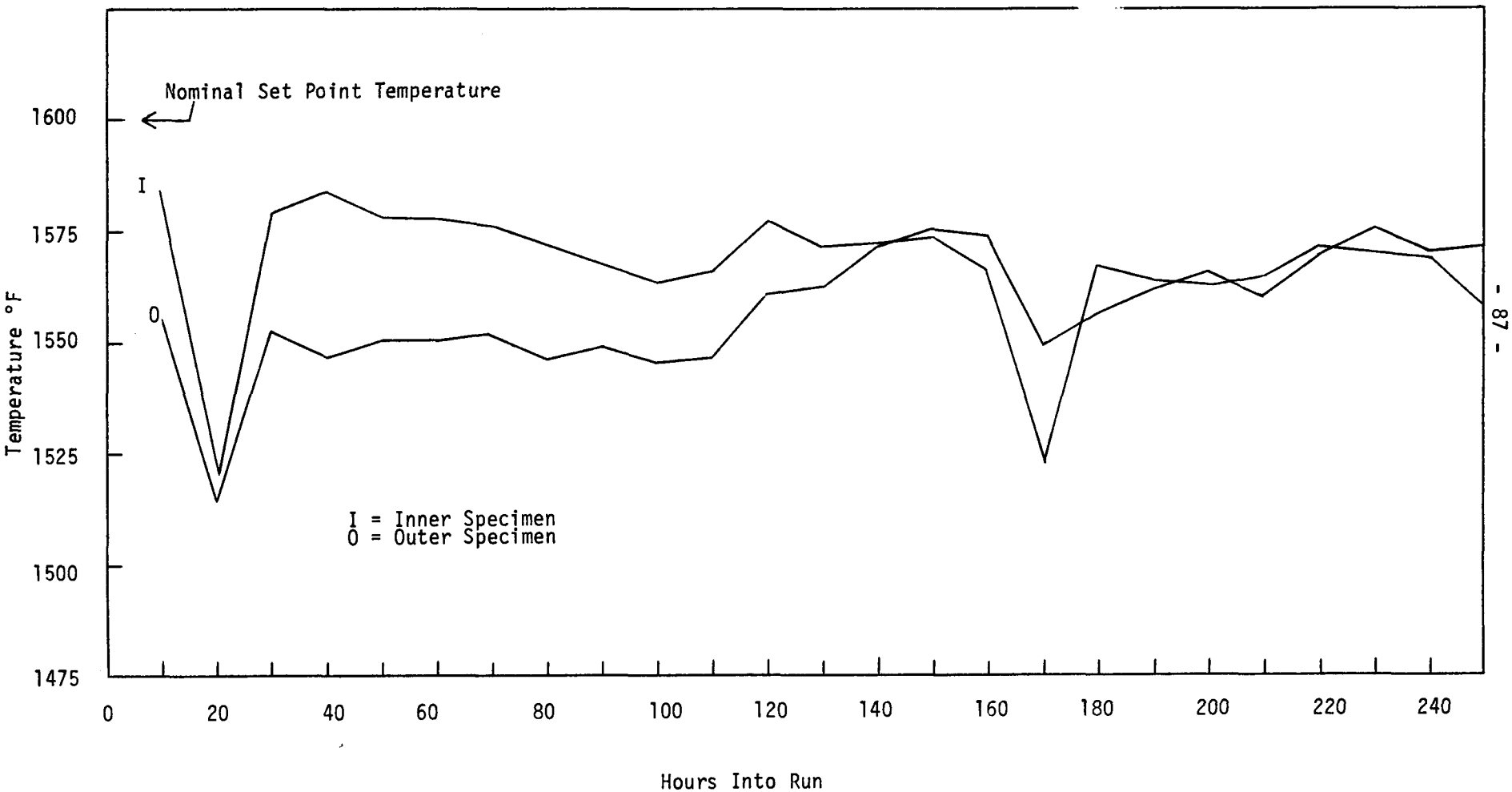


Figure A-3

Probe #2 1400°F In Bed

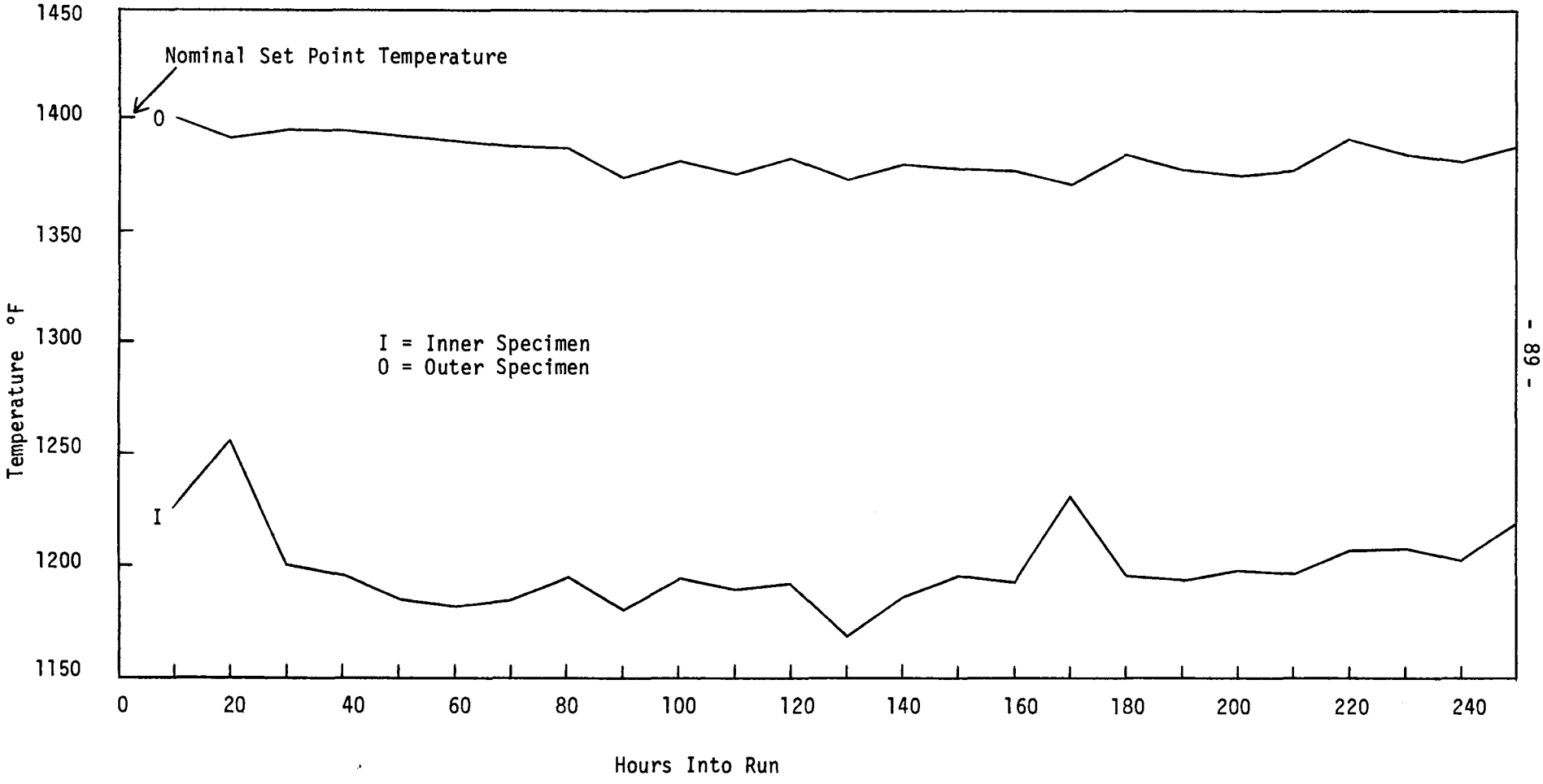


Figure A-4

Probe #14 1400°F Above Bed

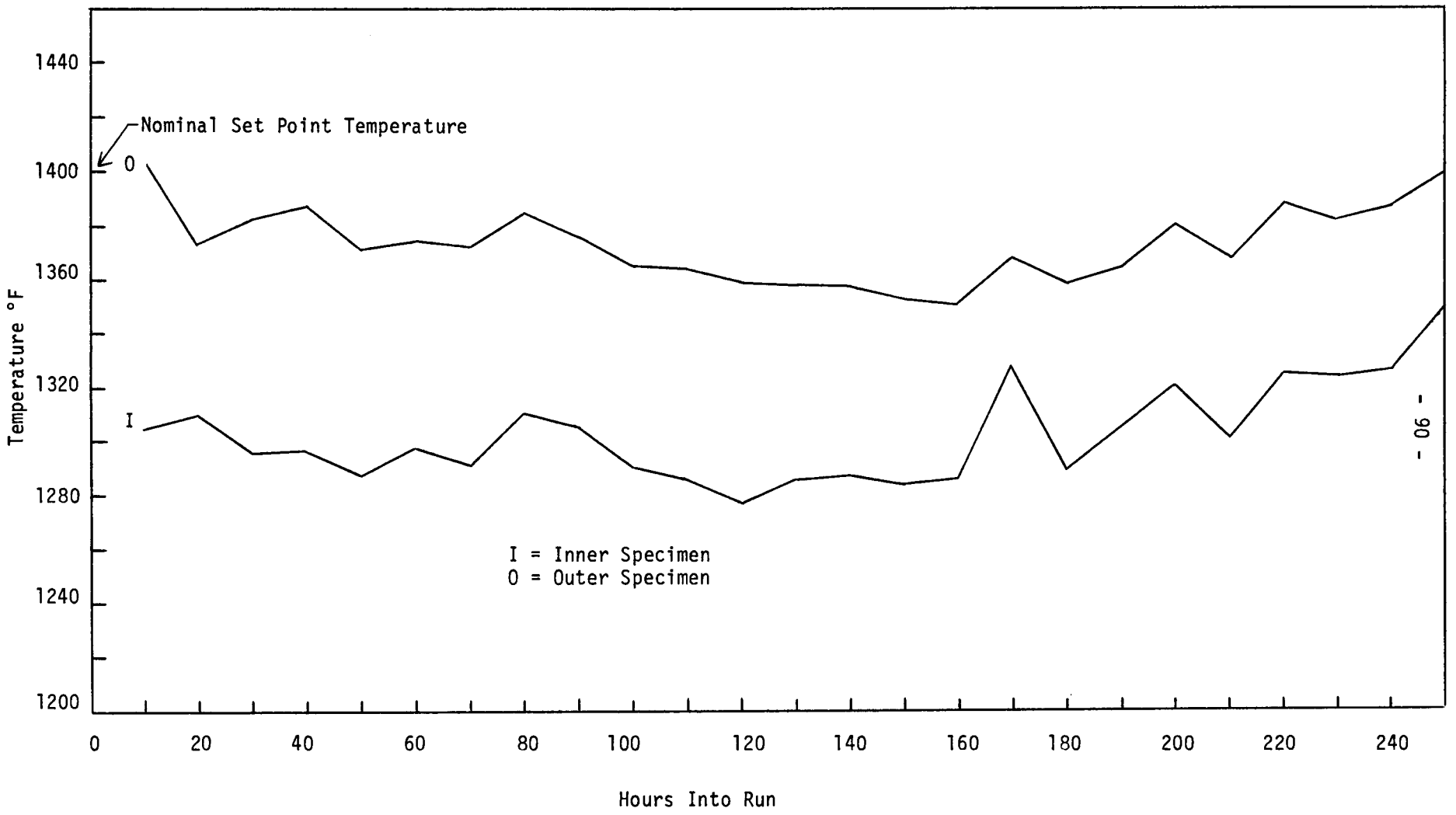


Figure A-5

Probe #11 1200°F In Bed

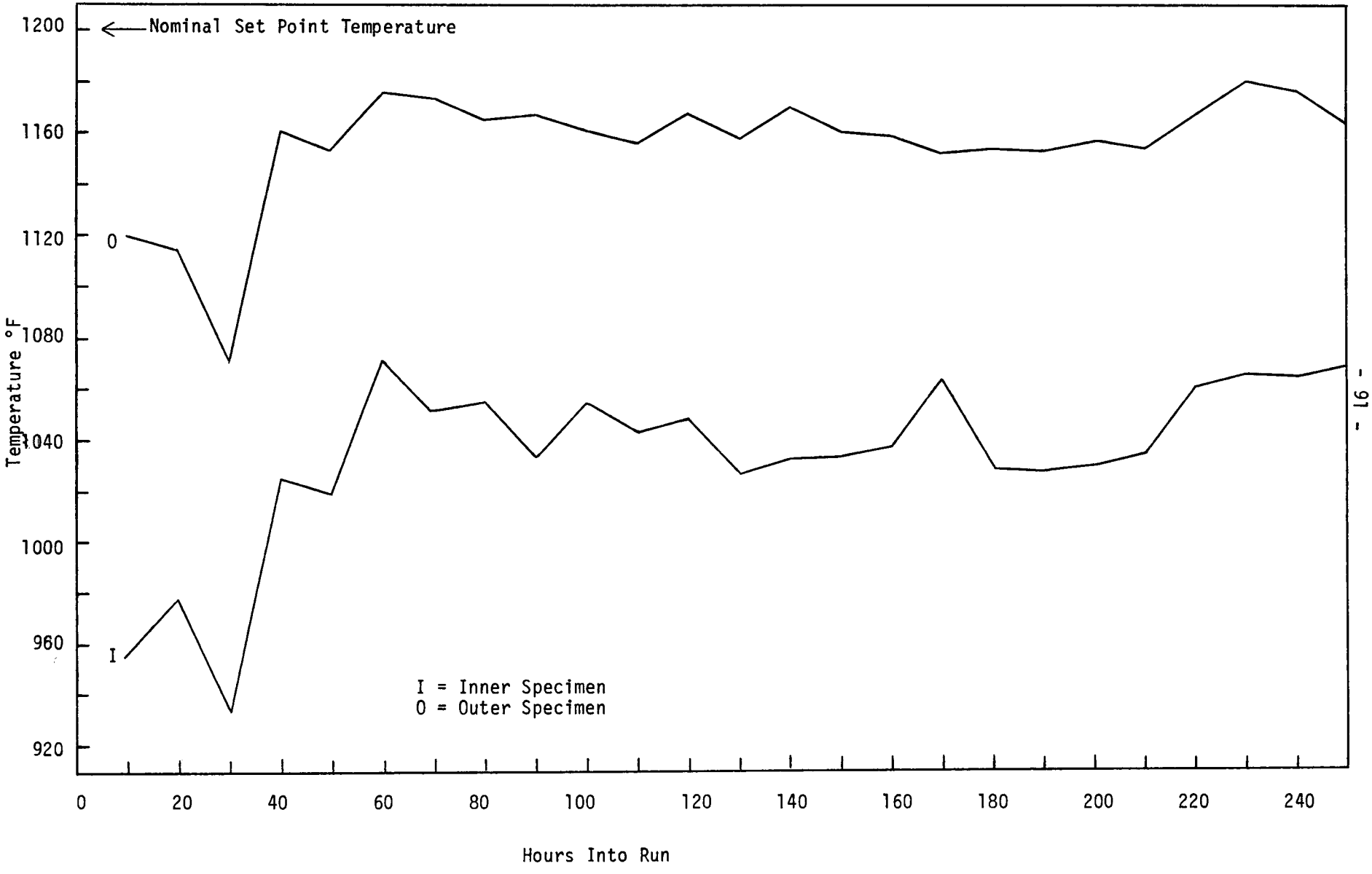


Figure A-6

Probe # 20 1200°F Above Bed

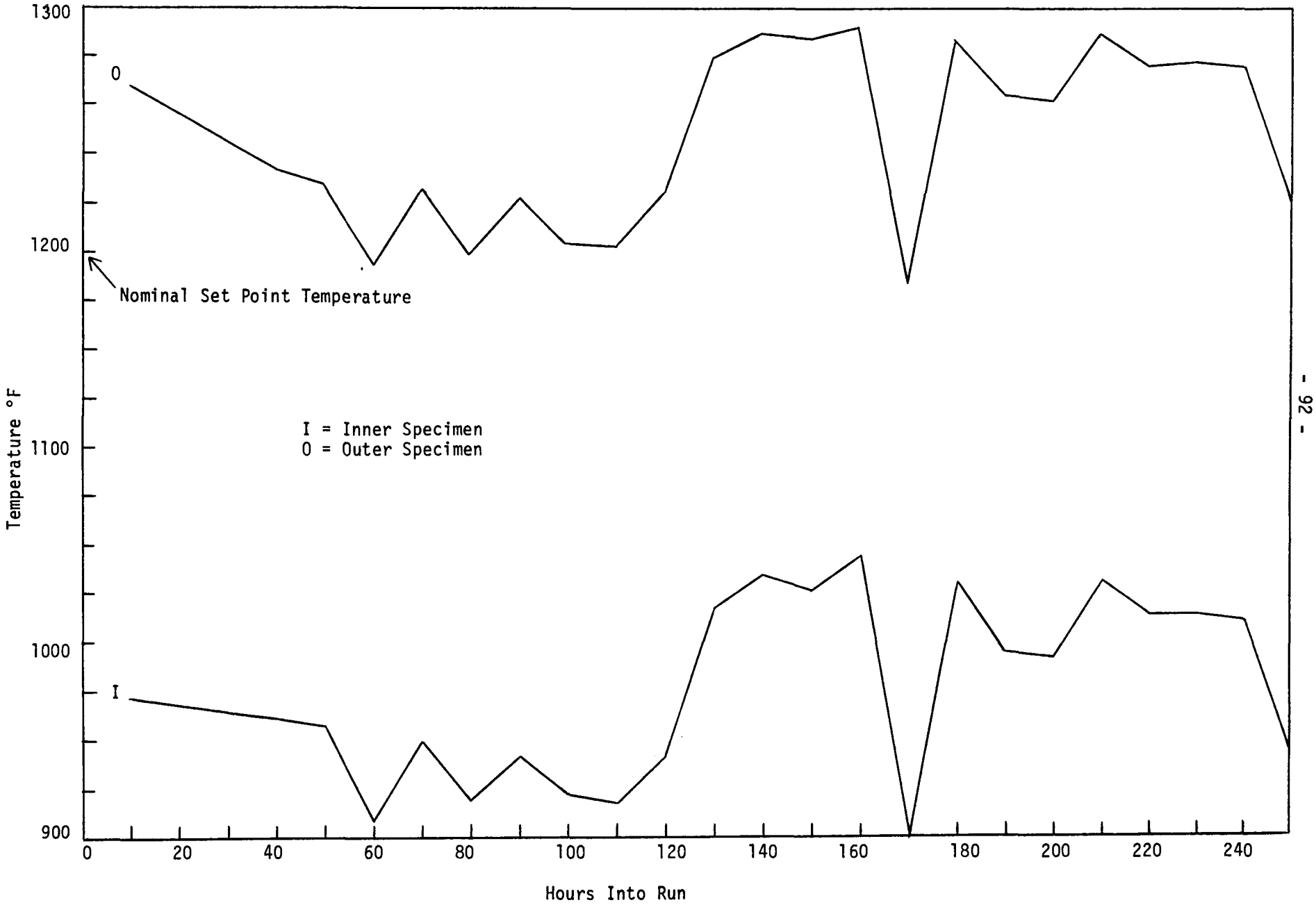


Figure A-7

Probe #8 1050°F In Bed

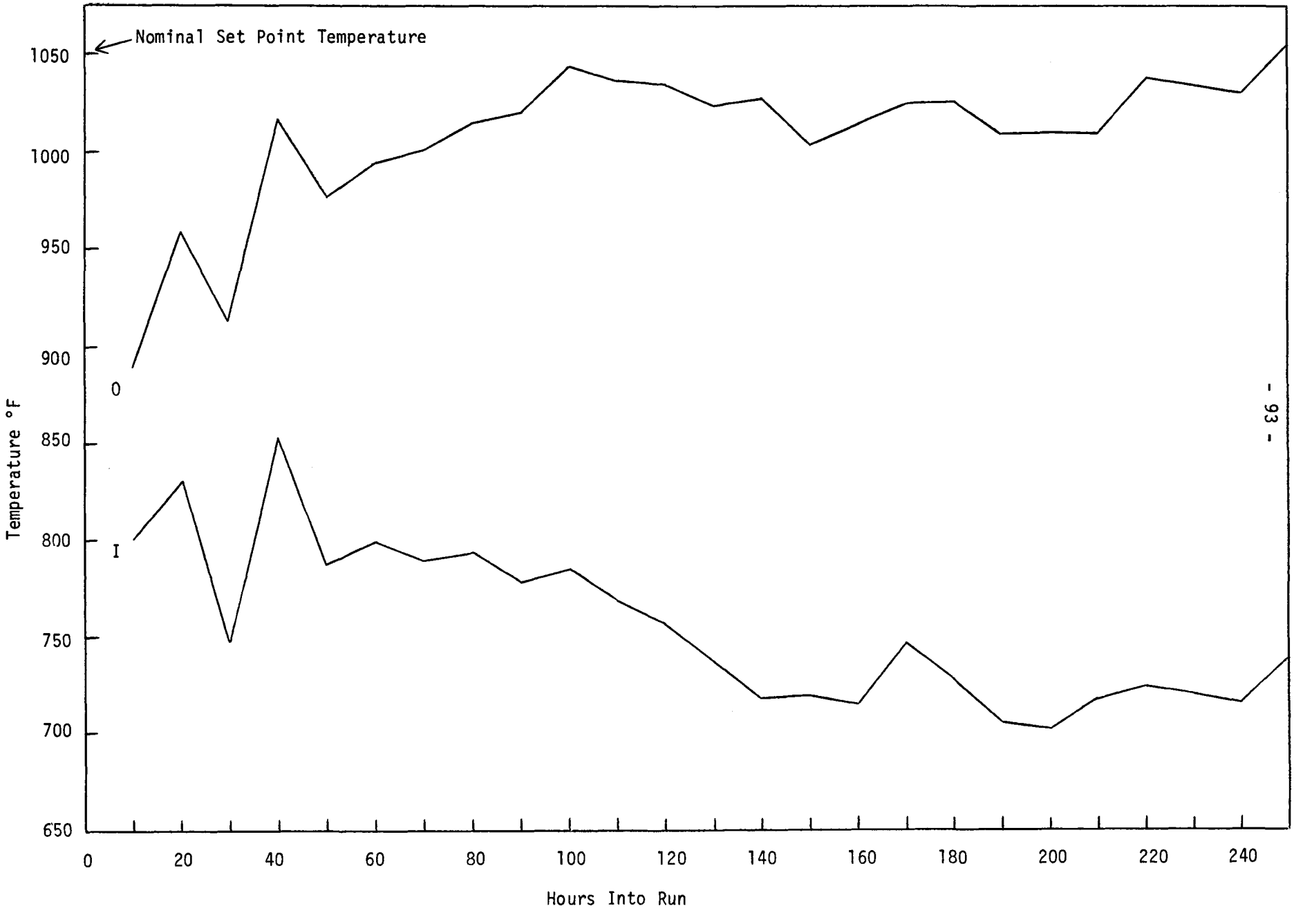
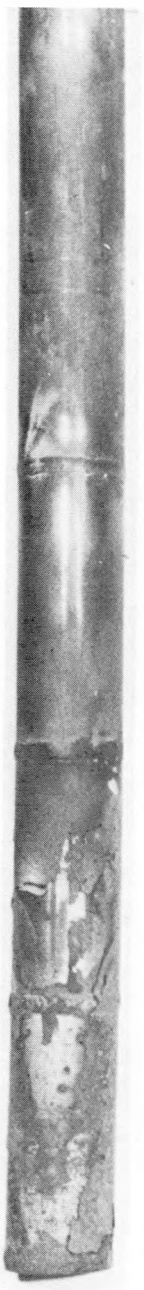
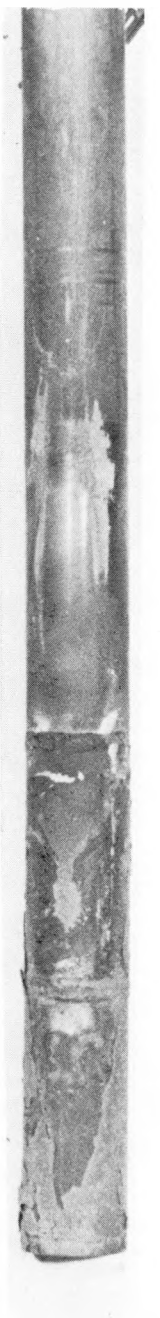


Figure A-8

1600°F In-Bed Probe (Top Side View)



Probe No. 1



Probe No. 3

Probe No. 5

Figure A-9

1600°F Above-Bed Probe (Top Side View)

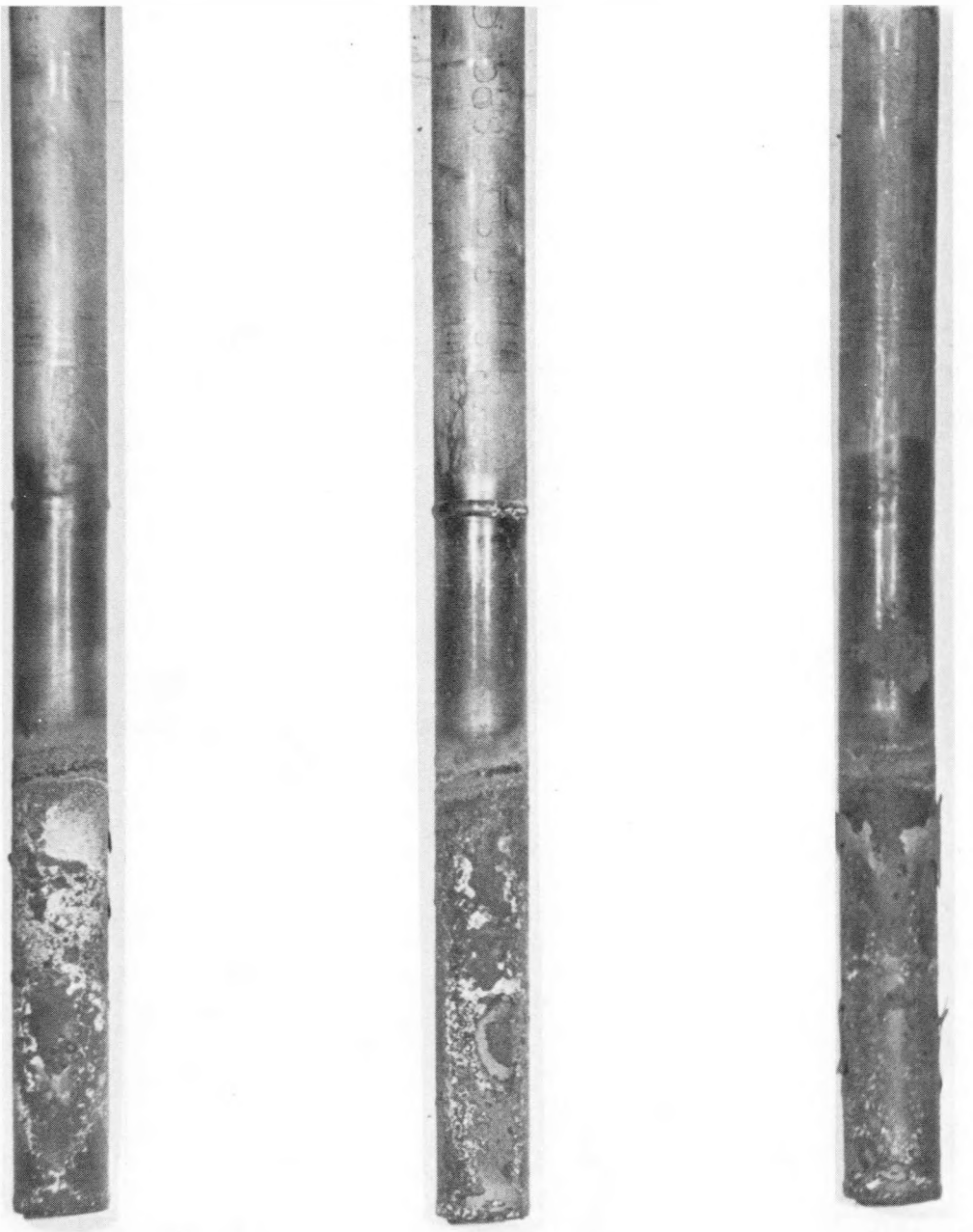
Probe No. 13

Probe No. 15

Probe No. 17

Figure A-10

1400°F In-Bed Probe (Bottom Side View)



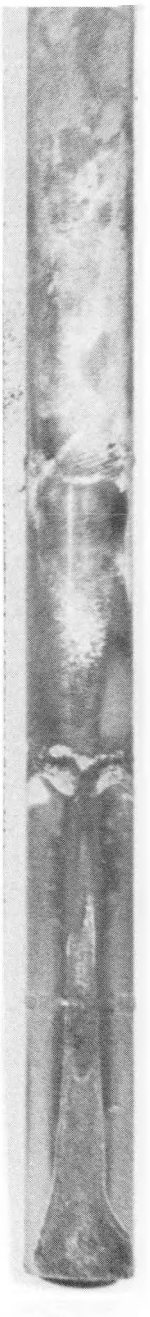
Probe No. 2 Probe No. 4 Probe No. 6

Figure A-11

1400°F Above-Bed Probe (Top Side View)

Probe No. 14

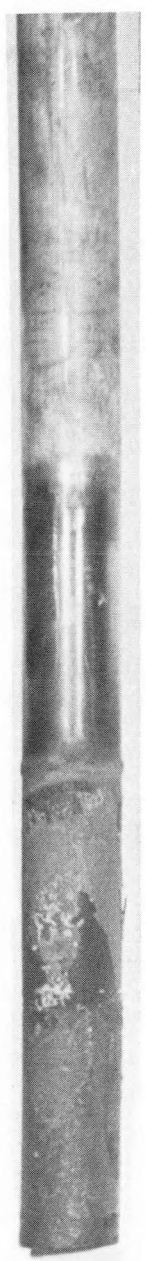
Probe No. 16



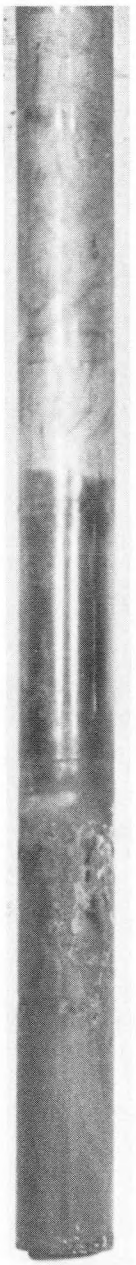
Probe No. 18

Figure A-12

1200°F In-Bed Probe (Bottom Side View)



Probe No. 7

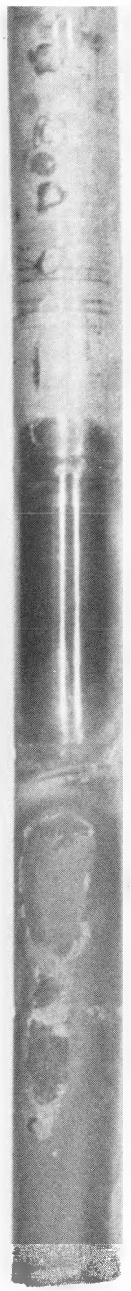


Probe No. 9

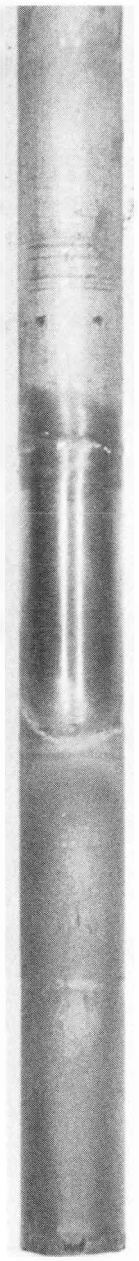
Probe No. 11

Figure A-13

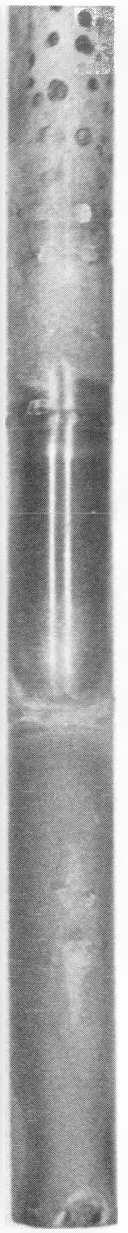
1200°F Above-Bed Probe (Bottom Side View)



Probe No. 19



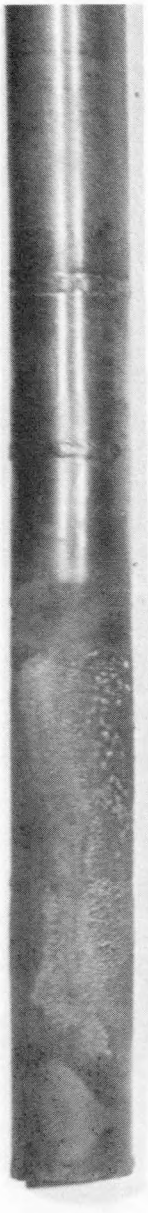
Probe No. 20



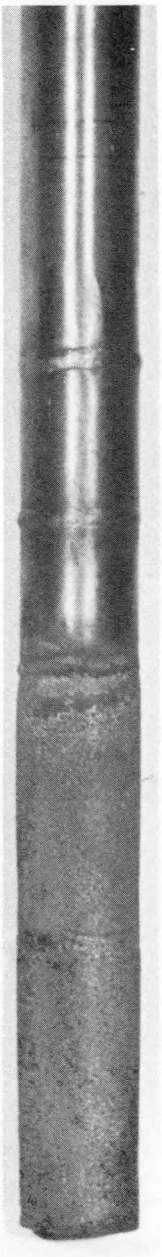
Probe No. 22

Figure A-14

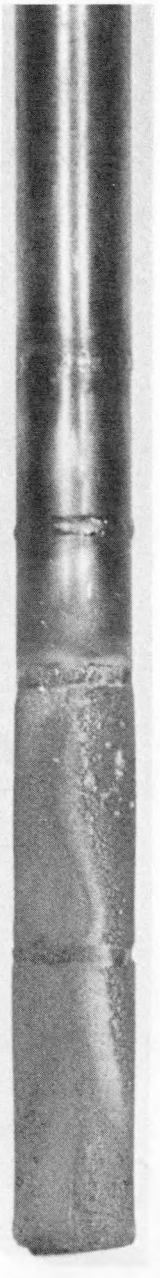
1050°F In-Bed Probe (Bottom Side View)



Probe No. 8



Probe No. 12



Probe No. 10

*U.S. GOVERNMENT PRINTING OFFICE : 1979 0-620-097/2245