DISTRIBUTION SHEET

To	From	Page 1 of 1
DISTRIBUTION	W. S. Lewis	Date 11/8/94
Project Title/Work Order		EDT No. 129860
Sludge Stabilization Operability Test Report		ECN No.

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
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G. B. Chronister	T5-50	X			
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ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 129860

2. To: (Receiving Organization) Distribution	3. From: (Originating Organization) PFP Process Engineering
4. Related EDT No: NA	
5. Proj/Prog/Dept/Div: 15530	6. Cog/Proj Engr: WS Lewis
7. Purchase Order No: NA	
8. Originator Remarks: Operation Test Report from OTP to test the HC-21C Sludge Stabilization Furnaces	9. Equip/Component No: NA
	10. System/Bldg/Facility: 73T/234-5Z/PFP
11. Receiver Remarks:	12. Major Assm Dwg No: NA
	13. Permit/Permit Application No. NA
	14. Required Response Date:

15. DATA TRANSMITTED

(A) Item No.	(B) Document/Drawing No.	(C) Sheet No.	(D) Rev No.	(E) Title or Description of Data Transmitted	(F) Impact Level	(G) Reason for Transmittal	(H) Originator Disposition	(I) Receiver Disposition
1	WHC-SD-CP-OTR-151	1	0	Sludge Stabilization Operability Test Report	SQ	1	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 see MRP 5.43 and EP-1.7	1. Approval 2. Release 3. Information 4. Review 5. Post-Review 6. Dist (Receipt Acknow. Required)	1. Approved 2. Approved w/comment 3. Disapproved w/comment 4. Reviewed no/comment 5. Reviewed w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp
1	1	Cog./Proj. Eng	WS Lewis	10/10/94	T5-55						
1	1	Cog./Proj. Eng. Mgr.	MW Silva	10/24/94	T5-55						
1	1	QA	O R Hotz	10-24-94	T4-19						
1	1	Safety	S C Duncan	10/28/94	T4-18						

18.	19.	20.	21. DOE APPROVAL (if required)
WS Lewis 10/10/94 Signature of EDT Originator / Date	N/A Authorized Representative for Receiving Organization / Date	MW Silva 11/7/94 Cognizant/Project Engineer's Manager / Date	Ltr No. ☐ Approved ☐ Approved w/comments ☐ Disapproved w/comments

BD-7400-172 (2/89)

RELEASE AUTHORIZATION

Document Number:	WHC-SD-CP-OTR-151, REV.0
Document Title:	Sludge Stabilization Operability Test Report
Release Date:	November 10, 1994

This document was reviewed following the procedures described in WHC-CM-3-4 and is:

APPROVED FOR PUBLIC RELEASE

WHC Information Release Administration Specialist:

Kara M. Broz — November 10, 1994

SUPPORTING DOCUMENT		1. Total Pages 64
2. Title Sludge Stabilization Operability Test Report	3. Number WHC-SD-CP-OTR-151	4. Rev No. 0
5. Key Words OTP, HC-21C, OTR, Sludge, Thermal, Stabilization, PFP APPROVED FOR PUBLIC RELEASE 11/11/94	6. Author Name: W. S. Lewis Signature Organization/Charge Code 15530/K6F21	

7. Abstract

Document provides the results of the Operability Test Procedure performed to test the operability of the HC-21C thermal stabilization process. The OTP assured all equipment functioned properly and established the baseline temperature profile for glovebox HC-21C.

DISCLAIMER

8. RELEASE STAMP

TABLE OF CONTENTS

I. INTRODUCTION

Operability Test Procedure SD-CP-OTP-151, "Sludge Stabilization," was started on August 7, 1994 and successfully completed on September 2, 1994. This test report includes a "road map" that describes the sequence of events during the OTP, a description of the exceptions and resolutions, an analysis of the data and some conclusions/recommendations.

The primary objects of the OTP were to verify functionality of equipment, verify controller programming, obtain a baseline temperature profile for the glovebox, and to determine time required for the boat to cool once placed in the desiccator. Typical operating steps/sequences and human factors were also observed to provide input to development of procedures and best ALARA practices. All objectives of the OTP were met and are further discussed in the analysis of data and conclusions/recommendations section.

II. ROAD MAP

During operation of an OTP because equipment is being functionally tested problems are often encountered that do not allow the OTP to be performed as smoothly as an operating procedure. This section of the OTR provides a road map of the timing and problems encountered during the OTP.

TIME LINE OF EVENTS DURING THE OTP

8-7-94
- Pre-job for OTP
- All of section 4.1 of the OTP performed and the CBRS job cards signed off with the exception of two job cards missing from the work package. These were signed off the following day.

8-8-94
- Started sections 4.2, 4.3, and 4.4 of the OTP.
- Unable to get reading on off-gas filter DP gauges. (Exception #1)
- Discovered CO_2 flow to Furnace 2 is blocked. (Exception #2)
- Insufficient vacuum to rotameters @ 40 cfh (Exception #4)
- Started both furnaces with program 3 (Pnr3) and completed the program.
- Noticed temperature differences between TIC and TAS. (Exception #5)

- Furnace deviation alarm repeatedly received. (Exception #6)
- Discovered water in both rotameters, drained once by disconnecting the rotameters and water returned. (Exception #3)

8-9-94
- Started and completed program 4 (Pnr 4) with both furnaces.

8-10-94
- Plant Status: Seismic outage
  10" - 12" of water discovered in Demister # 1

8-11-94
- Plant Status: Seismic outage
  10" - 12" of water in Demister # 1 - 26" vacuum system can not be operated for OTP until water from Demister # 1 can be removed

8-12-94
- Plant Status: 10" - 12" of water in Demister # 1 (workplan being re-written to drain Demister # 1)
  Cap 4 is not operable

8-13-94
- Weekend - No Work

8-14-94
- Weekend - No Work

8-15-94
- Tuned temperature controllers for both furnaces.
- Plant Status: 10" - 12" of water in Demister # 1 (workplan can not be performed due to Cap 4 being down)
  Cap 4 is not operable

8-16-94
- Plant Status: 10" - 12" of water in Demister # 1
  Cap 4 is not operable

8-17-94
- Plant Status: 10" - 12" of water in Demister # 1
  Cap 4 is not operable

8-18-94
- Installed off-gas filter for Furnace 2
- Plant Status: 10" - 12" of water in Demister # 1
  Cap 4 is not operable

8-19-94
- Demister # 1 is drained.
- Drained rotameters on the furnaces off-gas system.

8-20-94
- CO_2 system for Furnace 2 worked on, V-21C-4 turned around. Still no flow of CO_2 to furnace.
- Needle valves on off-gas system were replaced with a larger valve to increase flow. Off-gas flow not affected, need to look at the 26" vacuum system.
- Halon released to the glovebox due to fire maintenance work being done.

8-21-94
- Weekend - No Work

8-22-94
- Trouble shoot the 26" vacuum system and found pancake gasket in flange on V-21C-10.
- Halon primary bottles switched to secondary bottles.
- Started both furnaces with program 1 (Pnr 1).

8-23-94
- Rotameters filled with water during program 1.
- Rotameters were dried out using the 26" vacuum system. Increase in air flow caused the furnace temperatures to deviate from the temperature controller. Deviation alarms occurred on both furnaces. (Exception #7)
- Furnace 1 continued testing by starting program 3.
- Furnace 2 was restarted using program 1. After several deviation alarms the furnace was shutdown.
- Furnace 1 completed the combination of programs 1 and 3.
- Boat was placed in desiccator and cooling temperatures recorded.
- CO_2 lines are rodded out and discovered configuration is wrong. Piping corrected and CO_2 for Furnace 2 operable.
- Drained other piping legs off the 26" vacuum branch. Gasket was sucked up into the 26" vacuum system during this task. 26" vacuum system is not functioning correctly.

8-24-94
- 26" vacuum system operating.
- Off-gas piping for connection into the 26" vacuum system is relocated to line for HC-18M.

8-25-94
- Completed 26" tie in for HC-21C off-gas system. Discovered masking tape in valve V-2031-23B (new valve number V-21C-10).
- Started both furnaces on program 2 (Pnr 2).
- Small amount of water is discovered in the rotameters.
- Furnace 1 fails to complete program 2. Failed during the 1000° C dwell time. Tried to restart manually - not able to. (Exception 8)

8-26-94
- Completed program 2 with Furnace 2.

- Started program 1 with both furnaces.
- Furnace 1 failed, was not ramping correctly due to a failed fuse.
- Furnace 2 completes program 1.
- Furnace 1 has fuse replaced and program 1 is restarted.

8-27-94
- Furnace 1 completes program 1.
- Filter DP gauge for Furnace 1 functionally checked.

8-28-94
- Weekend - No Work

8-29-94
- Filter DP gauge for Furnace 2 trouble shoot. Gauge functionally tested.

9-2-94
- OTP signed off as complete.

Table 1 provides a breakdown of the events and problems encountered during the OTP.

TABLE 1

TEST ITEM	MAIN TASKS/CONDITION	CONTINGENCIES	PROBLEMS
(4.1) Instrumentation Check	CBRS cards completed - (see OTP)	Instrumentation for the process installed.	Two job cards not in package added 8/8/94 to complete section
(4.2) CO_2 Flow Check	CBRS Job Cards • B0416-1 completed 8/8/94	CO_2 System must be operable for Furnace 1	N/A
	• B0416-2 completed 8/24/94	CO_2 System must be operable for Furnace 2	No CO_2 flow to Furnace 2, changed check valve around and re-piped. Completed 8/23/94 EXCEPTION #2
(4.3) Check Exhaust Flow Rate	CBRS Job Cards • B0414-1 completed 8/27/94	Need 26" vacuum system operable. Need exhaust filter #1 installed.	Insufficient flow to receive reading on DP gauge. EXCEPTION #1
	• B0414-2 completed 8/25/94	Need 26" vacuum system operable.	N/A
	• B0415-1 completed 8/25/94	Need 26" vacuum system operable. Need exhaust filter #2 installed. Completed 8/18/94	Insufficient flow to receive reading on DP gauge. EXCEPTION #1
	• B0415-2 completed 8/25/94	Need 26" vacuum system operable.	N/A

(4.4) Check CO_2 & Exhaust Flow Rate	To take readings of the off-gas for both furnaces with the exhaust and CO_2 systems functional.	Need: Both off-gas filters installed. Completed 8/18/94 Both furnace's CO_2 systems must be functional. Completed 8/23/94 26" vacuum system operational (Demister #1 drained.) Completed 8/19/94	No CO_2 flow to Furnace 2. EXCEPTION #2 Off-gas flow problems. New tie-in to 26" vacuum system. Completed 8/25/94
(4.5) Furnace Cycle Program 1	First Run - Furnace 1 Completed with program 3 after dwell time.	Need exhaust system and CO_2. Need 26" vacuum system operable.	* Water in the rotameters. Water was purged by increasing the off-gas flow which caused the furnace temperature to deviate from the controller and a deviation alarm was received. Program was restarted using program 3.
	Second Run - Furnace 1 Terminated due to bad fuse (FU-21C-3.)	Need exhaust system and CO_2. Need 26" vacuum system operable.	Fuse (FU-21C-3) blew and no power could be supplied to the furnace. Exception #8
	Third Run - Furnace 1 Completed 8/27/94.	Need exhaust system and CO_2. Need 26" vacuum system operable.	N/A

	First Run - Furnace 2 Terminated after dwell time.	Need exhaust system and CO_2. Need 26" vacuum system operable.	See * problem in previous block. Trouble-shooting was done to see how the furnace could be restarted when a deviation alarm was received. After several alarms the furnace was allowed to cool.
	Second Run - Furnace 2 Completed 8/26/94.	Need exhaust system and CO_2. Need 26" vacuum system operable.	Very small amount of water in rotameters.
(4.5) Furnace Cycle Program 2	Completed program 2 with Furnace 2 and part of program with Furnace 1.	Need exhaust system and CO_2. Need 26" vacuum system operable.	Very small amount of water in rotameters. Furnace 1 received a deviation alarm during the 1000 °C dwell time and program was not completed. EXCEPTION #8
(4.5) Furnace Cycle Program 3	Completed program 3 with both furnaces and one filter installed.	Need exhaust system and CO_2. Need 26" vacuum system operable. No CO_2 system needed.	Water in rotameters. Drained out 8/8/94
(4.5) Furnace Cycle Program 4	Completed program 4 with both furnaces.	No exhaust was needed. (No 26" vacuum system or CO_2)	N/A

III. Analysis of Data

A. Equipment Functionality

All equipment is functioning properly. However, as noted in the road map section several deficiencies were identified that required resolution.

Difficulty was encountered while trying to functionally test the differential pressure (DP) gauges across the exhaust filters. The problem was that the gauges are rated 0-10 psi. With the small air flow (2-3 cfm) and the relatively rough filter (2 micron), no measurable pressure drop is seen. Flow through the filter was inhibited by disconnecting and plugging the line at the "T" above the filter. The gauge then responded and the functional test job cards were signed off.

While functionally testing the CO2 lines there was no flow to furnace number 2. Troubleshooting revealed that the line had been hooked up incorrectly and was plugged. This was corrected and adequate flowrates established.

When the 26 inch vacuum system was initially valved in a slug of roughly 1 liter of water drained into the exhaust rotameters. This solution was drained. As the furnaces heated up the water started collecting in the rotameters again. The water is believed to have come from two sources. The first was water draining from other inactive drops on the same 1 inch header that the HC-21C drop was connected. This problem was solved by tieing directly into the 2 inch vacuum header. The second source of water was residual water from the piping, filters, and furnace fire brick. At the start of the OTP water was appearing in the rotameters when they reached about 300°C. By the end of the OTP a very small amount of water (<20 ml) collected in the rotameters when the temperature reached about 950°C. This water should disappear completely as the system operates. The small amount of water seen at the end of the "program run" would not affect operation and can be eliminated from the system by momentarily increasing the exhaust flowrate.

Another problem encountered with the vacuum system was trying to establish adequate flowrates. Troubleshooting identified a Teflon blank with a small pinhole had been installed in the vacuum line above V-21C-10. The blank was removed and adequate flows were established. Slightly larger needle valves were installed in the off gas line to further enhance the flow characteristics (especially in functionally testing the DP gauges, and removing water from the rotameters).

The fuse for power to furnace number 1 blew during a portion of the testing. The fuse was replaced. Troubleshooting of the system

determined that furnace number one was wired incorrectly. Only 2 of the 4 heating elements were functioning. This caused the current draw to be much greater to try and maintain the same temperature. The furnace was rewired and is operating properly.

During the heating cycles the temperature difference between the Controller and the High Temperature Alarm at time differed by as much as 20°C. This was due to the fact that the thermocouples tended to slide out of place in the back of the furnace allowing differing quanties of air flow past the thermocouples. A high temperature cement was used to cement the thermocouples to the insulating inserts. This solved the problem.

B. Controller Programming

The controllers were each programmed with 4 different programs. The programs were for PRF Sludge items (Pnr 1), RMC Line Oxalate items (Pnr 2), RMC Line Oxide (Pnr 3), and desiccant drying (Pnr 4). Each of the programs were successfully completed for each furnace. The results are graphically displayed in Figures 1 - 4.

During initial heat up the temperature tended to overshoot significantly causing the deviation alarm to shut off power to the furnaces. As long as the ramp was in the first sequence of the program the controller could be restarted. The controllers were reprogrammed to use Proportional Integral Derivative (PID) control rather than strictly Proportional control. This reduced the overshoot so than the deviation alarm did not go off but an overshoot of around 10-15°C was being observed when the temperatures reached the 175°C soak temperature.

After completion of the OTP, the programs for PRF Sludge and RMC Line Oxalate (Pnr 1 & 2) were modified to slow the ramp rate down once the temperature approached the soak temperature. Instead of ramping at 300°C per hour all the way to the soak temperature of 175°C, the controller will ramp at 300°C until 160°C then reduce the rate to 100°C per hour up to the 175°C soak temperature. The controllers are only overshooting by 3-4°C with the new programming, as shown by the attached recorder strip chart of a 9/26/94 test run (Figure 5).

Figure 1

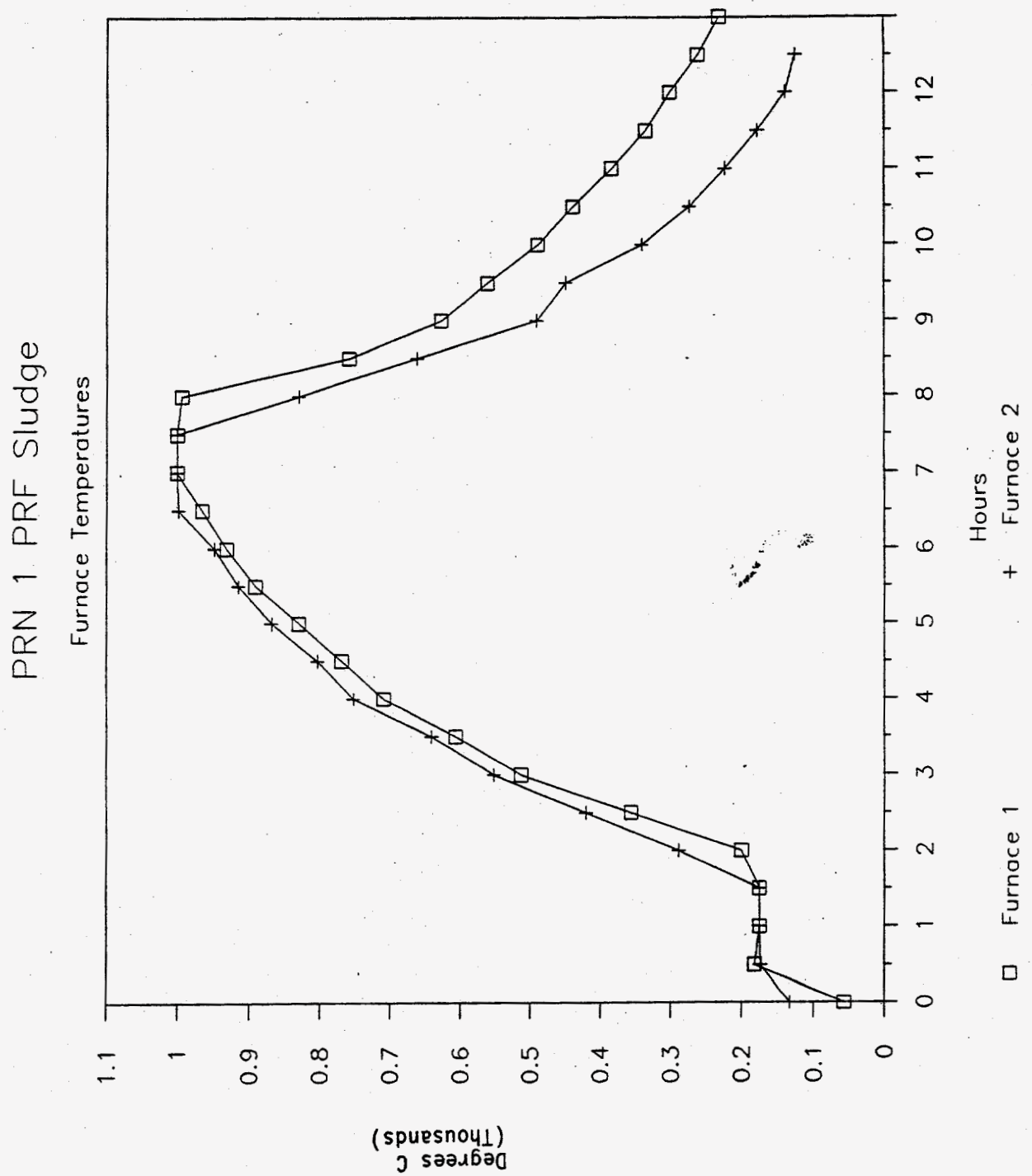

PRN 1 PRF Sludge
Furnace Temperatures
Degrees C (Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Hours
□ Furnace 1
+ Furnace 2

Figure 2

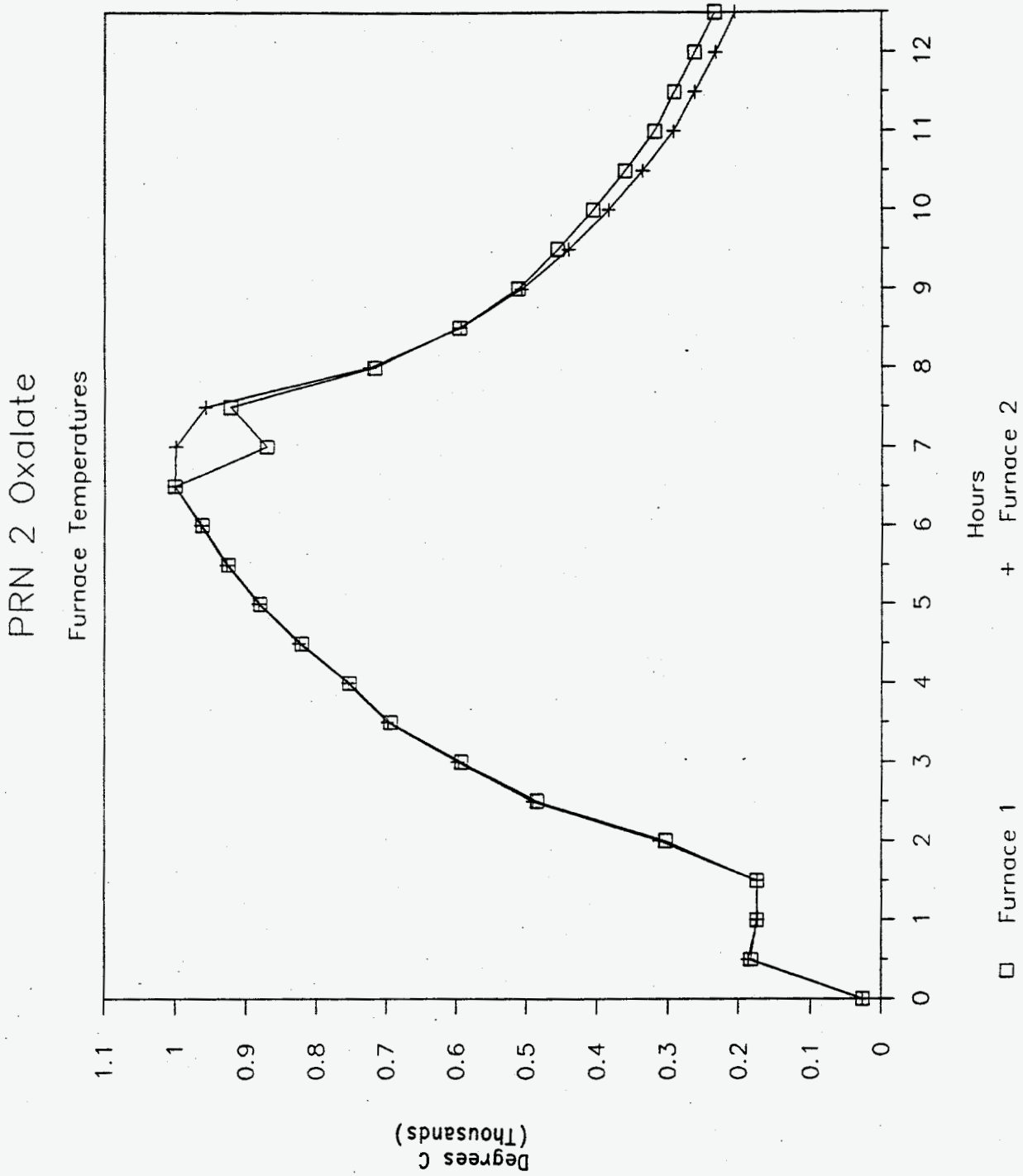

PRN 2 Oxalate
Furnace Temperatures
Degrees C
(Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Hours
□ Furnace 1
+ Furnace 2

Figure 3

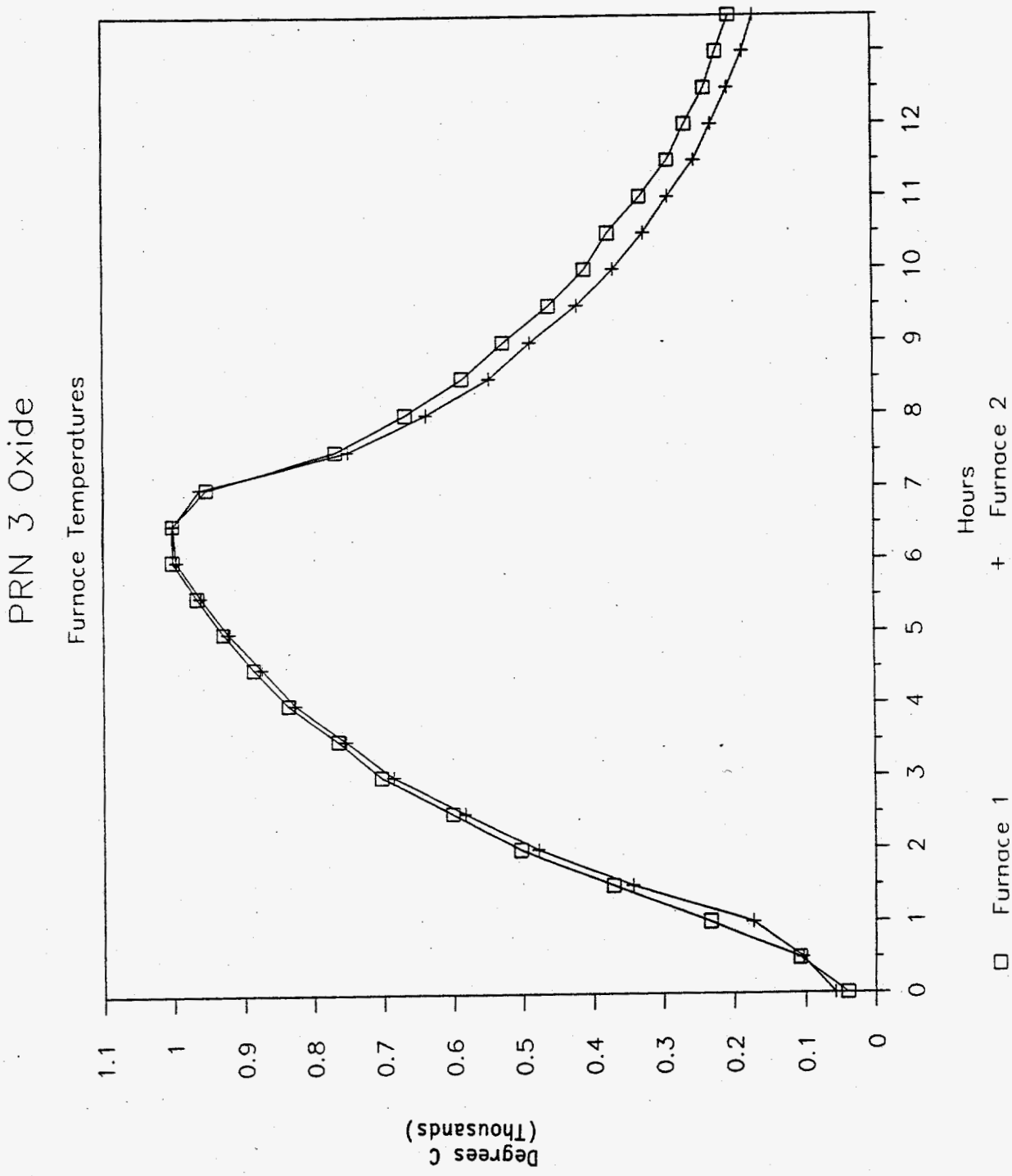

PRN 3 Oxide
Furnace Temperatures
Degrees C
(Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Hours
□ Furnace 1
+ Furnace 2

Figure 4

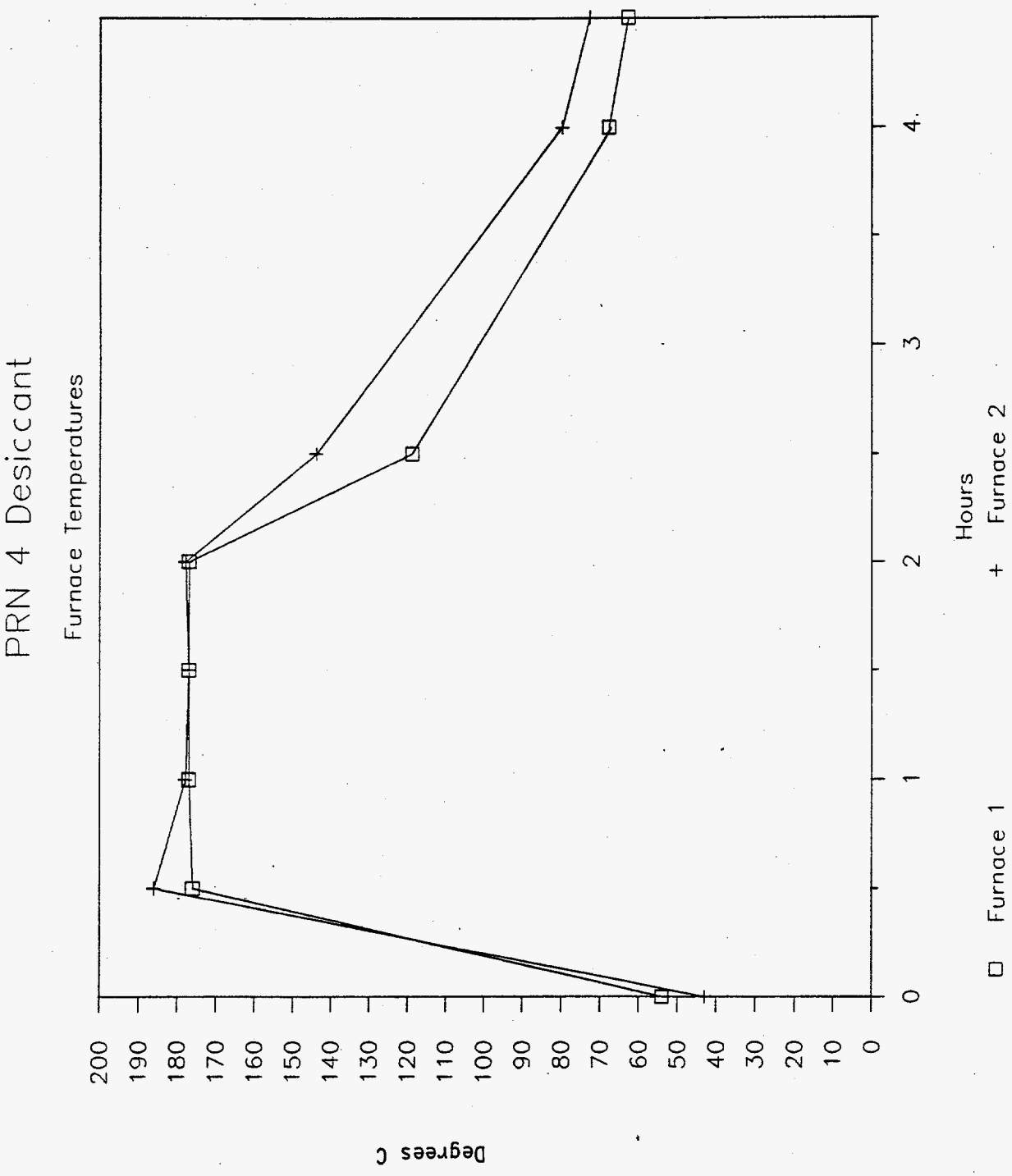
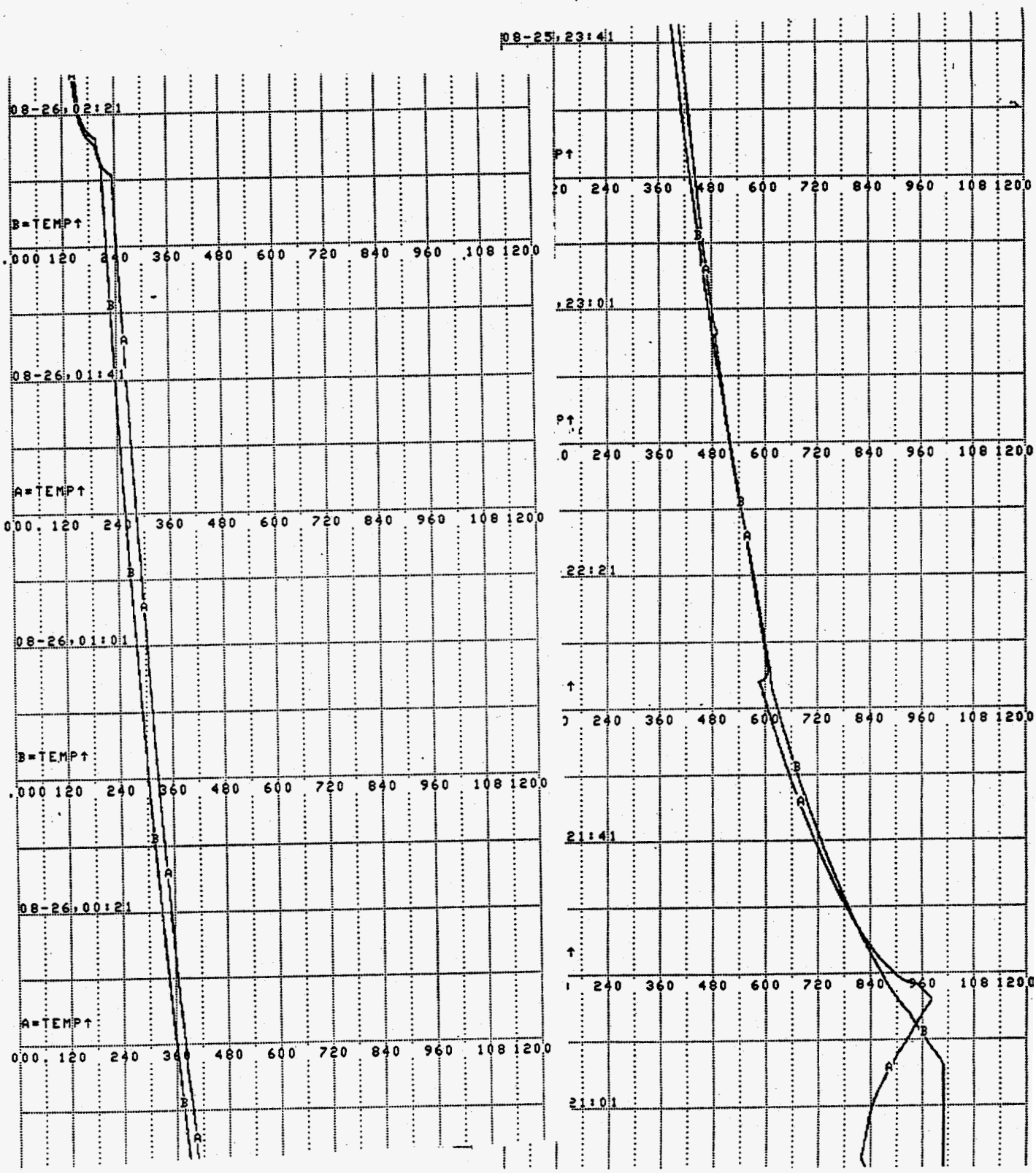

PRN 4 Desiccant
Furnace Temperatures
Degrees C
200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
Hours
□ Furnace 1
+ Furnace 2

Figure 5


08-26,02:21
B=TEMP↑
08-26,01:41
A=TEMP↑
08-26,01:01
B=TEMP↑
08-26,00:21
A=TEMP↑
08-25,23:41
22:21
21:41
21:01
240 360 480 600 720 840 960 108 1200

C. Glovebox Temperature Profile

One of the primary objectives of the OTP was to establish a temperature profile in the glovebox and assure that it was well below the set point for the Halon fire suppression system (93°C). The OSD limit for the glovebox temperature and high glovebox temperature shutdown interlock are set at 65°C. The temperatures in the glovebox rose to 63°C during the initial run. The air flow in the glovebox was increased (exhaust damper opened) and the temperature dropped back down to 58°C. Once the higher glovebox flow rates were established, the glovebox temperature never rose above 58°C. Figure 5 shows a typical temperature profile through a furnace program once the glovebox flow rates were increased.

A secondary objective of the OTP was to determine the effectiveness of the exhaust system heat exchangers. Figures 6 and 7 show typical temperature profiles for the two heat exchangers. Peaks and dips in the temperature measurements are associated to changing the exhaust flow rates. At peak furnace temperatures the heat exchangers provided as much as a 20°C temperature differential. Maximum temperatures exiting the heat exchangers was less than 50°C. This is adequate for reducing temperature going to the 26 inch vacuum system.

Figure 6

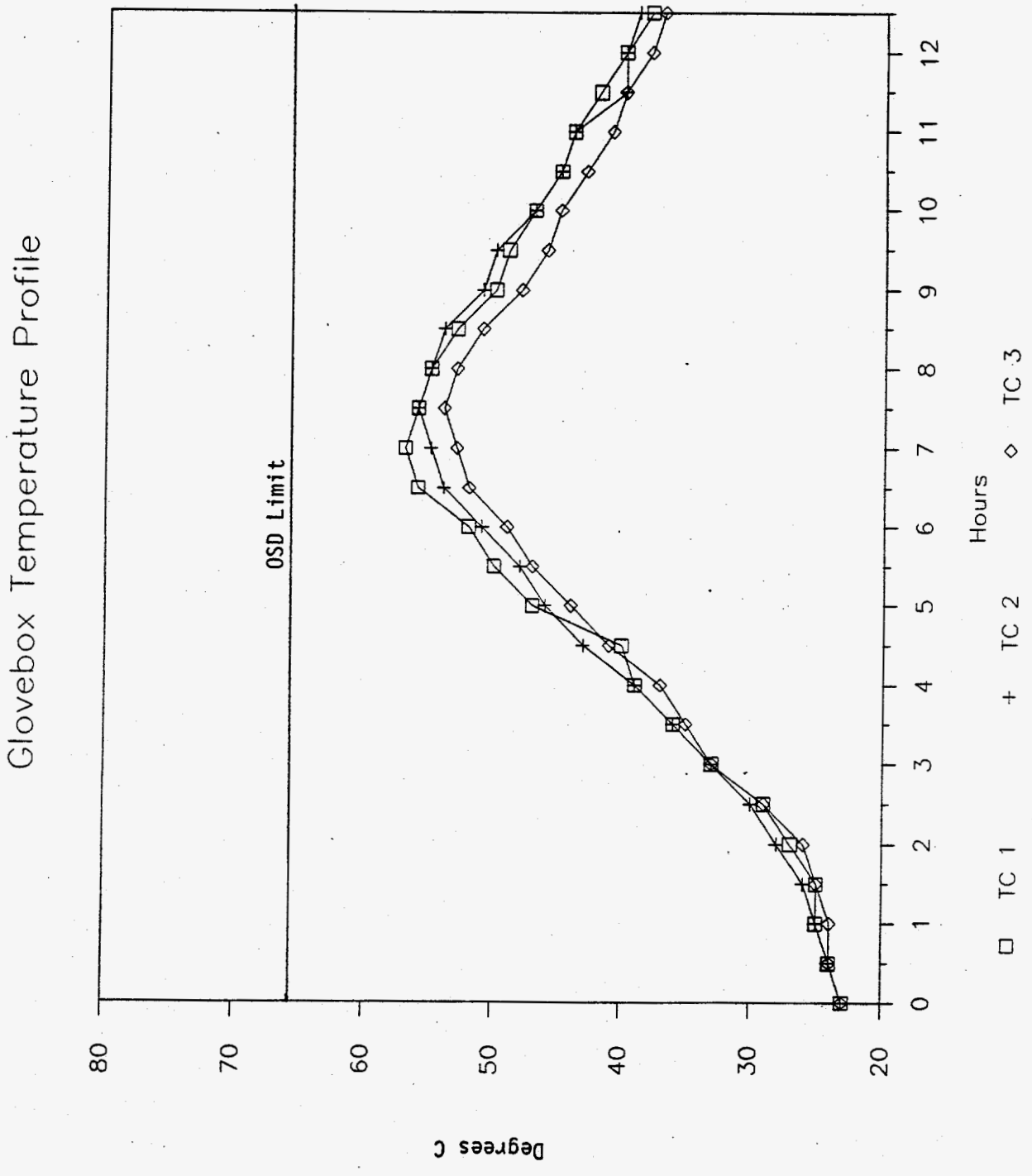

Glovebox Temperature Profile
OSD Limit
Degrees C
80
70
60
50
40
30
20
Hours
0
1
2
3
4
5
6
7
8
9
10
11
12
TC 1
TC 2
TC 3

Figure 7

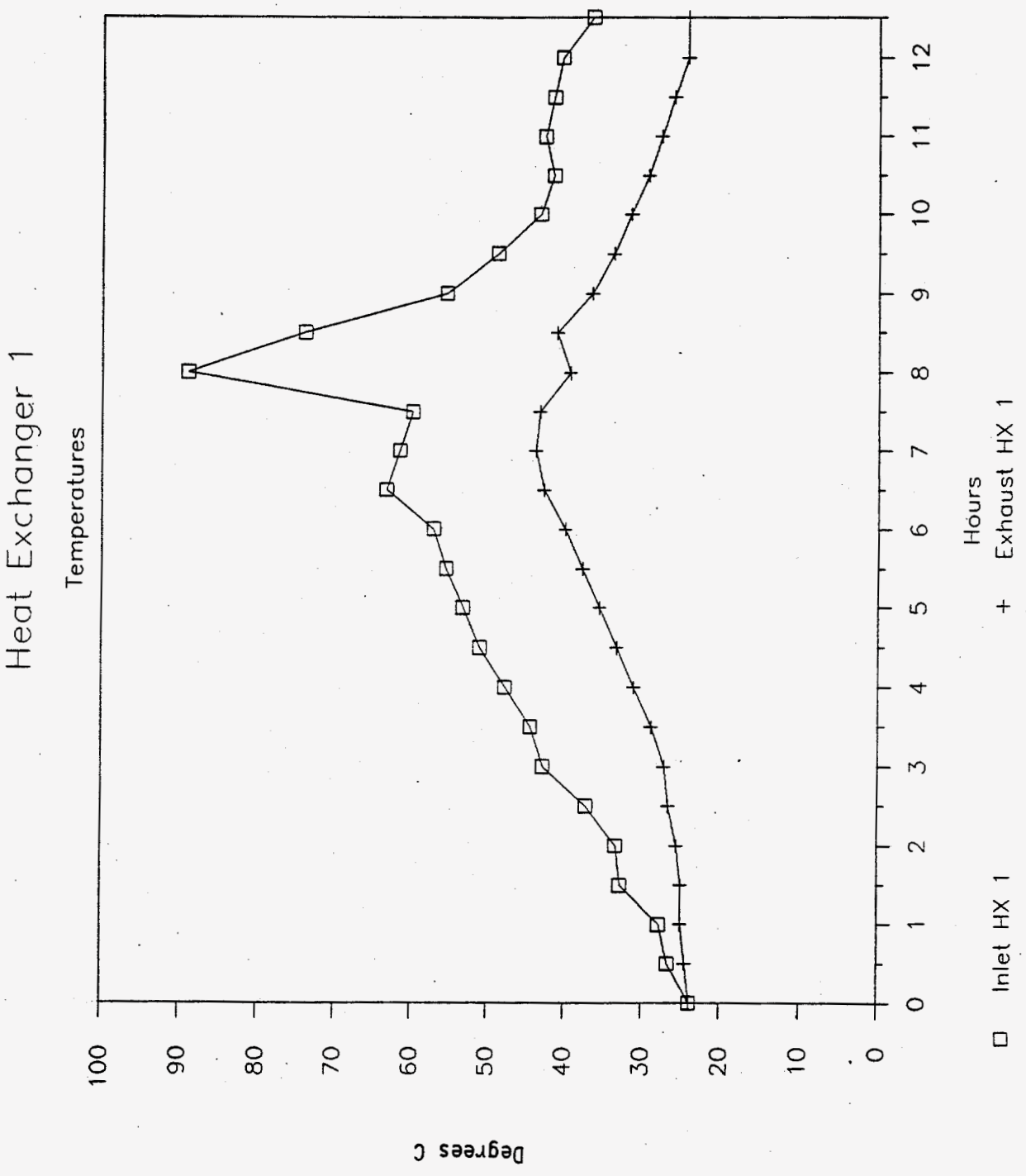
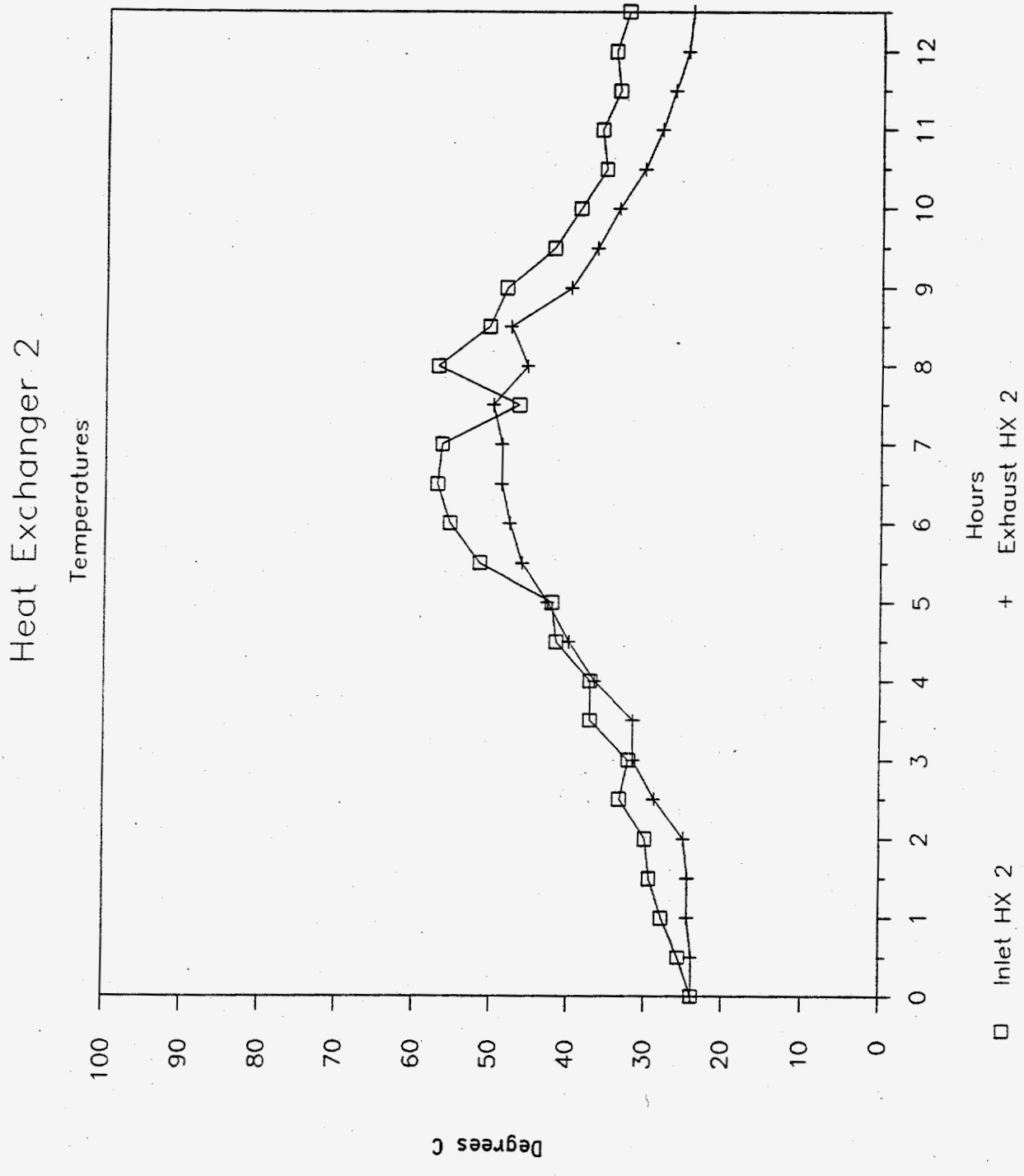

Heat Exchanger 1
Temperatures
Degrees C
100
90
80
70
60
50
40
30
20
10
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Hours
□ Inlet HX 1
+ Exhaust HX 1

Figure 8

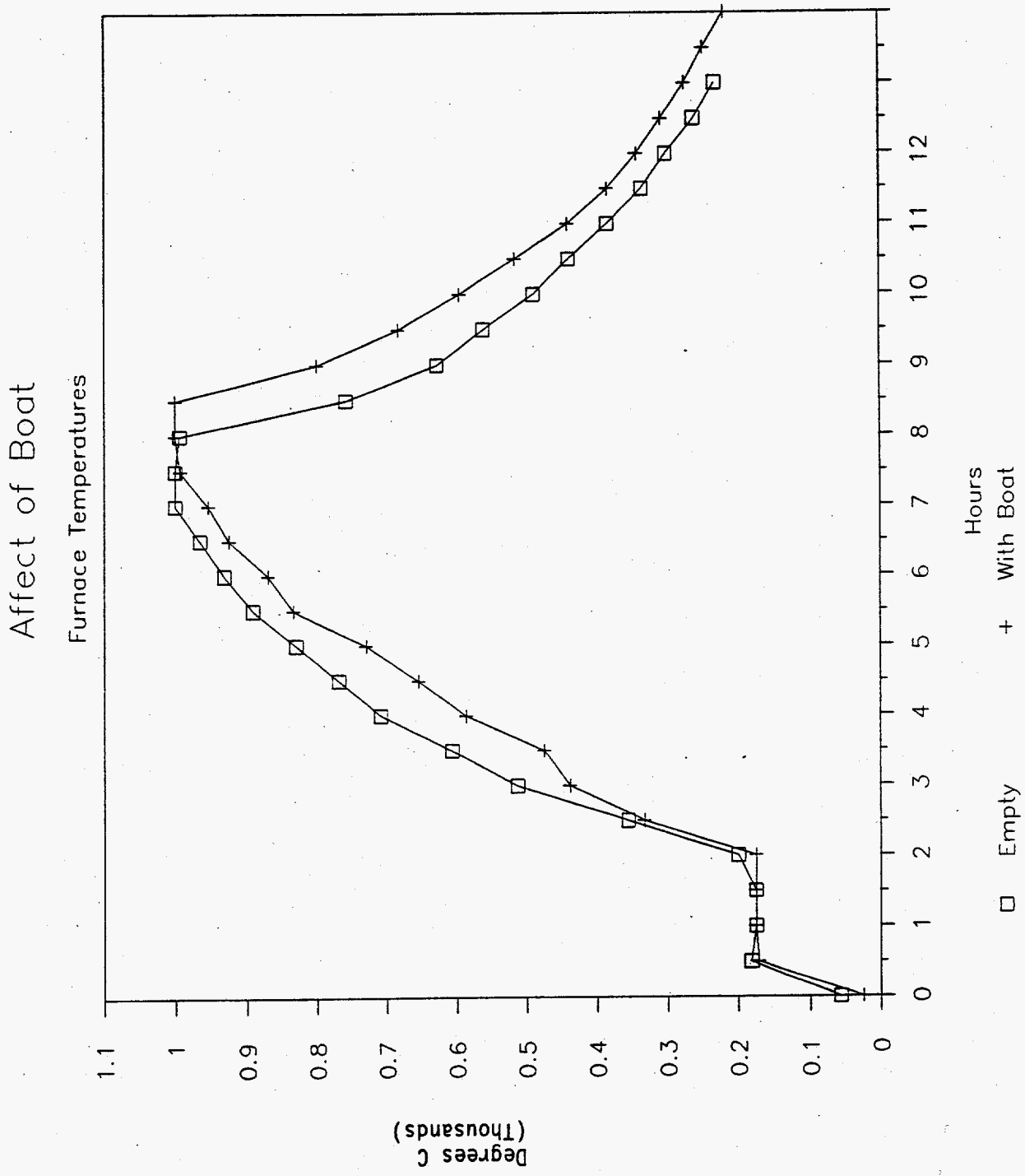

Heat Exchanger 2
Temperatures
Degrees C
100
90
80
70
60
50
40
30
20
10
0
0
1
2
3
4
5
6
7
8
9
10
11
12
Hours
□ Inlet HX 2
+ Exhaust HX 2

D. Boat Cool Down Time

One run was performed with a boat filled with 500 grams sand in the furnace. This was performed to determine the durability of the boat and to determine the affects the boat would have on the heat up and cool down rates. Figure 8 shows a comparison of a run with the boat and one without. As expected, the boat tends to slightly depress the temperatures during ramp up and increase the cool down time. The boat, when removed from the furnace was covered with a black layer which left a small layer of black ash in the bottom of the furnace. The degradation of the boat is expected and within acceptable limits (no warping observed).

The boat was removed from the furnace when the furnace temperature reached 200°C and placed in a desiccator. A thermometer was placed in the boat and readings taken every 15 minutes. The maximum temperature on the thermometer was 100°C so readings were not take initially. The data was plotted and a regression method used to fit the data to an equation. Extrapolation of the data showed that it would take less than 45 minutes for the boat to cool from 200°C to 75°C where it can be handled.

Figure 9


Affect of Boat
Furnace Temperatures
Degrees C
(Thousands)
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0 1 2 3 4 5 6 7 8 9 10 11 12
Hours
+ With Boat
□ Empty

IV. Conclusions

All of the objectives of the OTP were met. All of the equipment is functioning properly. Some minor modifications are being made to make the system more ergonomic. These modifications include relocation of the CO2 shutoff valves, relocation of the exhaust system needle valves, and the addition of vacuum isolation valves in room 230A. The controller programs are all functioning properly. Modification of the programs and controller tuning has minimized overshoot of the controllers. The glovebox temperature profile is acceptable. The differential pressure on the outlet filter for glovebox HC-21C will need to be observed periodically to assure adequate air flow in the glovebox. The time required for the boat to remain in the desiccator to cool down was determined and has been incorporated into the operating procedure.

Finally this OTP also provided an excellent opportunity for the operators to obtain OJT training.

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APPENDIX A

JUL 25 1994
RE Sta.S

ENGINEERING DATA TRANSMITTAL

Page 1 of 1

1. EDT 603462

2. To: (Receiving Organization)	3. From: (Originating Organization)	4. Related EDT No.:
Distribution	PFP Process Control Engineering	
5. Proj./Prog./Dept./Div.:	6. Cog. Engr.: W. S. Lewis	7. Purchase Order No.:
8. Originator Remarks: Operation Test Procedure for testing the HC-21C Sludge Stabilization Furnaces is routed for approval.		9. Equip./Component No.:
		10. System/Bldg./Facility: 73T/234-5Z/PFP
11. Receiver Remarks:		12. Major Assm. Dwg. No.:
		13. Permit/Permit Application No.:
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1	WHC-SD-CP-OTP-151	1	0	Sludge Stabilization Operability Test Procedure	SQ	1	1	

16. KEY

Impact Level (F)	Reason for Transmittal (G)	Disposition (H) & (I)
1, 2, 3, or 4 (see MRP 5.43)	1. Approval 4. Review 2. Release 5. Post-Review 3. Information 6. Dist. (Receipt Acknow. Required)	1. Approved 4. Reviewed no/comment 2. Approved w/comment 5. Reviewed w/comment 3. Disapproved w/comment 6. Receipt acknowledged

17. SIGNATURE/DISTRIBUTION (See Impact Level for required signatures)

(G) Reason	(H) Disp.	(J) Name	(K) Signature	(L) Date	(M) MSIN	(J) Name	(K) Signature	(L) Date	(M) MSIN	(G) Reason	(H) Disp.
1	1	Cog.Eng. W. S. Lewis	W S Lewis	7/25/94	T5-55	L. T. Cunningham			T5-55	3	
1	1	Cog. Mgr. M. W. Gibson	M W Gibson W S Lewis	7/25/94	T5-55	G. R. Wittman			T5-55	3	
1	1	QA D. R. Groth	E.L. ADAMSON	7/25/94	T4-19						
1	1	Safety J. T. Vistica		7/25/94	T4-18						
1	1	Safety A. G. Pines		7/25/94	T4-10						
1	1	Operations G. B. Chronister		7/25/94	T5-04						

18. L.T. Cunningham — Signature of EDT Originator — Date 7/25/94

19. N/A — Authorized Representative for Receiving Organization — Date

20. M.W. Gibson W S Lewis — Cognizant/Project Engineer's Manager — Date 7/25/94

21. DOE APPROVAL (if required) Ltr. No. N/A
- [ ] Approved
- [ ] Approved w/comments
- [ ] Disapproved w/comments

BD-7400-172-2 (07/91) GEF097

JUL 25 1994

Date Received: July 25, 1994

INFORMATION RELEASE REQUEST

Reference: WHC-CM-3-4

Complete for all Types of Release

Purpose

- [ ] Speech or Presentation
  - [ ] Full Paper
  - [ ] Summary
  - [ ] Abstract
  - [ ] Visual Aid
- [ ] Speakers Bureau
- [ ] Poster Session
- [ ] Videotape

(Check only one suffix)

- [ ] Reference
- [X] Technical Report
- [ ] Thesis or Dissertation
- [ ] Manual
- [ ] Brochure/Flier
- [ ] Software/Database
- [X] Controlled Document
- [ ] Other

ID Number (include revision, volume, etc.): WHC-SD-CP-OTP-151, REV. 0

List attachments.

Date Release Required: July 25, 1994

Title: Sludge Stabilization Operability Test Procedure

Unclassified Category: UC-

Impact Level: SQ

New or novel (patentable) subject matter? [X] No [ ] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[ ] No [ ] Yes Disclosure No(s).

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[X] No [ ] Yes (Identify)

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Title of Conference or Meeting

Group or Society Sponsoring

Date(s) of Conference or Meeting

City/State

Will proceedings be published? [ ] Yes [ ] No
Will material be handed out? [ ] Yes [ ] No

Title of Journal

CHECKLIST FOR SIGNATORIES

Review Required per WHC-CM-3-4	Yes	No	Reviewer - Signature Indicates Approval: Name (printed) / Signature / Date
Classification/Unclassified Controlled Nuclear Information	[ ]	[X]	
Patent - General Counsel	[ ]	[X]	
Legal - General Counsel	[ ]	[X]	
Applied Technology/Export Controlled Information or International Program	[ ]	[X]	
WHC Program/Project	[ ]	[X]	
Communications	[ ]	[X]	
RL Program/Project	[ ]	[X]	
Publication Services	[ ]	[X]	
Other Program/Project	[ ]	[X]	

Information conforms to all applicable requirements. The above information is certified to be correct.

	Yes	No
References Available to Intended Audience	[X]	[ ]
Transmit to DOE-HQ/Office of Scientific and Technical Information	[ ]	[X]

Author/Requestor (Printed/Signature) / Date: L.T. Cunningham 7/25/94

Intended Audience: [ ] Internal [X] Sponsor [ ] External

Responsible Manager (Printed/Signature) / Date: M.W. Gibson 7/25/94

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

Date Cancelled | Date Disapproved

SUPPORTING DOCUMENT

1. Total Pages 30

2. Title	3. Number	4. Rev No.
Sludge Stabilization Operability Test Procedure	WHC-SD-CP-OTP-151	0

5. Key Words	6. Author
HC-21C, OTP, Sludge, Thermal, Stabilization, PFP	Name: L. T. Cunningham Signature 7/25/94 Organization/Charge Code 15530/K6JC3

7. Abstract

DOCUMENT PROVIDES INSTRUCTIONS FOR PERFORMING THE OPERABILITY TEST OF THE SLUDGE STABILIZATION PROCESS IN GLOVEBOXES HC-21A AND HC-21C IN BUILDING 234-5Z AT THE PLUTONIUM FINISHING PLANT.

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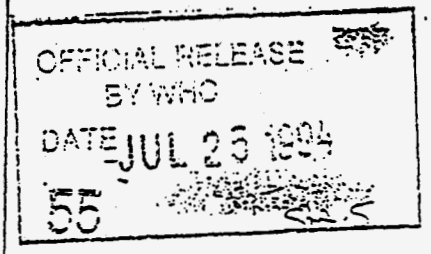
9. Approval Designation: SO

10. RELEASE STAMP



1.0 TEST PLAN

1.1 This Operability Test Procedure (OTP) provides instructions for testing operability of the Thermal Stabilization Process located in glovebox HC-21C, room 230A and HC-21A, room 230B, in 234-Z at the Plutonium Finishing Plant (PFP), in the 200 West Area of the Hanford Site.

The Thermal Stabilization Process is an old process (formerly performed in the HA-21I glovebox), redesigned, allowing Operations to safely stabilize plutonium bearing material. Temperatures of 1000 °C are sustained to produce impure high fired plutonium oxide.

The Thermal Stabilization Process consists primarily of two Thermolyne model FA1630 muffle furnaces controlled by Eurotherm temperature controllers. A variety of thermocouples inform the controller of various temperature profiles within the furnaces and glovebox.

1.2 The test objectives are to functionally test the electrical performance of the process equipment and the ergonomics of the installed equipment. Temperature ramp rates along with interlocks within the controller will be tested. Data will be collected in order to provide an indication of a baseline temperature profile. Results of the tests will be summarized in an Operational Test Report (OTR).

2.0 SAFETY

Applicable Safety Documents - Provisions of the *Radiological Control Manual*, WHC-CM-1-6, *Industrial Safety*, WHC-CM-4-3, *Industrial Hygiene*, WHC-CM-4-40 and Radiation Work Permit or others as specified in the Job Control System (JCS) work package, apply to all work performed under this OTP.

A pre-job safety meeting shall be conducted and documented in Table 1 by the Test Engineer (TE) prior to work start to discuss the scope of work and the safety issues. This OTP shall be read and discussed in detail by all personnel involved with its performance.

An operator will need to be stationed in room 230A at all times to monitor glovebox temperatures. It may be necessary to turn off the power to the muffle furnaces if the glovebox temperatures get too high (>65°C). Also the operator may need to hold down the Halon fire suppressant button to interrupt the fire suppressant system if the glovebox temperature gets over 93°C and the Halon injection system activates. The Halon injection system is only needed if there is a fire within the glovebox. Halon will not cool down the glovebox temperature if it overheats.

Gloves near furnaces will be pulled out of the glovebox prior to energizing the furnaces to protect them from overexposure to heat or coming in contact with hot objects. The furnaces tests will be aborted if gloves fail.

3.0 TOOLS, EQUIPMENT, AND SUPPLIES

Portable Thermocouple and Readout Instrument
Misc. hand tools
Thermometer
Leather Gloves

Writing Utensil
Others as needed per direction of test engineer and lead operator.
07-GN-044, Wiring Disconnects/Reconnects

OPERABILITY TEST PROCEDURE APPROVAL DESIGNATOR SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE 5 OF 30

TABLE 1
PRE-JOB SAFETY/OPERABILITY BRIEFING LIST

PRESENTER: WS Lewis DATE: 8/7/94

ATTENDEE		DATE	ORGANIZATION
PRINT NAME	SIGNATURE		
Barry Orth	Barry Orth	8-7-94	OPS
David L Romine	David L Romine	8-7-94	OPS
DAVID C. JEUSSEN	D.C. Jeussen	8-7-94	ISST
Edward L KAUER	Edward L Kauer	8-7-94	OPS
Dave Floyd	Dave Floyd	8-7-94	OPS
Scott W. Harder	Scott W Harder	8-7-94	OPS
William A. Ruhlman	William A Ruhlman	8-7-94	OPS-POE
Michael R. Yeaman	Michael R Yeaman	8-7-94	ISST
W S Lewis	W S Lewis	8-7-94	Engr
R.F. HORAN	Robert F Horan	8-7-94	ELECT
Ken Gray	KEN GRAY	8-7-94	ELECT
Barry Orth	Barry G. Orth	8-22-94	OPS
Scott W. HARDER	Scott W Harder	8-22-94	OPS
WS Lewis	W S Lewis	8/22/94	Engr

ire/SPP 8-22-94

4.0 PROCEDURE

The Test Engineer shall be designated by the Cognizant Engineer from PFP Process Engineering and has overall responsibility and authority over the OTP performance. Testing will be conducted by the Test Engineer (TE) and Nuclear Operations. PFP Quality Assurance (PFP-QA) will provide verification in spaces identified. Each step shall be initialed, as it is completed, by the Test Engineer or designee. Initials will be placed in the space provided to the left of the sequence step. Test section completion verification will be signed by the Cognizant Engineer or designee in the space provided. Data recording will be performed by TE or designee.

Discrepancies will be noted on the Exceptions List provided (Section 6.0) and according to provisions in Appendix L of WHC-CM-6-1, Standard Engineering Practices.

If equipment is faulty, the OTP will be discontinued until the Cognizant Engineer is notified and the problem is resolved.

Adjustments to the OTP may be necessary in the field as the test run progresses. Therefore, the Test Engineer is permitted to authorize test site personnel to ink in minor changes to the OTP with the concurrence of the Cognizant Engineer.

a. Each change must be signed by the cognizant engineer and the responsible manager. Additional signatures will be specified by the Cognizant Engineer as required by WHC-CM-3-5. Change authorizations obtained by the telephone shall be noted as such.

b. The Cognizant Engineer or his/her designee shall ensure that the job site changes remain within the scope of the OTP and any limits specified therein. The Cognizant engineer may authorize the continuation of the OTP prior to obtaining Exception or Pen and Ink signatures if determined to have a non-safety impact.

4.0 PROCEDURE (cont.)

The following tests are presented in the order that the tests should be performed. Deviation from the testing order must be approved by the cognizant engineer or his/her designee. The test section(s) may be re-performed if needed.

Existing data sheets or applicable test sections may be copied and added to this test plan if needed to re-perform a section of the test. The page number of the page added will be appended with an alphabetical (a-z) suffix.

4.1 Instrumentation Check

NOTE - Calibrations/functional checks to be verified with either current calibration stickers or check for completion with work package 2Z-94-1313.

WSL 4.1.1 Verify that furnace temperature controllers (TIC-21C-A and TIC-21C-B) have been functionally checked. ✓QC

WSL 4.1.2 Verify that High Temperature Alarm Switches (TAS-21C-A and TAS-21C-B) have been functionally checked. ✓ QC

WSL 4.1.3 Verify temperature recorder (TR-21C) is calibrated. 7-27-94 TO 7-27-95 8-29-94

WSL 4.1.4 Verify glovebox high temperature alarm switch (TAS-21C-C) is calibrated. 7/25/94 To 7-25-95 8-29-94

WSL 4.1.5 Close the door to muffle furnace #1. Verify that light IL-21C-C is ON. QC ✓

WSL 4.1.6 Start any heating cycle program (1-4) on TIC-21C-A. Verify that green light HS-21C-A is ON. ✓QC

WSL 4.1.7 Press hand switch HS-21C-A. Verify that green light HS-21C-A is OFF and red light HS-21C-B is ON. ✓QC

WSL 4.1.8 Verify heating light IL-21C-A is ON. ✓QC

4.1 Instrumentation Check (cont.)

WBL	4.1.9	Open the door to muffle furnace #1. Verify that lights IL-21C-A and IL-21C-C are OFF.
WBL	4.1.10	Press HS-21C-B.
WBL	4.1.11	Close the door to muffle furnace #1. Verify that light IL-21C-C is ON.
WBL	4.1.12	Sign off CBRS card B0410-C.
WBL	4.1.13	Start any heating cycle program (1-4) on TIC-21C-A. Verify that green light HS-21C-A is ON.
WBL	4.1.14	Press hand switch HS-21C-A. Verify that green light HS-21C-A is OFF and red light HS-21C-B is ON.
WBL	4.1.15	Verify heating light IL-21C-A is ON.
WBL	4.1.16	Change TAS-21C-A AL 2 setpoint to a temperature below the current temperature reading on TAS-21C-A.
WBL	4.1.17	Verify heating light IL-21C-A is OFF and annunciator FURNACE #1 OVERHEAT alarms. Acknowledge alarm on alarm panel.
WBL	4.1.18	Return TAS-21C-A AL 2 setpoint to 1025°C.
WBL	4.1.19	Press HS-21C-B.
WBL	4.1.20	Sign off CBRS card B0410-B.
WBL	4.1.21	Start any heating cycle program (1-4) on TIC-21C-A. Verify that green light HS-21C-A is ON.
WBL	4.1.22	Press hand switch HS-21C-A. Verify that green light HS-21C-A is OFF and red light HS-21C-B is ON.
WBL	4.1.23	Verify heating light IL-21C-A is ON.

4.1 Instrumentation Check (cont.)

WSL 4.1.24 Press HS-21C-B. Verify that green light HS-21C-A is ON, red light HS-21C-B is OFF. rac

WSL 4.1.25 Verify heating light IL-21C-A is OFF. rac

WSL 4.1.26 Sign off CBRS cards B0410-1, B0410-6, B0410-7, and B0410-8. Alt. Approval N/A 6.5.c 8/7/94 STET

WSL 4.1.27 ~~Disconnect leads from contacts 5 and 6 on EIC-21C-A using maintenance procedure 07-GN-044, Wiring Disconnects/Reconnects.~~ Shorted [illegible] to Furnace 2 connectors

WSL 4.1.28 Start any heating cycle program (1-4) on TIC-21C-A. Verify that green light HS-21C-A is ON. rac

WSL 4.1.29 Press hand switch HS-21C-A. Verify that green light HS-21C-A is OFF and red light HS-21C-B is ON. Record time: ~~15:54~~ 16:23 WSL 8/7/94 rac

Note - Heating light IL-21C-A will not illuminate due to EIC-21C-A control signal being disconnected. rac

WSL 4.1.30 Verify that FURNACE #1 TEMPERATURE DEVIATION alarm annunciates and lights HS-21C-A and HS-21C-B go OFF. Record time of these events: 16:27. rac

WSL 4.1.31 Sign off CBRS card B0410-5. Not in package WSL 8/7/94

WSL 4.1.32 Close the door to muffle furnace #2. Verify that light IL-21C-D is ON. rac

WSL 4.1.33 Start any heating cycle program (1-4) on TIC-21C-B. Verify that green light HS-21C-C is ON. rac

WSL 4.1.34 Press hand switch HS-21C-C. Verify that green light HS-21C-C is OFF and red light HS-21C-D is ON. rac

WSL 4.1.35 Verify heating light IL-21C-B is ON. rac

4.1 Instrumentation Check (cont.)

WSL	4.1.36	Open the door to muffle furnace #2. Verify that lights IL-21C-C and IL-21C-D are OFF. ✓QC
WSL	4.1.37	Press HS-21C-D. WG Lewis 8/29/94 Mark W Dil 8/30/94 Addl. Approvals: NA
WSL	4.1.38	Close the door to muffle furnace #2. Verify that light IL-21C-D is ON. ✓QC
WSL	4.1.39	Sign off CBRS card B0411-C.
WSL	4.1.40	Start any heating cycle program (1-4) on TIC-21C-B. Verify that green light HS-21C-C is ON. ✓QC
WSL	4.1.41	Press hand switch HS-21C-B. Verify that green light HS-21C-C is OFF and red light HS-21C-D is ON. ✓QC
WSL	4.1.42	Verify heating light IL-21C-B is ON. ✓QC
WSL	4.1.43	Change TAS-21C-B AL 2 setpoint to a temperature below the current temperature reading on TAS-21C-B. ✓QC
WSL	4.1.44	Verify heating light IL-21C-B is OFF and annunciator FURNACE #2 OVERHEAT alarms. Acknowledge alarm on alarm panel. ✓QC
WSL	4.1.45	Return TAS-21C-B AL 2 setpoint to 1025°C.
WSL	4.1.46	Press HS-21C-D.
WSL	4.1.47	Sign off CBRS card B0411-B.
WSL	4.1.48	Start any heating cycle program (1-4) on TIC-21C-B. Verify that green light HS-21C-C is ON. ✓QC
WSL	4.1.49	Press hand switch HS-21C-C. Verify that green light HS-21C-C is OFF and red light HS-21C-D is ON. ✓QC
WSL	4.1.50	Verify heating light IL-21C-B is ON. ✓QC

4.1 Instrumentation Check (cont.)

WSL 4.1.51 Press HS-21C-D. Verify that green light HS-21C-C is ON, red light HS-21C-C is OFF. ✓ QC

WSL 4.1.52 Verify heating light IL-21C-B is OFF. ✓ QC

WSL 4.1.53 Sign off CBRS card B0411-1, B0411-6, B0411-7, and B0411-8.

WSL 4.1.54 Disconnect leads from contacts 5 and 6 on EIC-21C-A using maintenance procedure 07-GN-044, Wiring Disconnects/Reconnects.

WSL 4.1.55 Start any heating cycle program (1-4) on TIC-21C-A. Verify that green light HS-21C-A is ON. ✓ QC

WSL 4.1.56 Press hand switch HS-21C-A. Verify that green light HS-21C-A is OFF and red light HS-21C-B is ON. Record time: 16:57. ✓

Note - Heating light IL-21C-A will not illuminate due to EIC-21C-A control signal being disconnected.

WSL 4.1.57 Verify that FURNACE #1 TEMPERATURE DEVIATION alarm annunciates and lights HS-21C-A and HS-21C-B go OFF. ✓ QC
Record time of these events: 17:01.

WSL Not in package 8/7/94 4.1.58 Sign off CBRS card B0411-5. Approval - NA 8/30/94 WS Lewis 8/30/94 MW

WSL 4.1.59 Start any heating cycle program (1-4) on temperature controllers TIC-21C-A and TIC-21C-B. Verify that green lights HS-21C-A and HS-21C-C are ON. ✓ QC

WSL 4.1.60 Press hand switches HS-21C-A and HS-21C-C.

WSL 4.1.61 Verify heating lights IL-21C-A and IL-21C-B are ON. ✓ QC

WSL 4.1.62 Press Emergency Shutdown Button HS-21C-E. ✓ QC

WSL 4.1.63 Verify heating lights IL-21C-A and IL-21C-B are OFF. ✓ QC

4.1 Instrumentation Check (cont.)

WSK 4.1.64 Sign off CBRS card B0412-1.

QC Verification: Instrumentation specified are calibrated/functionally tested:

Rodney R. Thorne Rodney R Thorne 8-26-94
Print/Sign Name Date

4.2 CHECK CO_2 FLOW RATE

LTC 4.2.1 Open the CO_2 bottle valves.

LTC 4.2.2 Open valve V-21C-9 at the CO_2 cabinet.

LTC 4.2.3 Open V-21C-3 and adjust the flow through FI-21C-3 to 35 ± 2 cfh.

LTC 4.2.4 Verify FI-21C-3 responds to flow. Sign off CBRS card B0416-1.

WSK 4.2.5 Open V-21C-4 and adjust the flow through FI-21C-4 to 35 ± 2 cfh.

LTC 4.2.6 Verify FI-21C-4 responds to flow. Sign off CBRS card B0416-2.

WSK 4.2.7 Record the flow rates of FI-21-3 and FI-21-4.

FI-21-3 36 cfh FI-21-4 35 cfh

WSK 4.2.8 Close valves V-21C-3, V-21C-4 and V-21C-9.

4.3 CHECK EXHAUST FLOW RATE

LTC 4.3.1 Request power operations to start the 26 vacuum system per ZO-060-602, "Operate 26" Process Vacuum".

LTC 4.3.2 Open vacuum isolation valve V-21C-10.

4.3 CHECK EXHAUST FLOW RATE (cont.)

LTC 4.3.3 Open V-21C-1 and adjust flow on rotameter FI-21C-1 to read 130 ± 5 cfh. (V-21C-1 may need to be throttled down.)

4.3.4 Verify FI-21C-1 and DPI-21C-1 responds to flow. Sign off CBRS cards B0414-1 and B0414-2.

LTC 4.3.5 Open V-21C-2 and adjust flow on rotameter FI-21C-2 to read 130 ± 5 cfh. (V-21C-2 may need to be throttled down.)

8-30-94
see exception 5 4.3.6 Verify FI-21C-2 and DPI-21C-2 responds to flow. Sign off CBRS cards B0415-1 and B0415-2.

LTC 4.3.7 Open valves V-21C-7 and V-21C-8. Record dP from DPI-21C-1 and flow rate from FI-21C-1.

NOTE: If dP is >10 psig, stop and notify cognizant engineer.

DPI-21C-1 ~0.5 psi FI-21C-1 130 cfh

LTC 4.3.8 Open valves V-21C-5 and V-21C-6. Record dP from DPI-21C-2 and flow rate from FI-21C-2.

DPI-21C-2 ~0.5 psi FI-21C-2 130 cfh

LTC 4.3.9 Close valves V-21C-1 and V-21C-2.

4.4 CHECK CO_2 AND EXHAUST FLOW RATE

LTC 4.4.1 Open valve V-21C-9 at the CO_2 cabinet.

LTC 4.4.2 Open V-21C-3 and adjust the flow through FI-21C-3 to 35 ± 2 cfh.

4.4.3 Open V-21C-4 and adjust the flow through FI-21C-4 to 35 ± 2 cfh.

4.4 CHECK CO_2 AND EXHAUST FLOW RATE (cont.)

LTC 4.4.4 Open V-21C-1 and adjust flow on rotameter FI-21C-1 to read 130 ± 5 cfh.

WBL 4.4.5 Open V-21C-2 and adjust flow on rotameter FI-21C-2 to read 130 ± 5 cfh.

LRCH 4.4.6 Record dPs from DPI-21C-2 and DPI-21C-2 and flow rates from FI-21C-1, FI-21C-2, FI-21C-3 and FI-C21C-4.

See except 5 DPI-21C-1 0.5 psi DPI-21C-2 .5 psi

FI-21C-1 130 cfh FI-21C-2 130 cfh

FI-21-3 ~~36~~ 35 cfh WBL 4/27/94 FI-21-4 ~~130~~ ~~35~~ cfh WBL 4/27/94

LRCH 4.4.7 Proceed to Section 4.5 or close valves.

4.5 ENERGIZE MUFFLE FURNACES

This section of the OTP tests the operation of the furnaces and the temperature limits within the glovebox. The furnaces should be started at about the same time for each test. All four programs will be tested. Icon Prn1 is for PRF Sludge cycle. Icon Prn2 is for RMC Oxalate cycle. Icon Prn3 is for RMC Oxide. Icon Prn4 is for drying desiccant.

NOTE - The Emergency Shutdown switch is to be pressed if the glovebox temperature exceeds 65°C.

- Response to an alarm will be per ZO-160-800.

LTC 4.5.1 Request power operations to start 26" vacuum per ZO-060-602, "Operate 26" Process Vacuum".

LTC 4.5.2 Weigh a boat using balance in HC-21A. Record weight on Desiccator Cooldown Data Sheet. no empty boat weight

LTC 4.5.3 Place approximately 500 grams of MgO sand into boat. Record total weight on Desiccator Cooldown Data Sheet.

4.5 ENERGIZE MUFFLE FURNACES (cont.)

LTC 4.5.4 Place boat into muffle furnace #1 and close furnace door.

LTC 4.5.5 Open valve V-21C-10 (located in room 263).

LTC 4.5.6 Open V-21C-1 and adjust flow on rotameter FI-21C-1 to read 130 ± 5 cfh.

LTC 4.5.7 Open V-21C-2 and adjust flow on rotameter FI-21C-2 to read 130 ± 5 cfh.

LTC 4.5.8 Record DPI-21C-1 and DPI-21C-2 on PRF Sludge Program (Prnl) Data Sheet.

WBL 4.5.9 Adjust the flow through the rotometers as necessary for changes in temperature. Note changes in comment area on data sheets.

LTC 4.5.10 Pull out EMERGENCY SHUTDOWN button HS-21C-E. Red light HS-21C-E should be illuminated.

LTC 4.5.11 IF red DOOR CLOSED lights (IL-21C-C and IL-21C-D) are not ON, THEN close furnace doors.

> WARNING
>
> Interior surfaces of furnace will reach temperatures that could cause gloves to melt on contact. Melted gloves could lead to a breach of glovebox containment.

LTC 4.5.12 Pull gloves out of glovebox and tie together using bungi cord(s) during heatup/cooldown cycle.

LTC 4.5.13 Press SCROLL key on each temperature controller (TIC-21C-A and TIC-21C-B) until Prnl appears on the display window, THEN press the RUN key.

4.5 ENERGIZE MUFFLE FURNACES (cont.)

WTC 4.5.14 Press the START CYCLE buttons (HS-21C-A and HS-21C-C) for both furnaces.

WTC 4.5.15 Verify the red CYCLE IN PROGRESS lights (HS-21C-B and HS-21C-D) come on for each furnace. IF red light does not come on, press the STOP CYCLE buttons (HS-21C-B and HS-21C-D) for both furnaces and notify test engineer.

WTC 4.5.16 WHEN heating starts, record time on PRF Sludge Program (Prn1) Data Sheet.

NOTE- Use portable thermocouple and readout instrument to obtain room, glovebox wall, and heat exchanger top, bottom and exhaust temperatures.

4.5.17 Observe furnaces and record required data on PRF Sludge Program (Prn1) Data Sheets every 30 minutes until furnace temperature reaches approximately 200°C during cooldown cycle.

CAUTION

The Halon fire suppression system is designed to be activated by temperatures in excess of 93°C. The glovebox high temperature alarm should alarm and shut off power to both furnaces if the glovebox temperature reaches 65°C.

WEG 4.5.18 IF glovebox temperature raises above 65°C, press EMERGENCY SHUTDOWN button and notify supervision. IF Halon system is activated, press HALON RELEASE HOLD button. The HALON RELEASE HOLD button must be held down continuously.

WEG 4.5.19 IF a fire starts during the furnace heating cycle, press the EMERGENCY SHUTDOWN button and leave the room immediately.

4.5 ENERGIZE MUFFLE FURNACES (cont.)

4.5.20 AFTER processing cycle has completed, check that power has been removed from the furnace. The red system power lights (IL-21C-A and IL-21C-B) are OFF.

4.5.21 Allow furnace to cool.

CRITICALITY

Minimum edge-to-edge spacing of 10 inches shall be maintained between any two charges, loaded ovens, or combination of both.

4.5.22 WHEN the furnace temperature indicated on TIC's is ≤200°C, remove boats from furnace #1 using boat handling tools.

4.5.23 Place a thermometer in the boat to monitor temperature of boat and contents.

4.5.24 Immediately place the boat into a desiccator. Record time boat was placed in desiccator on Desiccator Cooldown Data Sheet.

NOTE - The second heating cycle should be started while boat is cooling in desiccator. This will provide a worse case for glovebox temperature (boat cooling and furnace heating).

4.5.25 Record the boat temperature on Desiccator Cooldown Data Sheet every 15 minutes until the temperature reaches 75°C.

4.5.26 WHEN boat has cooled to ≤75°C, remove from desiccator.

4.5.27 Pull gloves out of glovebox and tie together using bungi cord(s) during heatup/cooldown cycle.

4.5 ENERGIZE MUFFLE FURNACES (cont.)

WBL 4.5.28 Press SCROLL key on each temperature controller (TIC-21C-A and TIC-21C-B) until Prn2 appears on the display window, THEN press the RUN key.

WBL 4.5.29 Press the START CYCLE buttons (HS-21C-A and HS-21C-C) for both furnaces.

WBL 4.5.30 Verify the red CYCLE IN PROGRESS lights (HS-21C-B and HS-21C-D) come on for each furnace. IF red light does not come on, press the STOP CYCLE buttons (HS-21C-B and HS-21C-D) for both furnaces and notify test engineer.

4.5.31 WHEN heating starts, record time on RMC Oxalate Program (Prn2) data sheet.

WARNING

Interior surfaces of furnace will reach temperatures that could cause gloves to melt on contact. Melted gloves could lead to a breach of glovebox containment.

NOTE- Use portable thermocouple and readout instrument to obtain room, glovebox wall, and heat exchanger top, bottom and exhaust temperatures.

LTC 4.5.32 Observe furnaces and record required data on RMC Oxalate Program (Prn2) Data Sheets every 30 minutes until furnace temperature reaches approximately 200°C during cooldown cycle.

4.5 ENERGIZE MUFFLE FURNACES (cont.)

CAUTION

The Halon fire suppression system is designed to be activated by temperatures in excess of 93°C. The glovebox high temperature alarm should alarm and shut off power to both furnaces if the glovebox temperature reaches 65°C.

NOTE - Should Halon system annunciate, press HALON RELEASE HOLD button. The HALON RELEASE HOLD button must be held down continuously until C line gloveboxes can be checked for fire. The HALON RELEASE HOLD button must continue to be held until the fire department resets the system if no fire is found.

N/A LTC 4.5.33 IF glovebox temperature raises above 65°C, press EMERGENCY STOP button and notify supervision.

N/A LTC 4.5.34 IF a fire starts during the furnace heating cycle, press EMERGENCY STOP button and exit the room.

LTC 4.5.35 AFTER processing cycle has completed, check that power has been removed from the furnace. The red system power lights (IL-21C-A and IL-21C-B) are OFF.

LTC 4.5.36 Allow furnace to cool to ≤ 75°C.

LTC 4.5.37 Repeat 4.5.28 to 4.5.36 for Prn3 and Prn4 using RMC Oxide Program (Prn3) Data Sheet and Desiccant Drying Program (Prn4) Data Sheet, respectively.

OPERABILITY TEST PROCEDURE IMPACT LEVEL 3SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE 17 OF ??

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6.0 TEST EXCEPTION LIST

Sludge Stabilization OTP Exceptions List

STEP	EXCEPTION	RESOLUTION	INITIALS
4.3.4 4.3.6 4.3.7 4.3.8	DP guage for off gas Filter not calibrated prior to running furnaces (sect 5) EP	Insufficient flow to get reading a guages. Plugged lines out of Filter housing to establish sufficient to get reading off guage. (XS Package 94-382)	WSL
4.2.6 4.2.7	Unable to establish CO_2 Flow to Furnace #2. Will skip testing of CO_2 Flow until problem resolved.	Troubleshoot in 94-382. Check valves backwards, piping hooked up wrong. Corrected.	WSL
	CO_2 not essential to running section 4.5.	Normal flows established and recorded step 4.2.7 and 4.4.6	
4.3.2 Section 4.5	Water showed up (~1 liter) in off gas rotometers when V-21C-10 opened.	Drained. When more water appeared decided water from inactive leg of 26" vac sys.	WSL

OPERABILITY TEST PROCEDURE IMPACT LEVEL 3SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE 17 OF ??

17 A

6.0 TEST EXCEPTION LIST

Sludge Stabilization OTP Exceptions List

STEP	EXCEPTION	RESOLUTION	INITIALS
	Drain ck. Water problem continued as furnace temp increased.	rerouted line from HC-21C to 2" header (bypass inactive legs) Solution from inactive legs and from moist Filters and furnace firebrick. Continued OTP to dry out system. By end of OTP almost all moisture gone. (JCS 94-382)	
4.3.7 4.3.8 Sect 4.5	Could only get ~40cfh in each off gas rotameter. Continue with OTP carefully monitor glovebox temperatures.	Troubleshoot per 94-382 Found pancake in valve V-21C-10 (duct level) established adequate (marginal) Flows. Changed to larger needle valves (94-382). Good flows.	WSL

OPERABILITY TEST PROCEDURE IMPACT LEVEL 3SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE 17 OF ??

17B

6.0 TEST EXCEPTION LIST

Sludge Stabilization OTP Exceptions List

STEP	EXCEPTION	RESOLUTION	INITIALS
5) 4.5	Temperature readings between TAS + TIC differ due to thermocouple being partially pulled out of furnace. Continue with OTP but varify thermocouples fully in furnace prior to starting cycle. The TAS is a backup to the TIC deviation alarm.	Will cement thermocouples into ceramic inserts with high temp cement. per JCS 94-1658	WBL
6) 4.5.17	Furnace temperature overshoots TK setpoint causes deviation alarm to shut off power to furnaces - Operator instructed by test engineer to reset alarm and restart TIC	TIC returned by test engineer Changed from Proportional band Control to PID to provide better response. Controlled well.	WBL

OPERABILITY TEST PROCEDURE IMPACT LEVEL 3SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE 17 OF ??

17C

6.0 TEST EXCEPTION LIST

Sludge Stabilization OTP Exceptions List

STEP	EXCEPTION	RESOLUTION	INITIALS
4.5.17	To remove water from rotameter test engineer instructed operator to increase exhaust flow. This caused deviation alarm. Unable to restart Program 1 past first ramp.	Will rerun program 1 for both Furnaces. Rerun was completed See data sheets 25a, 25b, 25c & 25d	WBL
4.5.32	During final soak period of program 2 Furnace #1 lost power. Because program 2 had cycled through all ramps and soaks successfully testing instructed operators to continue taking readings during cool down. Program will not have to be rerun.	Fuse FU-21C-3 blew. Replaced with JCS 94-385. Long term fix replace fuse with slow blow fuse. Existing fuse adequate to complete testing. per JCS 94-1659	WBL

6.0 OTP ACCEPTANCE SHEET

6.1 Any equipment non-conformance or anomalies will be listed on the Exceptions List.

6.2 Upon test completion and acceptance, the Cognizant Engineer will prepare an Operational Test Report (OTR) from the original OTP with field entries and transmit it to Central Files via Engineering Data Transmittal (EDT).

6.3 The undersigned concur that the OTP was completed successfully.

Quality Assurance R.R. Thorne (Print) / Rodney R. Thorne (Signature) /Date 8-27-94

Cognizant Engineer W S Lewis (Print) / W S Lewis (Signature) /Date 8/27/94

Cognizant Engineer M W Gibson (Print) / Mark W Gibson (Signature) /Date 8/31/94
Group Manager

Operations Manager G B Chronister (Print) / G B Chronister (Signature) /Date 8/31/94

PFP Plant Manager R. D. Redekop (Print) / R D Redekop (Signature) /Date 9/2/94

APPENDIX A

TEST DATA SHEETS

Appendix A

OTP step 4.5.1 Desiccator Cooldown Data Sheet

see data sheet pg 24 Furnace #1 readings for heatup WHL 8/1/94

Boat Weight Empty - TARED (0) g				Boat Weight with MgO - 509.7 g					
8/23/94	Start	0:15	0:30	0:45	1:00	1:15	1:30	1:45	2:00
Time	1345	1410	1425	1440	1455	1510	1525	1545	1600
Boat Temperature	110°C	107°C	75°C	58°C	48°C	41°C	37°C	33°C	31°C
	2:15	2:30	2:45	3:00	3:15	3:30	3:45	4:00	4:15
Time									
Boat Temperature									

Time Boat Placed into Desiccator - 1345

Time Boat and MgO sand Reaches 75°C - 1425

WHC 7/1/94

OTP step 4.5.13

Furnace #1+2 Run #1 started 8/22/94

Furnace #1 Run #2

Appendix A

PRF Sludge Program (Prn1) Data Sheet

Time furnaces started -. DPI-21C-1 <0.5 DPI-21C-2 <0.5

	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Time 23:16															
Record Time	23:16	23:46	00:16	00:46	0116	01:46	0216	02:46	0316	03:46	04:16	04:46	05:16	05:46	06:16
TIC-21C-A (°C)	25	171	175	175	175	333	439	475	587	650	721	834	896	935 ~~X~~	954
TIC-21C-B (°C)	24	170	171	175	175	331	465	363	286	230	216	133	109	88	116
Glovebox TC #1 (°C)	23	23	24	25	26	27	29	31	32	34	36	38	39	41	42
Glovebox TC #2 (°C)	22	23	25	25	26	27	29	31	32	33	35	41	41	42	43
Glovebox TC #3 (°C)	22	23	24	24	25	27	29	30	31	32	33	38	38	39	40
Glovebox Wall (°C)/F	75	75	75	75	76	75	77	77	78	79	81	83	80	83	82
Heat Ex. Top (°C)/F	74/75	73/73	73/73	73/73	74/75	74/73	74/73	76/75	75/75	79/76	78/76	83/75	78/76	80/75	79/75
Heat Ex. Bottom (°C)/F	73/73	75/75	84/80	86/81	86/84	87/84	94/91	95/95	98/93	97/90	109/95	112/92	106/91	108/90	120/87
Heat Ex. Exhaust (°C)/F	73/73	74/74	75/75	75/75	77/76	78/78	84/83	81/87	92/87	94/89	87/83	100/78	105/80	108/81	113/91
Room Temp. (°C)/F	73	73	76	72	73	72	73	73	72	72	73	73	72	73	73
Exh. Flow Rate (cfh)	130/130	131/131	130/130	130/130	130/130	130/130	130/130	'	'	'	'	'	' 130	' 130	' 130

Possible thermocouple card available in D&C-1L 8-22-94

App. Design. N/A G.B.C 8/22/94

COMMENTS Flow Meters were full of water but ran between 120-140 w/ water

NOTE: TAG-21C-1 was reading about 25° to 30° lower than TIC-21C-A Controller.

Deviation alarm when tried to suck water out of rotameters by increasing exhaust flow to 200 cfh. Restarted furnace #1 on program 3. Will have to rerun

July 25, 1994 Program #1 for both furnaces. 1:45pm

Appendix A
PRF Sludge Program (Prnl) Data Sheet

Time	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	06:46	07:16	07:46	0816	0846	0916	0946	1016	1046	1116	1146	12:17	1246	1316
TIC-21C-A (°C)	998	1000	1000	800	683	590	517	441	385	344	309	278	248	219
TIC-21C-B (°C)	66	64	58	53	49	46	43	46	44	43	41	40	39	38
Glovebox TC #1 (°C)	44	44	45	45	43	43	41	39	38	37	36	35	34	33
Glovebox TC #2 (°C)	43	44	43	43	42	41	40	38	37	36	35	34	33	32
Glovebox TC #3 (°C)	40	41	41	40	39	38	37	36	35	34	33	32	31	30
Glovebox Wall (°F)	84	85	86	83	84	84	86	84	84	86	86	86	84	84
Heat Ex. Top (°F)	84/73	76/73	81/73	81/73	80/73	79/73	78/75	77/73	77/74	76/73	76/74	76/74	76/74	74/75
Heat Ex. Bottom (°F)	104/88	130/85	130/86	126/85	124/84	120/84	112/84	115/74	109/76	109/76	105/75	102/75	102/74	101/74
Heat Ex. Exhaust (°F)	102/77	120/76	111/76	117/76	117/75	108/76	102/76	90/73	90/74	87/73	85/73	82/74	80/74	78/74
Room Temp. (°F)	71	70	74	70	70	70	74	75	73	73	74	75	74	77
Exh. Flow Rate (cfh)	*/130	*/130	120/130	130/130	130/130	130/130	120/130	120/*	130/*	130/*	120/*	115/*	110/*	120/*

COMMENTS * Rotameter full of water
* shut down
12:05 more water in FI-21C-1. Indication fluctuating

Add. Approval: N/A
W [signature]
8/30/94
[initials] 8/30/94

July 25, 1994 1:45pm

25 a oof 30

WBL 9/4/94

Appendix A

WBL ~~RMC Oxide~~ PRF Program (Prn3) Data Sheet

OTP Step 4.5.13
Furnace #1, Run #3, started on 8/26/94

Time	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	13:10	13:40	14:10	14:40	15:10	15:40	16:10	16:40	17:10	17:40	18:10	18:40	19:10	19:40
TIC-21C-A (°C)	57	182	175	175	200	356	513	607	709	769	830	891	931	965
TIC-21C-B (°C)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	N/A
Glovebox TC #1 (°C)	38	36	35	34	35	33	35	35	37	38	40	41	42	41
Glovebox TC #2 (°C)	40	39	38	37	38	36	36	36	37	37	38	39	39	40
Glovebox TC #3 (°C)	41	41	39	38	40	38	36	36	35	35	35	37	37	38
Glovebox Wall (°C)(°F)	79°F	87°	86°	85	85	82	82	82	81	81	83	85	86	86
Heat Ex. Top (°C)(°F)	73°	75°F	75°	75°	75	75°	75	76	76	76	77	77	76	77
Heat Ex. Bottom (°C)(°F)	77°	~~839~~ 175	95	96	99	102	106	104	114	115	119	120	115	135
Heat Ex. Exhaust(°C)(°F)	73°	~~704~~	80	78	80	80	80	81	80	81	84	87	89	93
Room Temp. (°C)(°F)	72°	72	77	73	73	74	74	75	74	74	74	76	76	76
Exh. Flow Rate (cfh)	130	130	130	130	130	130	130	120	120	120	120	130	130	130

All N. Approx. N/A
WBL
8/27/94
MLS
9/30/94

COMMENTS Only Running Furnace #1 only Taking Readings For Furnace #1, DPI reading not take because Furnace #2 ramped up. Test engineer indicates not necessary.

Appendix A

~~RMC Oxide~~ PRF Program (~~Prn3~~ PRN 1) Data Sheet

Time	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	2010	2040	2110	2140	2210	2240	2310	2340	0010	0040	0110	0140	0210	
TIC-21C-A (°C)	1000	1000	994	758	628	562	490	440	385	336	302	262	232	
TIC-21C-B (°C)	N/A	N/A	NA	NA	N/A	N/A	NA	46	44	42	41	40	39	
Glovebox TC #1 (°C)	45	47	47	45	43	42	40	38	37	36	35	33	32	
Glovebox TC #2 (°C)	41	42	43	42	41	39	38	37	35	34	33	32	31	
Glovebox TC #3 (°C)	39	40	40	39	38	37	36	35	34	33	32	31	30	
Glovebox Wall (°~~C~~F)	88	86	85	89	89	85	86	80	86	85	85	81	81	
Heat Ex. Top (°~~C~~F)	77	78	78	78	77	77	77	75 / 72	74 / 72	74 / 71	73 / 71	73 / 71	74 / 73	
Heat Ex. Bottom (°~~C~~F)	135	142	146	136	123	124	109	115 / 72	111 / 72	112 / 72	112 / 73	111 / 74	113 / 72	
Heat Ex. Exhaust(°~~C~~F)	91	100	101	101	97	93	90	83 / 72	80 / 73	80 / 72	78 / 73	76 / 73	81 / 73	
Room Temp. (°~~C~~F)	75	74	74	73	72	74	72	72	72	71	72	72	73	
Exh. Flow Rate (cfh)	130	130	140	120	120	120	120	120 / 0	120 / 0	120 / 0	120 / 0	120 / 0	130 / 0	

Ad & Apr. WB 8/30/94 MWD 9/30/94

COMMENTS Only Running Furnace #1

August 8, 1994 7:01pm

25C

WSL 8/1/94

Appendix A
PRF Sludge Program (Prnl) Data Sheet

OTP Steps 4.5.13 #2, Run 2, Started 8/26/94

Time furnaces started - 0320 8-28-94 DPI-21C-1 <0.5 psi DPI-21C-2 <0.5 psi

Time	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Record Time	0320	0350	0420	0450	0520	0550	0620	0650	0720	0750	0820	0850	0920	0950	1020
TIC-21C-A (°C)	130	NA	NA	NA	N/A	NA	NA	N/A	NA	NA	N/A	N/A	N/A	n/a	N/A
TIC-21C-B (°C)	133	174	175	175	288	420	552	641	732	803°	869	915°	948	948	1000
Glovebox TC #1 (°C)	35	34	32	32	31	31	32	33	35	36°	38	39°	40°	42°	42°
Glovebox TC #2 (°C)	36	34	33	32	32	32	33	34	35	36°	38	39°	40°	41°	42°
Glovebox TC #3 (°C)	34	33	32	32	31	32	32	33	35	36°	38	39°	40°	42°	42°
Glovebox Wall ~~(°C)~~ °F	84	84	79	82	80	81	79	78	80	80°	82°	83°	82°	82°	82°
Heat Ex. Top ~~(°C)~~ °F	16 / 75	74	73	73	73	72	73	73	71	72° / 73	73 / 75	72° / 75	74 / 77	75 / 80	76 / 81
Heat Ex. Bottom ~~(°C)~~ °F	114 / 102	93	86	89	93	97	98	100	98	88° / 107°	92 / 112	96° / 110°	90 / 112	90 / 114	90 / 122
Heat Ex. Exhaust ~~(°C)~~ °F	83 / 79	77	76	77	76	77	76	77	79	73° / 84°	77 / 87	71° / 95°	78 / 100	79 / 109	79 / 112
Room Temp. ~~(°C)~~ °F	74	73	72	70	71	71	72	71	70	72°	74	74	74	74	76
Exh. Flow Rate (cfh)	130 / 125	130	130 / 130	130	130	130	130	130	130	130 / 150	130 / 150	130 / 150	130 / 150	130 / 150	130 / 150

Add Appendix: N/A WB/Laura 8/30/94 MWD 8/30/94

COMMENTS TIC-21C-B overshot the 175°C by 18°C to 193°C. ALL Readings after Time 0.0 are for Furnace #2 only. TIC-21C-B held at 175°C for one hour Then started ramping up. ~~After deviation alarm switched to program 3 for furnace #2. Program #1 will have to be re-run for both furnaces.~~ WSL 8/27/94 see page 24 of OTP.

OPERABILITY TEST PROCEDURE APPROVAL DESIGNATOR SQ	SLUDGE STABILIZATION OPERABILITY TEST PROCEDURE	WHC-SD-CP-OTP-151 REV-0 PAGE ~~25~~ OF 30

25d

Appendix A
PRF Sludge Program (Prnl) Data Sheet

Time 1050	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	1050	1120	1150	1220	1250	13:20	13:50	14:20	14:50	15:20	15:50	16:20	16:50	17:20
TIC-21C-A (°C)	N/A	N/A	41	44	44	101	174	175	175	251	382			
TIC-21C-B (°C)	1000°	830°	662	491°	450	341	274	234	179	139	125			
Glovebox TC #1 (°C)	44°	44°	42°	40°	39°	37°C	37°	35°	34°	34	33			
Glovebox TC #2 (°C)	43°	44°	43°	42°	41°	40°C	39°	38°	37°	37	36			
Glovebox TC #3 (°C)	43°	44°	43°	44°	42°C	41°C	40°	39°	39°	39	37			
Glovebox Wall (~~°C~~) F	84°	85°	80/87	86/90	84/87	86	86°	84°	85°	84	83			
Heat Ex. Top (~~°C~~) F	76/82	75/82	74/82	75/81	77/81	74/84	74/78	75/81	77/81	75/78	75/76			
Heat Ex. Bottom (~~°C~~) F	88/122	87/123	87/118°	77/150	96/117	82°F/132°	98/138	98/123	98/121	100/118	92/114			
Heat Ex. Exhaust (~~°C~~) F	80/115	78/113	79/106°	76/96	81/94	76/91°	91/93	78/89	80/89	80/89	80/87			
Room Temp. (~~°C~~) F	75	73	72	75°	75°	72°	74°	74	74	73	74			
Exh. Flow Rate (cfh)	130/150	130/150	170/150	200/200	0/150	130/200	130/200	130/200	130/200	130/200	130/200			

Add'l. App: N/A [illegible] 8/30/94 [illegible] 8/30/94

COMMENTS

WBL 9/1/94

OTP step 4.5.28

Appendix A
RMC Oxalate Program (Prn2) Data Sheet

Furnace #1 + 2, started 8/25/94

Time furnaces started - 08:42 Same 8-26-94 DPI-21C-1 0.5 psi DPI-21C-2 0.5 psi

Time	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Record Time	Same 8-26-94 08:40	1411	1435	1511	1535	1611	1640	1711	1740	1811	1840	1911	1940	2011	2040
TIC-21C-A (°C)	86°F	183°	175°	175°	304°	485	594	695	753	822	881	926	963	1001	872
TIC-21C-B (°C)	27°F Same 8-26-94	187°	174°	175°	312°	491	598	699	755	825	883	929	965	1002	1000
Glovebox TC #1 (°C)	23°	24°	25°	25°	27°	29°	32°	36°	39°	42°	47°	50°	52°	56°	57°
Glovebox TC #2 (°C)	23°	24°	25°	26°	28°	30°	33°	36°	39°	43°	46°	48°	51°	54°	55°
Glovebox TC #3 (°C)	23°	24°	24°	25°	26°	29°	32°	35°	37°	41°	44°	47°	49°	52°	53°
Glovebox Wall (°C)F	77°	77°	77°	77°	78°	78°	78°	80°	80°	82°	82°	87°	89°	91°	93°
Heat Ex. Top (°C)F	74° 73°	73° 74°	73° 74°	74° 74°	75° 75°	75° 76°	77° 77°	77° 78°	78° 79°	79° 80°	80° 82°	80 82	81 84	81 84	82 84
Heat Ex. Bottom (°C)F	75° 75°	80° 78°	82° 82°	91° 85°	98° 86°	97° 92°	103° 98°	112° 99°	118° 99°	124° 107°	128° 108°	132 125	135 132	146 135	145 134
Heat Ex. Exhaust (°C)F	75° 75°	76° 75°	77° 76°	77° 76°	78° 77°	80° 82°	81° 89°	84° 89°	88° 98°	92° 104°	96° 107°	100 115	104 118	109 120	111 120
Room Temp. (°C)F	75°	75°	76°	76°	76°	75°	77°	77°	77°	76°	77°	77°	76°	76°	78°
Exh. Flow Rate (cfh)	130 130	130 130	130 130	130 130	130 130	130 140	130 150	130 155	140 160	160 160	160 160	160 160	160 160	160 160	150 170

Change from celcius to Farenheit Approval Designator N/A 9-2-94 GSL 8/26/94

COMMENTS Tempature Controller TIC-21C-A went above HOLD degrees 183°, same with Tempature controller TIC-21-B went above Tempature HOLD point 187°

Appendix A
RMC Oxalate Program (Prn2) Data Sheet

Time	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	2111	2140	2211	2240	2310	2340	2410	2440	0110	0140	0210			
TIC-21C-A (°C)	923	718	597	513	457	407	362	320	292	263	235			
TIC-21C-B (°C)	958	725	595	508	441	385	337	293	263	234	207			
Glovebox TC #1 (°C)	56°	55°	53°	50°	49°	47°	45°	44°	42°	40°	38°			
Glovebox TC #2 (°C)	56°	55°	54°	51°	50°	47°	45°	44°	42°	40°	39°			
Glovebox TC #3 (°C)	54°	53°	51°	48°	46°	45°	43°	41°	40°	38° 38°	37°			
Glovebox Wall (°C)/°F	92°	90°	92°	94°	93°	90°	90°	87°	87°	88° 85°	86°			
Heat Ex. Top (°C)/°F	82 / 82 2	84 / 83 2	84 / 82 2	81 / 81 2	77° / 79 2	72° / 78 2	75° / 76 2	75° / 76 2	75° / 75 2	72° / 73 2	73° / 73 2			
Heat Ex. Bottom (°C)/°F	140 / 116 2	193 / 135 2	165° / 123 2	132° / 119 2	120° / 108 2	110° / 102 2	102° / 96 2	101° / 97 2	101° / 93 2	105° / 94 2	98° / 91 2			
Heat Ex. Exhaust (°C)/°F	110 / 122 2	103 / 114 2	106 / 118 2	98° / 104 2	93° / 98 2	89° / 93 2	85° / 87 2	82° / 83 2	79° / 80 2	76° / 77 2	76° / 76 2			
Room Temp. (°C)/°F	75°	76°	76°	74°	75°	77°	72°	72°	72°	74°	72°			
Exh. Flow Rate (cfh)	150 / 110 2	100 / 100 2	120 / 120 2	120 / 120 2	120 / 120 2	120 / 120 2	120 / 120 2	120 / 120	120 / 120 2	120 / 120 2	110 / 120 2			

Change from °Celcius to °Fahrenheit Approved Designator NA
8-25-94

COMMENTS Both Rotameters were opened completely to allow condensate to drain, per B.O.H.R. (2120 hrs.) 2205 - Reset Rotameters To 120° per ICE STA'
for Mr. Gilbert 8-25-94

WBL 9/1/94

OTP step 4.5.37

Furnace #1 + 2, started 8/8/94

Appendix A
RMC Oxide Program (Prn3) Data Sheet

Time furnaces started -			DPI-21C-1 <0.5 psi						DPI-21C-2 <0.5 psi						
Time	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Record Time	9:15	10:00	10:15	10:45	11:15	11:45	12:15	12:45	1318	1345	1415	1445	1515	1545	1615
TIC-21C-A (°C)	40	108	233	371	503	601	703	765	837	887	930	967	1001	1002	954
TIC-21C-B (°C)	58	104	173	344	478	583	686	754	826	875	923	962	996	1001	963
Glovebox TC #1 (°C)	23	24	25	27	29	31	36	40	45	48	53	53	53	54	56
Glovebox TC #2 (°C)	23	25	26	28	30	33	38	42	47	51	55	56	56	57	58
Glovebox TC #3 (°C)	23	24	24	29	31	35	39	44	50	54	59	59	57	57	62
Glovebox Wall (°C)/°F	—	—	—	76°F	78°F	78°F	80°F	82°F	82°F	100°F	88°F	90°F	93°F	90°F	94°F
Heat Ex. Top (°C)/°F	—	—	—	99°F	80°F / 82°F	78°F / 81°F	79°F / 84°F	81°F / 87°F	84°F / 88°F	84°F / 88°F	86°F / 88°F	88°F / 94°F	91°F / 89°F	91°F / 93°F	85°F / 92°F
Heat Ex. Bottom (°C)/°F	—	—	—	80°F	130°F / 106°F	120°F / 151°F	120°F / 159°F	125°F / 138°F	149°F / 140°F	165°F / 165°F	149°F / 154°F	167°F / 186°F	165°F / 189°F	161°F / 191°F	170°F / 156°F
Heat Ex. Exhaust (°C)/°F	—	—	—	76°F	87°F / 87°F	92°F / 107°F	97°F / 189°F	102°F / 140°F	109°F / 147°F	92°F / 140°F	103°F / 130°F	155°F / 176°F	165°F / 182°F	150°F / 146°F	71°F / 155°F
Room Temp. (°C)/°F	—	—	—	75°F	80°F	78°F	78°F	80°F	80°F	80°F	80°F	84°F	83°F	76°F	77°F
Exh. Flow Rate (cfh)	60	60	60	100	55 / 55	55 / 55	55 / 55	55 / 55	55	55 / 55	55 / 55	80 / 55	80 / 55	60 / 60	60 / 70

PORTABLE THERMOCOUPLE ONLY AVAILABLE IN °F.
LT Cmpl 8/8/94

App. Required: N/A
Marlin 8/25/94
GBC 8/26/94
Inlet
outlet

COMMENTS Halted at 0915 to drain water from rotameters. PROGRAM CONTINUED TO DWELL AT 1000°C AFTER THE ONE HOUR DWELL TIME AT 1000°C. STOPPED PROGRAM AT 1610. ACKNOWLEDGED DEVIATION ALARM.

Appendix A
RMC Oxide Program (Prn3) Data Sheet

PORTABLE THERM. ONLY AVAILABLE IN °F. [illegible] 8/8/94
App. Designs N/A
[illegible] 8/26/94

Time	7.5	8.0	8.5	9.0	9.5	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14
Record Time	1645	1715	1745	1815	1845	1915	1945	2015	2045	2115	2145	2215	2245	
TIC-21C-A (°C)	768	668	586	527	461	410	367	330	290	265	237	220	201	
TIC-21C-B (°C)	750	638	547	488	421	369	325	290	252	228	204	182	166	
Glovebox TC #1 (°C)	55	53	51	49	47	46	44	42	40	39	37	37	35	
Glovebox TC #2 (°C)	57	55	52	49	48	46	44	42	40	38	37	36	35	
Glovebox TC #3 (°C)	61	55	54	50	48	46	44	42	39	38	36	36	34	
Glovebox Wall (°C)	90°F	95°F	94°F	91°F	90°F	89°F	89°F	86°F	82°F	86°F	82°F	84°F	80°F	
Heat Ex. Top F ~~(°C)~~	86° / 87	90° / 91°	82° / 88°F	80° / 84°	84° / 82	83° / 82°	82° / 80°	84° / 82°	81° / 78°	76 / 76	75 / 75	74 / 74	74 / 74
Heat Ex. Bottom F ~~(°C)~~	169° / 163°	165° / 148°	160° / 134°	149° / 147°	135° / 130°	125° / 122°	116° / 113°	116 / 106°	105 / 93°	104 / 93	93 / 89	96 / 85	86 / 84	
Heat Ex. Exhaust F ~~(°C)~~	140° / 148°	130° / 147°	117° / 123°	96° / 98	94° / 100°	91° / 90°	87° / 88°	87° / 86°	85° / 83°	81 / 79	80 / 79	78 / 77	76 / 76	
Room Temp. F ~~(°C)~~	87	82	77	77	75	76	78	75	72	76	73	73	72	
Exh. Flow Rate (cfh)	60 / 70	60 / 70	60 / 70	60 / 70	70 / 60	60 / 65	60 / 60	50 / 60	60 / 60	65 / 60	60 / 50	60 / 50	60 / 70	

COMMENTS LOST 26" INCH VACCUM FOR APPROX 5 MIN FROM 1755 - 1800. POWER SHUT OFF AND THEN TURNED BACK ON AFTER WE CALLED THEM. FURNACE OPENED AT 200°C. AFTER ~5 MINUTES, THE GLOVEBOX TEMP INCREASE 2°C (from 37°C to 39°C) AND FURNACE TEMP DROPPED TO ~170°C. ONLY ONE FURNACE WAS OPENED AT 2155. FURNACE TEMP INCREASED BACK TO 184°C AFTER DOOR WAS CLOSED. BOTH FURNACE DOORS OPENED AT 22:47. FURN. #1 AT 200°C AND FURN. #2 AT 165°C. GLOVE BOX TEMP REACHED 40°C from 2245 Readings.

August 8, 1994 7:01pm

WBL 9/1/94

OTP step 4.5.37

Furnace #1 + #2, started 8/7/94

Appendix A

Drying Desiccant Program (Prn4)

Time furnaces started -			DPI-21C-1 N/A						DPI-21C-2 N/A						
Time	0.0	0.5	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0	5.5	6.0	6.5	7.0
Record Time	0850	0920	0950	10:20	1050	11:20			1250	0117					
TIC-21C-A (°C)	54	176	177	177	177	119			68	63					
TIC-21C-B (°C)	43	186	178	177	178	144			80	73					
Glovebox TC #1 (°C)	24	24	24	25	25	30			29	29					
Glovebox TC #2 (°C)	23	23	24	25	26	31			29	29					
Glovebox TC #3 (°C)	23	23	24	24	25	29			28	28					
Glovebox Wall (°C/F)	—	—	—	—	—				—	—					
Heat Ex. Top (°C/F	—	—	—	—	—				—	—					
Heat Ex. Bottom (°C)F	—	—	—	—	—				—	—					
Heat Ex. Exhaust(°C)F	—	—	—	—	—				—	—					
Room Temp. (°C/F	—	—	—	—	—				—	—					
Exh. Flow Rate (cfh)	—	—	—	—	—				—	—					

Addtl. Approvals:

WBSwis 8/30/94

MWSil 8/30/94

COMMENTS Exhaust System was NOT started for this Program #4