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MINUTES -- GRAPHITE DISTORTION, VSR, HCR
 SERVICEABILITY PROGRAM MEETING
 FEBRUARY 4, 1965

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MINUTES -- GRAPHITE DISTORTION, VSR, HCR
SERVICEABILITY PROGRAM MEETING
FEBRUARY 4, 1965

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By Dickinson, 5-25-94
Verified By PK Schmitt 5-31-94

Prepared by

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MINUTES -- GRAPHITE DISTORTION, VSR, HCR
SERVICEABILITY PROGRAM MEETING
FEBRUARY 4, 1965

Attendance

W. K. Alexander	G. F. Howden
C. R. Barker	F. J. Kempf
R. G. Clough	R. L. Loundagin
P. H. Cooke	D. C. McClure
M. L. Faught	R. Nilson
E. J. Filip	R. S. Peterson
S. M. Graves	W. W. Porter
C. H. Gydesen	A. Russell
R. S. Hammond	
H. W. Heacock	
D. L. Hovorka	

Operational Report -- W. W. Porter

All VSR's are operable.

The K Reactors have reported sticking HCR's (six at KE). The situation appears to be one of continuing distortion. Rods No. 2 and 5 are sticking at C Reactor.

R. G. Clough reported that HCR channel conditioning has been scheduled for each forthcoming outage to alleviate the KE problems attributed to step plug binding and channel obstructions.

The 2-1/2 year old HCR sleeve installation at KE has been inspected and determined to be in excellent condition.

VSR Channel Films -- C. H. Gydesen

Films were shown on Channel No. 41, C Reactor, prior to channel enlargement, after enlargement, and after sleeving.

Program Status -- H. W. Heacock

The appendix to HW-84408, Minutes, VSR Program Meeting, September 29, 1964 (Secret) was used as an outline for the discussion of program status and accomplishments. The appendix as amended is attached to this document.

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A. VSR Systems

1. Manufacturing Engineering -- C. R. Barker

Three different "moles" to be used in channel renovation are near completion. They are in the process of being debugged. The moles will clear a channel of protruding blocks and narrowed passageways. They will not enlarge a channel.

The Spare Parts order for material for five channels at C Reactor had been previously reported cancelled. The order has not been re-established awaiting recommendations from Facilities Engineering Section. FES should have information regarding possible relaxation in purity and strength requirements by March 1, 1965, to develop new specifications. The reasons for consideration of relaxation are reduced cost and earlier delivery. Strength requirements now have limited the procurement to one supplier who has not performed well regarding delivery dates and has been escalating prices.

2. Facilities Engineering -- R. S. Peterson, R. S. Hammond

The production test for a K test sleeve installation has been approved. Actual performance has slipped to an estimated date of May, 1965, and this may be delayed six to eight months further depending on possible process channel enlargement assignment.

Metallic sleeves have been determined to be unsatisfactory. A letter to this effect has been circulated. A document with details of the study was issued in February (RL-REA-669, Water Cooled Metal VSR Liners, C and K Reactors (Secret)).

The stack force theories were not reconciled completely by December, 1964. A series of graphite mock-up tests to determine failure modes, key and sleeve strengths is under way. Agreement is expected to be reached after the test results are assimilated. A decision is expected early in March.

3. Research and Engineering -- S. M. Graves, R. Nilson

The consequences of ball drops at the C and K Reactors have been evaluated and documented in RL-REA-229 (Secret) and HW-83152 (Secret), by A. D. Vaughn.

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B. Ball 3X System

1. Research and Engineering -- R. Nilson, W. K. Alexander

- a. A comment issue of a document describing possible circuit changes to reduce the likelihood of inadvertent ball drops has been issued, and comments received. A review meeting within Research and Engineering will be held approximately March 1, 1965, prior to final issue.
- b. W. K. Alexander reported on the ceramic ball investigation program. Relatively rapid burnout of the ceramic balls is their primary advantage. Current efforts are being used to optimize the strength and cost variables. A review of the K Reactor total control indicates that the ball strength can be reduced from previous concepts. Burnout losses can be reduced by a factor of four to five. With fifty percent caulking efficiency (caulking assumed to reduce ball retention in the reactor by fifty percent), the losses could be reduced by an eight to ten factor. Gadolinium and samarium are being reviewed as poison candidates. Graphite balls are being considered. Present estimates show that a cost of less than \$100,000 per reactor can be obtained for a ceramic ball loading.

2. Facilities Engineering --

a. Chain 3X -- D. L. Hovorka

J. P. Cooke reviewed chain 3X progress. The design is in the drafting stage. A prototype is anticipated prior to June, 1965. A production test will follow prototype testing. On-reactor testing will be accomplished by about August, 1965.

The system will consist of approximately 1,000 pounds of 1/8" chain stored in the ball 3X hopper. The chain will pass over a powered sprocket into and out of reactor. The time required to place the chain in reactor is estimated to be fifteen minutes. Control strength is fifty percent of the present boron-steel balls. The channels involved are the six outermost at the K Reactors.

Justification is less spline usage for total control.

b. Caulking -- D. L. Hovorka

J. P. Cooke explained the caulking method developed using a chain

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"stopper" and concrete vibrator. Samples of baked graphite-sugar-water mixture were exhibited. The attendees viewed a demonstration of caulking in a mockup. Flow characteristics were demonstrated as well as methods for mixture placing control, including the chain stopper. A production test is being written and on-reactor testing is targeted for an early date.

c. Surveillance Documents on Ball 3X and Thermal Shield Cooling Tubes -- R. S. Peterson

RL-REA-247, Ball 3X Bellows Surveillance, C and K Reactors, C. E. Bonham, 11/19/64 (Confidential), and RL-REA-297, Thermal Shield Cooling Tube Surveillance, B, C, D, and K Reactors, C. E. Bonham, 11/19/64 (Confidential) have been issued.

3. Manufacturing -- M. L. Faught

a. Installation of Reverse Current or Undervoltage Annunciation for Ball System Batteries

The present system has been determined to be adequate.

b. Review Sensing Line and Auxiliary Header Maintenance and Purge Practices

The EMS is to be revised to assure better control of the system.

c. Develop More Reliable LP-VP Time Delay Circuits

Completion waiting on Ball 3X system study document.

d. Standardization of K Beckman Seismoscope Interlock Power Supplies

Design Change No. 978 was issued.

Additional Items of Interest

- a. The six outer hoppers at the K Reactors have been deactivated. A Design Change (DC-956) has been issued.
- b. Better "pushbuttons" have been installed in the manual scram circuit.
- c. Riser pressure sensing lines are being replaced.

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- d. All procedures involving the Ball 3X system are being carefully reviewed to avoid chances of spurious ball drops.

Recommendations for Containing Ball Problem -- H. W. Heacock

It was emphasized that a Department decision would be necessary prior to budget submission time of about March 15, 1965. A forthcoming document to be issued for comment on HCR-VSR programming may serve as a basis. The document, RL-REA-580, "Remedial Program, Horizontal Control Rod and Vertical Safety Rod Problems, B, C, D, and K Reactors", by P. H. Hutton, will be issued prior to March 1, 1965.

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Supervisor, Reactor Design

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APPENDIX

ROD SERVICEABILITY PROGRAM
STATUS AND SCHEDULE COMMITMENTS

<u>Item</u>	<u>Scheduled Complete</u>		<u>Status and Remarks</u>
	<u>HW-82887</u>	<u>Current</u>	
<u>VSR Systems</u>			
I. <u>MES</u>			
1. Design specialized maintenance tools	--		
2. Prepare channel maintenance procedures	--		Pending availability of tools. Manufacturing will provide procedures.
3. Design change for installation of graphite sleeves at C Reactor	--		Completed
4. Order material for 5 channels of sleeving at C Reactor	--		Bids are in and were reviewed and the inquiry cancelled. New specifications will be issued by April 1, 1965, based on reconciled stack force theory.
II. <u>FES</u>			
1. Install test sleeve in #41-C	--		Completed December, 1964
2. Production test for K test sleeve installation	FY '65	1/66	PT is approved. First channel to be sleeved about January, 1966.
3. Feasibility study for metallic sleeves	11/1/64		Complete. Document RL-REA-669 issued February 15, 1965.
4. Reconcile stack force theories	12/31/64	3/1/65	Schedule revised

<u>Item</u>	<u>Scheduled Complete</u>		<u>Status and Remarks</u>
	<u>HW-82887</u>	<u>Current</u>	
5. Define optimum force limits for VSR channel maintenance	1/1/65	4/1/65	Dependent on No. 4 above

III. R&E

1. Issue stack force theory	7/15/64		Completed
2. Issue stack force theory for C Reactor	10/15/64	12/1/64	Informal information available. Document issue date uncertain
3. Define consequences of inadvertent ball drop at K and C Reactors	10/15/64		Completed

Work on No.'s 2 and 3 delayed because of other assignments.

Ball 3X System

I. R&E

1. Recommend circuit changes to reduce likelihood of ball drops	10/1/64		Document issued for comment. Tentative issue date 4/1/65.
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II. FES

1. In-reactor caulking mat'ls test	9/15/64	--	Complete. Combination of mat'ls available.
2. Mock-up demonstration of caulking methods and equipment	9/15/64	11/1/64	Mock-up tests demonstrated 2/4/65 for meeting attendees.
3. Caulk one active VSR channel	12/15/64		Early target date will require approved PT.

Item	<u>Scheduled Complete</u>		<u>Status and Remarks</u>
	<u>HW-82887</u>	<u>Current</u>	
4. Pursue chain 3X concept	--		Ready for on-reactor test by 8/65.
5. Recommend program for 3X bellows surveillance and thermal shield cooling tube surveillance	9/1/64		Completed; RL-REA-247, RL-REA-279.
6. Recommendations for containing ball problem	12/31/64	3/1/65	Latest to get in FY 66 budget

III. Manufacturing

1. Installation of reverse current or undervoltage annunciation for ball system batteries			Study completed.
2. Review sensing line and auxiliary header maintenance and purge practices			Completed
3. Develop more reliable LP-VP time delay circuits (FES)	CY '64	Engr. work to be complete	Awaiting R&E ball 3X document.
4. Standardization of K Beckman Seismoscope interlock power supplies			Complete

HCR's

I. FES

1. Inconel rod tip at KW	1/31/65	4/15/65	Channel renovation complete. Two rods on site. One is being tested at 189-D. PT is being prepared for April installation into Channel No. 2 at KW.
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<u>Item</u>	<u>Scheduled Complete</u>		<u>Status and Remarks</u>
	<u>HW-82887</u>	<u>Current</u>	
2. Aluminum rod tip at B or D	9/1/65	9/1/65	On schedule. 5/3/65 vendor promise date
3. Uncooled rod tip	6/65		On schedule. R&D funds committed for ATH contract with NMPO. Expect drawings and specifications by 11/1/65.

**DATE
FILMED**

10 / 28 / 94

END