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OPERATING HISTORY OF HANFORD PILES

By

J. W. Talbott

Process Technology Unit
Pile Engineering Sub-Section

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HANFORD ATOMIC PRODUCTS OPERATION
RICHLAND, WASHINGTON

Operated for the Atomic Energy Commission by the
General Electric Company under Contract # W-31-109-Eng-52

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OPERATING HISTORY OF HANFORD PILES

INTRODUCTION

This document has been written because of a request for information from the Advisory Committee on Reactor Safeguards.(1) Some of the information summarized has been transmitted previously(2, 3) in response to other requests.(4, 5)

SUMMARY

Hanford operating experience has been summarized in terms of operating hours, startups and scram analysis.

DISCUSSION

With regard to the data on Tables I - VII the following shoud be noted:

1. The meaning used for the word "scram" is a rapid shutdown of the pile performed automatically by control instrumentation. Rapid shutdowns because of ruptured fuel elements were not included except in the instances where instruments detected the abnormalities resulting from the ruptures and scrammed the pile.

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(1) HAN-58364, C. Rogers McCullough, Reactor Safeguard Committee, AEC, 2-25-55.

(2) HW-36573, O. H. Greager, 5-6-55, "Safety Experience - Reactors and Critical Facilities."

(3) HW-37033, O. H. Greager, 6-7-55, "Safety Experience - Reactors and Criticial Facilities."

(4) OC:DGS, Letter from D. G. Sturges to A. B. Greninger, 4-13-55, "Safety Experience - Reactors and Critical Facilities."

(5) RD:ILB:EAL, Memorandum from W. K. Davis, 2-23-55, "Safety Experience - Reactors and Critical Facilities."

[redacted]

2. The large number of scrams falling under the heading of "Accidental Activation of Controls" in later years was caused primarily by panellit trips which occurred by accidental grounding of the panellit gages during normal maintenance.

3. Under the heading "Due to Personnel Inattention" are included scrams due to such things as (a) failing to by-pass a Beckman before resetting trips, (b) by-passing more than two Beckmans at the same time, (c) failing to re-set Beckman trips when raising the power level, and (d) a few panellit trips where it could be determined that the trip was the result of maintenance personnel exercising less than reasonable care.

4. Examples of scrams listed under the heading "Instrument Performed its Designed Purpose" may be clarifying. a) Should the flow of water to any tube drop below a predetermined value, the panellit gage will detect this drop in flow and scram the pile. b) The increase in neutron flux from power surges will be detected by the Beckmans and the pile scrammed. c) Dual areas (B-C, D-DR, KE-KW) are so designed that a Beckman scram at one pile automatically scrams the other pile. Thus for the first pile the scram may be due to personnel inattention, but at the second pile the scram would be classified under "Instrument Performed its Designed Purpose".

5. It is believed that a very large proportion of the scrams listed under the heading "Panellit - Unknown Cause" should properly be classified "Oscillating Panellit Gage" if all the facts were known.

For a short period in 1944 and 1945 the panellit gages were in the No. 1 safety circuit and caused frequent scrams because of oscillating gages and mechanical failure. Because of the relatively low tube powers being realized at that time it was considered safe to remove the panellits from the safety circuit and wire them to give an alarm should one pass its trip point. This procedure enabled operating personnel to examine the gage

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and if the alarm was caused by malfunctioning of the gage, the pile was not scrammed manually. The number of scrams occurring from early 1945 through roughly 1952 was thus decreased significantly. As tube powers were increased it became necessary to eliminate the delay inherent in such an operating procedure. During December 1952 a program was begun to again wire the panellit gages in the No. 1 safety circuit in such a manner that there be no time delay in initiating a scram signal after a gage passed its trip. As a result there was an increase in the number of scrams.

The large number of scrams classified under the heading "Other" during 1953 and 1954 for D and H Piles was due primarily to in-pile experiments being conducted at these reactors. (Recirculation loop at H and water quality control tube at D.)

JWT:jw

J. W. Talbott

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TABLE I

OPERATING EXPERIENCE - HANFORD REACTORS - 105 B

Startup Date 9-26-44

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	2280	8300	1848		4416	8335	8630	8500	8450	7870	8410	3028
2. Number of Startups	35	62	14		26	42	39	46	68	76	72	29
3. Number of Scrams	23	38	5		4	5	14	10	18	27	21	8
Due to Personnel Inattention	1	1			1		1		1	1		
Accidental Activation of Controls		2								4	4	2
Fluctuation or Loss of Power Supply	20	11	2		2	1	3	3		4	1	
Beckman Failure		2	1		1	3		1	1			
Mechanical Failure	2	11				1	2	2	2	3	7	2
Oscillating Panellit Gages		7										
Panellit - Unknown Cause								2	2	4	3	2
Instrument Performed its Designed Purpose		2					8	2	9	9	4	2
Other		2	1						3	2	2	
Unknown			1									

Not Operating 3-19-46 to 6-1-48

TABLE II

OPERATING EXPERIENCE - HANFORD REACTORS - 105 C

Startup Date 11-18-52

	1952	1953	1954	1955
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	1000	8670	8655	2626
2. Number of Startups	18	106	119	63
3. Number of Scrams	13	77	39	20
Due to Personnel Inattention			1	3
Accidental Activation of Controls	2	4	4	6
Fluctuation or Loss of Power Supply	8	11	1	
Beckman Failure			3	
Mechanical Failure		6	2	2
Oscillating Panellit Gage		12	1	
Panellit - Unknown Cause	1	28	22	3
Instrument Performed its Designed Purpose	1	8	3	6
Other		6	2	
Unknown	1	2		

TABLE III

OPERATING EXPERIENCE - HANFORD REACTORS - 105 D

Startup Date 12-17-44

	1944	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	360	8633	8425	8465	8255	8445	8080	8520	8500	7881	8319	2942
2. Number of Startups	5	55	52	47	60	36	35	51	56	70	87	48
3. Number of Scrams	3	29	9	6	8	4	9	12	4	34	54	12
Due to Personnel Inattention	1	3	1	1		1	1				1	2
Accidental Activation of Controls		5	1							2	19	1
Fluctuation or Loss of Power Supply		8	4	2	8	1	3	6		4	1	4
Beckman Failure		1		1		2				1		
Mechanical Failure	2	5	2	2				1	1	2	9	
Oscillating Panellit Gage		3										1
Panellit - Unknown Cause										6	6	1
Instrument Performed its Designed Purpose							4	1	2	7	9	2
Other		2	1				1	4	1	12	7	1
Unknown		2									2	

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TABLE IV

OPERATING EXPERIENCE - HANFORD REACTORS - 105 DR

Startup Date 10-3-50

	1950	1951	1952	1953	1954	1955
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	2135	8685	8670	7750	8650	2930
2. Number of Startups	16	62	49	60	87	40
3. Number of Scrams	10	22	7	27	47	29
Due to Personnel Inattention	1	1		1	2	1
Accidental Activation of Controls				4	9	4
Fluctuation or Loss of Power Supply	1	8	1	5	1	
Beckman Failure	1			2		2
Mechanical Failure		3	1	5	3	
Oscillating Panellit Gage				4	1	2
Panellit - Unknown Cause		6	1	2	19	17
Instrument Performed its Designed Purpose	6	3	1	2	9	3
Other	1	1	3	2	3	
Unknown						

TABLE V

OPERATING EXPERIENCE - HANFORD REACTORS - 105 F

Startup Date 2-25-45

	1945	1946	1947	1948	1949	1950	1951	1952	1953	1954	1955
1. Hours Operated (Critical Approaching Critical, and Adjusting Fuel)	7385	8610	8085	7635	8680	8400	8520	7550	8570	8505	2477
2. Number of Startups	30	52	50	58	52	46	48	80	45	107	30
3. Number of Scrams	12	6	13	6	18	18	13	11	12	43	17
Due to Personnel Inattention	1	2							1	3	2
Accidental Activation of Controls	1							3		5	3
Fluctuation or Loss of Power Supply	8	1	3	4	10	6	5	1	1	3	
Beckman Failure		1	6	2	8	5			1		5
Mechanical Failure			4							7	1
Oscillating Panellit Gage									1		
Panellit - Unknown Cause							1	2	4	20	5
Instrument Performed its Designed Purpose	2					5	5	5		5	1
Other		1				2	2		2		
Unknown									2		

TABLE VI

OPERATING EXPERIENCE - HANFORD REACTORS - 105 H

Startup Date 10-20-49

	1949	1950	1951	1952	1953	1954	1955
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	1750	8520	8600	8550	7790	8430	3053
2. Number of Startups	13	54	55	50	110	116	31
3. Number of Scrams	10	35	19	19	96	70	14
Due to Personnel Inattention		1		1	3	1	2
Accidental Activation of Controls					9	4	2
Fluctuation or Loss of Power Supply	2	9	5	2		1	1
Beckman Failure	7	9	1				
Mechanical Failure	1	9		4	43	3	1
Oscillating Panellit Gage				1	5	10	3
Panellit - Unknown Cause			1	8	27	28	5
Instrument Performed its Designed Purpose		7	6	2	4	1	
Other			4	1	5	22	
Unknown			2				

TABLE VII

OPERATING EXPERIENCE - HANFORD REACTORS

Startup Dates	4-17-55 105 KE	1-4-55 105 KW
1. Hours Operated (Critical, Approaching Critical, and Adjusting Fuel)	800	1698
2. Number of Startups	18	17
3. Number of Scrams	12	11
Due to Personnel Inattention	3	3
Accidental Activation of Controls	3	
Fluctuation or Loss of Power Supply		1
Mechanical Failure	4	1
Panellit - Unknown Cause	1	
Instrument Performed its Designed Purpose		6
Other	1	