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STUCK FUEL ELEMENT FAILURE FREQUENCY DURING THE PERIOD
OF IMPROVED GAMMA MONITOR FACILITIES AT KE AND KW REACTORS

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RICHLAND, WASHINGTON

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DATE February 18, 1966
TO T. H. Lyons, Project Planning and Control
FROM R. G. Lauer, Process Analysis

DISTRIBUTION:

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SUBJECT STUCK FUEL ELEMENT FAILURE FREQUENCY DURING THE PERIOD OF
IMPROVED GAMMA MONITOR FACILITIES AT KE AND KW REACTORS

Ref: Letter, T. H. Lyons to A. K. Hardin, same subject, 1-20-66

Introduction

At your request, the stuck fuel element failure frequency was analyzed at the K Reactors during the period of improved gamma monitor facilities. Failures that occurred during this interval* were compared to failures sustained prior to the installation of the new facilities**. Hole failures were omitted from the analysis due to their very low stuck failure frequency.

Summary of Results

During the 16* months of improved gamma monitor operation, 13 failures were experienced. Two were stuck failures of the end cap and side variety. By objectively analyzing these data in comparison to equivalent failure*** periods during unimproved gamma monitor operation, the following conclusions were born:

- 1) No valid improvement in stuck fuel element failure frequency was assessed for the interval under consideration.
- 2) No improvement (decrease) in outage time, due to stuck failures, was experienced
- 3) Stuck failure frequency during this interval was only equivalent to previous failure*** periods, by the method used in this analysis.

Discussion

The improved gamma monitor facilities have been in existence 16 months. During this time 13 failures were sustained. Two were stuck requiring an average of 25 removal hours/failure above that required for a non-stuck failure. All failures occurring in the hole were excluded due to their minute stuck failure frequency. Side, end cap and split failures were included, regardless of the cause**** since their stuck failure frequencies were of significance.

* October 1964 through January 1966

** January 1960 through September 1964

*** Failure Period: Thirteen failures constituted a failure period in this analysis. Any consecutive 13 failures, occurring during the base period, qualified as a failure period. All such periods were used in the analysis.

**** Corrosion, mechanical damage, misalignment, warp, etc.

T. H. Lyons

-2-

February 18, 1966

This analysis was based on failure periods consisting of 13 consecutive failures each, occurring from January* 1960 to September 1964. Analysis on a time period basis could lead to erroneous results, since the gamma monitor system does not prevent failures, but only detects them. Since it does have an affect after the failures occurrence, it is logical to base the analysis on equivalent failure periods (13 failures). Between January 1960 and September 1964**, 55 failure periods exist, any one of which could be compared to the 13 failures that occurred during the improved facilities operation. However, such a single choice would lead to a subjective conclusion based on the analyzer's decision of which period he picked. Thus, an integration of all possible base failure periods was made in considering the improved systems performance.

As a result of this analysis, an improvement in stuck failure frequency cannot be assessed. Operation with the improved facilities has been equivalent to unimproved facility operation. The 13 failures which occurred during the new facilities installation represents a small failure sample size. A more conclusive analysis may be warranted at a future date when more data is available.

R. G. Lauer, Process Analysis
Process Technology
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* T. H. Lyons, Don't Say It - Write It, 1-20-66

** $P = n - k + 1$ = number of failure periods to be considered under unimproved gamma monitor operation. Where: n = total number of failures that occurred from January 1960 to September 1964, k = failures that occurred from October 1964 to January 1966.

$P = 67 - 13 + 1 = 55$ failure periods which occurred in sequence

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