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Plus attachments:

3-1768 3/6/45, copy 7B-Pos

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SUBJECT OR TITLE

Exit Water Monitoring for Slug Jacket

Failure

TO

W. E. Jordon

FROM

J. J. O'Conner

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IN FIG. 1 are shown various decay curves. No. 1 is a normal decay curve for the reactor (operating room 2) in 1954. The other curves are for the reactor (operating room 2) in 1955. The curves show that the reactor is operating at a lower level than in 1954. This is due to the fact that the reactor is operating at a lower level than in 1954. The curves show that the reactor is operating at a lower level than in 1954. This is due to the fact that the reactor is operating at a lower level than in 1954.

The conclusion is that whereas a high degree of reliability is indicated by the results of the regular surveys, the decay curve is sufficiently sensitive to indicate that it can give a definite answer.

In general increased neutron readings in the water monitoring system which are less than 10% above normal are attributed to operating fluctuations. Readings more than 20% above normal result in a relative increase in activity in a single half meter will set off the alarm lights in the control room and indicate probability of a fuel failure unless otherwise explained; e.g. by a considerable change in this rate. In the case of readings between 10% and 20%, the probability is lower. When readings are observed the evidence of non-existence of a fuel failure can be decided upon within the tolerance of the decay curve although it often is inadvisable to do so.

It is desirable from an operational standpoint to obtain the maximum sensitivity possible out of the beta monitoring system. Readings or doubtful cases arise in which uncertainty exists whether a very slightly higher reading is due to normal operating fluctuations or to actual fuel failure. Furthermore, if a failure develops very slowly so as to require several days or even weeks to bring the activity appreciably, the possibility exists that the increase in activity may be overlooked. To assist in revealing the fluctuations a more sensitive and entirely independent spot checking technique is suggested as a supplementary test.

Reference: Memorandum W. E. Jordan to J. J. O'Connor, November 23, 1954
WATER MONITORING FOR FUEL FAILURE

From: J. J. O'Connor
To: W. E. Jordan
AEC RESEARCH AND DEVELOPMENT REPORT

40173

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operation; curve 3, for one day's operation; curve 4, for six month's operation. The usefulness of the curves applies principally to slugs which have been in the pipe for more than one day.

The value of the decay curve technique for slug failure detection depends upon the fact that the ratio of abnormal to normal activity consistently increases over the three and one half hour period. Operating fluctuations may increase the level of activity but a decay curve taken under such conditions would show a constant factor between it and the normal curve.

During a recent test at 105-B for comparing the beta and B-W monitoring systems, a solution of UH₂ was pumped into one of the tubes to simulate a slug failure. Details of the test are described in "105-B Comparison of Coating Failure Monitors", C. W. J. Wende to W. O. Simon, January 23, 1945; and "Simulated Jacket Failure Test," Final Report, IDB 70, by W. D. B. Spahn and M. H. Wilkening, February 9, 1945.

Water samples were collected during the test and a decay curve was taken by means of the water analysis G. M. tube assembly provided as standard equipment at 105-B. When a normal water activity curve was subtracted from this, the resulting curve fit the Becquerel Wheeler curve very closely for several hours (Fig. 2). The curves in (Fig. 1) were obtained simply by adding various B-W curves to the normal activity curve such that at two and one half minutes each B-W curve adds 16000 c/m or 20% to the normal curve. Curves representing higher or lower percentages addition may be easily calculated from those presented here. In each case percentages above normal as indicated by the Beckman are doubled at the corresponding time on the decay curve obtained by means of the G. M. water chamber.

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FIGURE 2
COMPARISON OF THE DECAY WITH
BORNSTADT-MILLER CURVE

Points are experimental
Line is B-M curve

2 seconds exposure

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