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PRODUCTION YIELD DATA AS A
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114

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June 14, 1961

PRODUCTION YIELD DATA AS A FUNCTION OF GRAPHITE TEMPERATURE

This report consists of eight curves, showing Plutonium-240 concentration and conversion ratio as a function of graphite temperature for various goal exposures. A range of 450 to 1000 degrees centigrade on the moderator temperature is used. Other parameters are as recommended by A. D. Vaughn and are consistent with the methods and constants used in present product accountability. No attempt has been made to state absolute conversion ratios or Pu-240 percentages. (These numbers may be obtained by use of the accountability tables generated by the SSA codes currently undergoing normalization by A. D. Vaughn and D. W. Hoba.)

The purpose of this report is to provide a basis for use in economic studies involving changes in graphite temperatures. No conclusions as to operating changes should be inferred from these curves since the combined economics of any change in graphite temperatures include significant and complex factors in addition to conversion ratio and product quality consideration. Studies are now being done on the economic implication of raising graphite temperatures by using less helium and using nitrogen in place of CO₂ - these studies will make use of the values presented in this report.

1. On curve 1 Pu-240 concentration for OIIE, OIIN, CIIE and CIIN are drawn and on curve 2 KIIIN and KIIIE. The uncertainty on grouping of the above types of fuel element and exposure is $\approx 2.5\%$ of full scale, or at 6 per cent Pu-240 concentration an error of less than 0.25%, which is of the same order as the uncertainties

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in the calculations. These curves are presented for the slope only and are independent of the exposure. To use these curves, one must first determine a value within this range and then calculate the absolute value at a different temperature, same exposure, by multiplying this value by the appropriate number on the ordinate.

2. Curves 3 through 8 show conversion ratio for three types of reactors and two types of material. They are set up as parametric curves to show the exposure variation.

D. G. Montague

Pile Physics Unit
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Research and Engineering Section

DG Montague:gs

The relative Pt-240 concentration as a function of graphite temperature for OLIN, OLIE, CILS, CIEE (normalized to 460°C).

GRAPHITE TEMPERATURE IN DEGREES CENTIGRADE

The relative Pu-240 concentration as a function
of graphite temperature for KIIIB and KIIIN
(Normalized to 500°C)

RATIO OF Pu-240 CONCENTRATION TO THE BASE AT 500°C

GRAPHITE TEMPERATURE IN DEGREES CENTIGRADE

1

CURVE 3

HW-69934
Page 5

The relative conversion ratio
as a function of Graphite temperature
and goal exposure for CIIN.
(Normalized to 460°C)

PER CENT CONVERSION RATIO TO BASE AT 460°C

GRAPHITE TEMPERATURE IN DEGREES CENTIGRADE

CURVE 1

CURVE 5

The relative conversion ratio as
a function of graphite temperature and
goal exposure for KIIE.
(Normalized to 500°C)

PER CENT CONVERSION RATIO TO BASE AT 500°C

GRAPHITE TEMPERATURE IN DEGREES CENTIGRADE

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