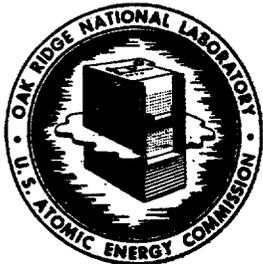


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55-8-93

DATE: August 17, 1955
SUBJECT: Fission Product Discharge Into
the ART Off-Gas Stack
TO: T.H.J. Burnett
FROM: C. S. Burtnette and Wm. B. Cottrell

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TO T.H.J. Burnett
LOCATION

DATE August 17, 1955

ANSWERING LETTER DATE

ATTENTION

COPY TO W. H. Jordan
A. P. Fraas

SUBJECT Fission Product Discharge Into
the ART Off-Gas Stack

The following tabulation summarizes the current estimate of the quantity of several of the Xe and Kr fission product isotopes which would be discharged to the ART stack. The isotopes not reported herein are obviously of less significance. The data was reviewed at this time as an evaluation of the performance of the off-gas system which has recently been specified in some detail. Another tabulation will be made at such time as the design of the Xenon removal system is frozen, and better experimental values of the holdup of Kr and Xe in the charcoal adsorber bed are obtained. Since the highest discharge rate of Kr^{88} is expected to be less than 1.6×10^{-4} vs 1.0×10^{-3} specified in the hazard report (ORNL-1835), normal discharge of activity should well be below the maximum permissible concentration for continuous exposure.

The reactor off-gas charcoal adsorber is presently designed to assure a minimum holdup time of, 48 hr for Kr, 605 hr for Xe, and with a gas flow in the off-gas system of 5000 liters/day. If full credit is taken for the safety factor, the design holdup times in the charcoal would be; 114 hr for Kr, 1140 hr for Xe. When additional allowance is made for the void volume (4.2 hr holdup) and off-gas line (0.23 hr holdup), the following decay times from pump swirl chamber to charcoal bed exit are established.

	<u>Minimum*</u>	<u>Design</u>
Kr	52.43 hr	118.43 hr
Xe	609.43 hr	1144.43 hr

These holdup times will result in the following activity discharge into the stack.

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Isotope	Minimum* Holdup Time		Design Holdup Time	
	Atoms/sec in Discharge	Curies/sec in Discharge	Atoms/sec in Discharge	Curies/sec in Discharge
Xe ¹³³	25.5×10^{14}	0.104	26.45×10^{12}	.001
Xe ¹³⁵	66.25×10^{-5}	negligible	negligible	negligible
Xe ¹³⁷	~0	negligible	negligible	negligible
Xe ¹³⁸	~0	negligible	negligible	negligible
Xe ¹³⁹	~0	negligible	negligible	negligible
Xe ¹⁴⁰	~0	negligible	negligible	negligible
Kr ⁸³	2.5×10^7	6.8×10^{-8}	negligible	negligible
Kr ^{85m}	3.66×10^{12}	4.36×10^{-3}	10.11×10^7	1.2×10^{-7}
Kr ⁸⁵	$\sim 3.42 \times 10^{15}$	$\sim 1.97 \times 10^{-4}$	$\sim 3.42 \times 10^{-15}$	2×10^{-4}
Kr ⁸⁷	2.39×10^4	9.55×10^{-11}	negligible	negligible
Kr ⁸⁸	8.875×10^{10}	1.6×10^{-4}	6.12×10^3	1.2×10^{-11}
Kr ⁸⁹	$< 2 \times 10^4$	$< 10^{-11}$	negligible	negligible
Kr ⁹⁰	$< 2 \times 10^4$	$< 10^{-11}$	negligible	negligible
Kr ⁹¹	$< 2 \times 10^4$	$< 10^{-11}$	negligible	negligible

* If charcoal bed were to effect only a 48 hr holdup of Kr.

C. S. Burtnette

Wm. B. Cottrell