Contract No:

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HEALTH PHYSICS SECTION

^{131}IODINE IN 221-H CANYON PROCESS AIR STREAMS

Introduction

As you requested, we summarized information derived 2/71 and 3/71 from several hundred air samples taken to determine the relative amounts of iodine in the 221-H canyon process air streams.

Summary

During the sampling period:

- Essentially no iodine was released to the process air streams from operations in the 221-H warm canyon.
- The hot canyon 7.3 scrubber-filter system was found to have average decontamination factor of four for influent airborne iodine.
- A significant amount (6%) of the total airborne iodine evolved in hot canyon vessels leaked out into the unfiltered canyon air stream.

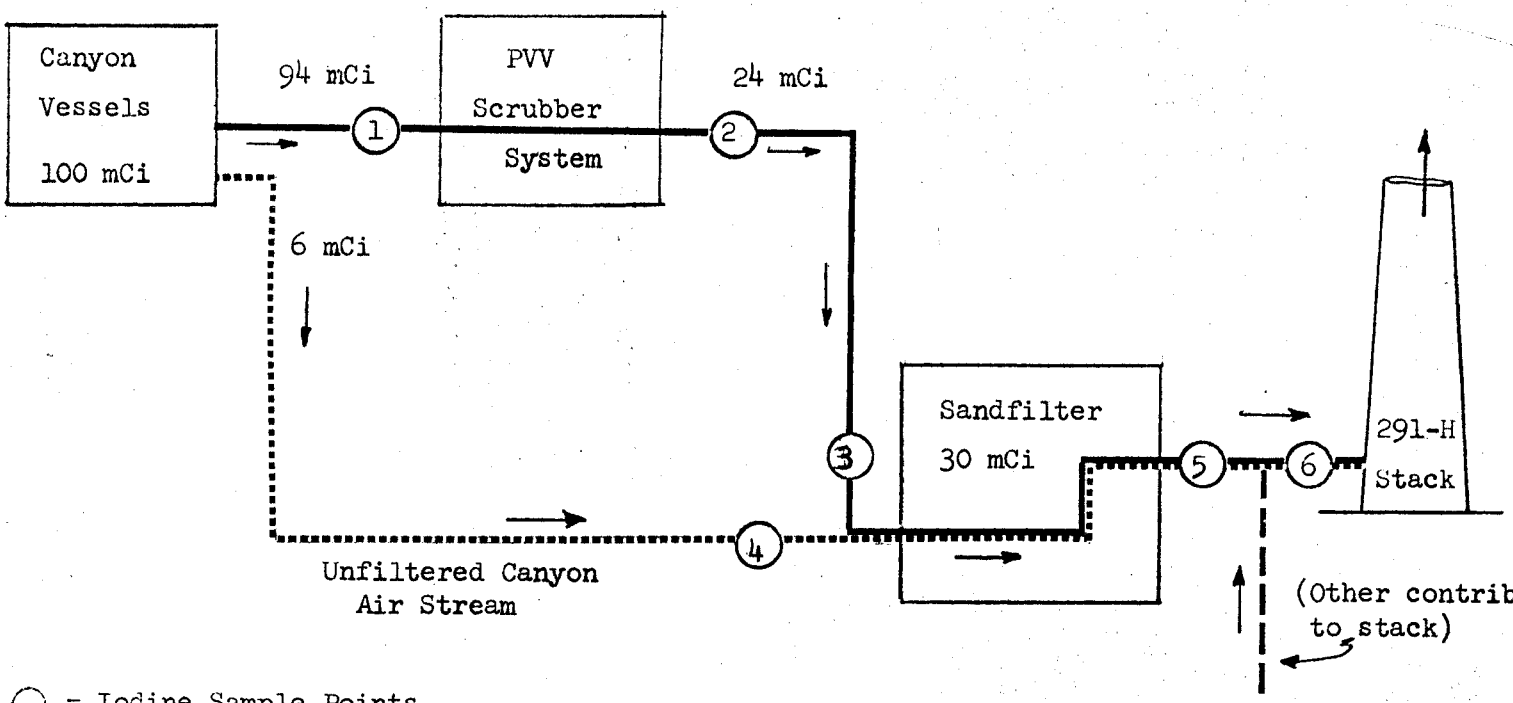
Discussion

An intensified 221-H process air sampling program was conducted in February and March 1971 to determine the source and cause of the high rate of iodine release to the environment via the 291-H stack. (The release rate, at times, reached 100 mCi/hr.) Filter paper (to collect particulate activity) and charcoal canisters (to collect radioiodine) were used to obtain samples of air as follows:

- Before and after the 5.6 warm canyon dehumidifier-filter system.
- Before and after the hot canyon 7.3 filter-scrubber system.
- The process vessel vent system (PVV) just before the 294-H sandfilter.
- The combined warm and hot canyon unfiltered canyon air before the sandfilter.
- The sandfilter composite effluent.
- The building exhaust to the environment via the 291-H stack.

The relative amounts of airborne iodine detected in canyon process air streams as indicated by collected samples can best be shown diagramatically as follows:

IODINE IN HOT CANYON PROCESS AIR STREAMS



◯ = Iodine Sample Points

① = Located in Section 7, HGVC, prior to scrubber system
② = Located in Section 7, HGVC, after scrubber system
③ = Located in 292-H, PVV prior to 294-H sandfilter
④ = Located in 292-H, UFCA prior to 294-H sandfilter
⑤ = Located in 292-H, Sandfilter discharge
⑥ = Located in 292-H, Stack (291-H) discharge

(For each 100 mCi of iodine evolved in canyon vessels, 6 mCi leaks directly to the unfiltered canyon air stream, 70 mCi is removed by the scrubber and a total of 30 mCi reaches the sandfilter. After short residence time in the sandfilter (several hours), essentially all the iodine is released to the environment via the 291-H 200' stack. This study did not deal with the amount of iodine retained in liquid wastes throughout processing.)

Attachment 1 summarizes the bases for interpreting iodine release data calculated in Attachment 2.

Please let us know if we can be of further assistance.

ATTACHMENT #1

SAMPLE BASES - ^{131}IODINE IN 221-H CANYON PROCESS AIR STREAMS

• Process Vessel Vent Air Flow Through Warm Canyon 5.7 Dehumidifier - Filter System	2,300 cfm
Process Vessel Vent Filter Sample Rate	0.5 cfm
Process Vessel Vent Filter Sample Points	221-H Warm Gang Valve Corridor - Section 5
• Process Vessel Vent Air Flow Through Hot Canyon 7.3 Scrubber-Filter System	2,300 cfm
Process Vessel Vent Scrubber Sample Rate	0.5 cfm
Process Vessel Vent Scrubber Sample Points	221-H Hot Gang Valve Corridor - Section 7
• Process Vessel Vent (PVV) Total Air Flow to Sandfilter (From Warm and Hot Canyon)	4,600 cfm
Process Vessel Vent Sample Rate	0.5 cfm
Process Vessel Vent Sample Point	292-H
• Unfiltered Canyon Air (UFCA) Flow to Sandfilter	114,000 cfm
Unfiltered Canyon Air Sample Rate	2 cfm
Unfiltered Canyon Air Sample Point	292-H
• Iodine Sample Collection Media	MSA charcoal canister
• Iodine Sample Counting Method	Single channel PHA centered on ^{131}I peak, 221-H; three minute count.

SAMPLE RESULTS -

^{131}IODINE IN 221-H CANYON PROCESS AIR STREAMS

1971 Iodine Sample Date	Unfiltered Canyon Air (UFCA) Iodine Release Rate X10^4 c/m/min *	Process Vessel Vent (PVV) To Sand Filter Iodine Release Rate X10^4 c/m/min *	UFCA + PVV Iodine Release Rate X10^4 c/m/min.	% ^{131}I Released to Sandfilter Due to Activity in UFCA. (Rest from scrubber effluent.) **	% Total ^{131}I That By-Passes PVV Scrubber By Leakage From Vessels to UFCA***
2/25	38.0	204.1	242.1	15.7	4.4
2/26	26.0	160.4	186.4	14.0	3.9
3/3	14.2	19.0	33.2	42.8	15.7
3/4	3.3	59.0	62.3	5.3	1.4
3/5	2.7	31.6	34.3	7.9	2.1
3/10	8.6	15.7	24.3	35.4	12.1
3/11	2.6	23.4	26.0	10.0	2.7
3/12	2.5	24.2	26.7	9.4	2.5
3/15	2.6	4.9	7.5	34.7	11.7
3/16	3.0	16.8	19.8	15.2	4.3
3/17	3.1	25.9	29.0	10.7	2.9
3/18	1.5	20.7	22.2	6.8	1.7
3/19	2.0	7.9	9.9	20.2	6.1
3/20	1.3	3.3	4.6	28.3	9.3
3/22	2.1	6.6	8.7	24.1	7.4
				Avg. 18.7%	Avg. 5.9%

* Example: ^{131}I c/m/min. = $\left[\frac{\text{c/m on charcoal canister}}{\text{ft}^3 \text{ sampled}}\right]$ [stream flow rate, cfm]

** % Iodine to Sandfilter from UFCA = $\left[\frac{\text{UFCA}}{\text{PVV + UFCA}}\right]$ [100]

*** Assumes a scrubber DF (decontamination factor) of 4. Total iodine is that released to the scrubber plus that leaked to the UFCA air stream.

% by-pass = $\left[\frac{\text{UFCA}}{(\text{PVV})\ (4) + \text{UFCA}}\right]$ [100]

ATTACHMENT #2