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Results from NDA Measurement of the 296-P-34 RMCS HEPA Filters

Prepared for the U.S. Department of Energy

FLUOR DANIEL HANFORD, INC.

Richland, Washington

Hanford Management and Integration Contractor for the
U.S. Department of Energy under Contract DE-AC06-96RL13200

Approved for Public Release; Further Dissemination Unlimited

Results from NDA Measurement of the 296-P-34 RMCS HEPA Filters

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1.0 INTRODUCTION

This data acquisition is specific to the rotary mode core sampler (RMCS) 'C' exhauster, or stack 296-P-34, high-efficiency particulate air (HEPA) filters. This data acquisition supports the National Emission Standards for Hazardous Air Pollutants (NESHAP), 40 CFR 61, Subpart H, compliance assessment HNF-1974, *Hanford Site Radionuclide National Emission Standards for Hazardous Air Pollutants Stack Source Assessment*. Calibration of the data collection instrumentation was conducted as described in Section 6.1, and in-field data collection took place on April 1, 1999.

Sampling was conducted in accordance with general safety rules in *Safety Responsibilities* (HNF-PRO-074). Industrial hazards were not expected and were not encountered. All radiation control technicians (RPTs) were qualified to operate the survey meters. RPT qualifications are verifiable. Exempt personnel operated the instrumentation for data collection. Waste Management Federal Services of Hanford, Inc. (WMH) and Waste Management Federal Services, Inc., Northwest Operations (WMNW) engineers were current in Radiation Worker II training and any other facility-specific training needed to access the HEPA filter area(s). All test personnel were cognizant of any applicable radiation work permits (RWPs).

Quality assurance is addressed in HNF-0528-3, *NESHAP Quality Assurance Project Plan for Radioactive Air Emissions Data*.

2.0 OBJECTIVE

The objective of this data acquisition was to measure and identify the gamma emissions from the 296-P-34 exhauster HEPA filters. Data acquisition was accomplished by nondestructive assay (NDA), using a portable gamma spectrometer calibrated to the exhauster HEPA filter geometry. The NDA technique that was used is referenced in 40 CFR 61 Appendix B Method 114 and also addressed in HNF-EP-0528.

3.0 SCOPE

This data acquisition applies only to the 296-P-34 stack HEPA filters for the measurement, identification, and quantification of gamma radiation isotopes that could be emitted. Additionally, standard field survey meters were used to assess the gross gamma radiation field.

4.0 DESCRIPTION OF TEST

The portable gamma spectrometer was calibrated, in a low background area, to the 296-P-34 exhauster's HEPA filter geometry. Background measurements were taken at the exhauster location. Gamma radiation emitted from the 296-P-34 HEPA filters was measured directly using a portable gamma spectrometer [high purity germanium (HPGe) detector, or equivalent]. Measurement locations in the field were specific, duplicating those used to calibrate the spectrometer.

5.0 EXPECTED RESULTS

Several gamma spectra were collected. The data can be used to estimate the potential unabated annual release. The source term challenging the 296-P-34 HEPA filters contains gamma emitting Cs-137, and alpha and beta emitters, conservatively assumed to be Pu-239/240, Am-241, and Sr-90. The Cs-137 is measured directly with the gamma spectrometer. The alpha and beta emitters can be estimated by ratio to the Cs-137 activity.

6.0 SET UP AND TEST STEPS

The HPGe detector and analyzer were calibrated as follows for the 296-P-34 HEPA filters. The 296-P-34 exhaustor has a prefilter followed by two HEPA filters in series before exhausting to the atmosphere.

The detector was cooled with liquid nitrogen at least 1 hour before calibration. At least two peaks are required to complete an energy calibration for the acquisition of a spectrum. Cs-137 and Co-60 were used as the two standards for calibration.

To calibrate the detector to the geometry of the exhaustor filter housing in the field, a duplicate mockup was constructed in a low background area. A National Institute of Standards and Technology traceable source(s) ($\sim 1 \mu\text{Ci}$) was placed into the center of the 'clean' HEPA filter. A collimated lead shield was placed around the detector probe, leaving the head end unshielded, and the head end of the detector was placed up against the center of the side of the HEPA filter housing. The calibration source was counted from 1 to 5 minutes. The gamma peaks were identified and the net integral, or activity under the peak, was calculated (accomplished by the detector's analysis software).

Data was collected from the 296-P-34 HEPA and pre filters as follows.

- A background reading was taken with a CP instrument or high-range survey meter or μR meter. The readings were recorded.
- A dose rate measurement was taken (CP) in the center of the side of each HEPA filter and prefilter. The readings were recorded.
- Three, 1 to 5 minute measurements were taken using the HPGe detector, with the same shielding configuration and in the same locations as was used in the mockup calibration. Each analysis file was saved and the data recorded. The count time might vary depending on the background radiation and its effect on the instrument's '% dead time'. To preclude statistical inaccuracy, the dead time should not exceed 60 %. The dead time was recorded.
- The filter service lifetime was recorded on the data sheet. The activity measured should be annualized to represent the most accurate amount of radioactivity during a year of filter operation.

7.0 RESULTS

Results of the data acquisition are included in Table 1.

8.0 REFERENCES

HNF-0528-3, *NESHAP Quality Assurance Project Plan for Radioactive Air Emissions Data*, latest revision, Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-1974, *Hanford Site Radionuclide National Emission Standard for Hazardous Air Pollutants Stack Source Assessment*, February 1998, Fluor Daniel Hanford, Inc., Richland, Washington.

HNF-PRO-074, *Safety Responsibilities*.

Table 1. Results for NDA on 296-P-34 HEPA Filters.

Measurement	Measurement Date	Count Time	Net Integral of Cs-137 peak	Cs-137 Quantity	Cs-137 Quantity
		(seconds)	(counts per Minute)	(uCi)	(Ci)
1ST STAGE HEPA (878 hours service life)					
Calibration #1 (Recessed detector)		600.00	284.10	0.89	
Calibration #2 (Recessed detector)		60.00	268.00	0.89	
Calibration #3 (Recessed detector)		60.00	286.00	0.89	
Calibration #4 (Recessed detector)		60.00	295.00	0.89	
Calibration #5 (Recessed detector)		60.00	292.00	0.89	
Calibration #6 (Recessed detector)		60.00	287.00	0.89	
Calibration Average			285.35		
Field Reading #1	04/01/99	60	90,965.00	282.76	
Field Reading #2	04/01/99	60	90,044.00	279.90	
Field Average (in uCi)				281.33	
Field Average (in Ci)					2.81E-04
PREFILTER (878 hours service life)					
Calibration #1 (Thru handle)		600.00	550.90	0.89	
Calibration #2 (Thru handle)		600.00	543.00	0.89	
Calibration Average			546.95		
Field Reading #3	04/01/99	60.00	82,929.00	134.49	
Field Reading #4	04/01/99	60.00	82,129.00	133.19	
Field Average (in uCi)				133.84	
Field Average (in Ci)					1.34E-04
2ND STAGE HEPA (878 hours service life)					
Calibration #1 (Flush)		600.00	613.50	0.89	
Calibration #2 (Flush)		600.00	631.30	0.89	
Calibration Average			622.40		
Field Reading #5	04/01/99	60	10427	14.860	
Field Average (in Ci)					1.49E-05
TOTAL ACTIVITY (all filters)					4.30E-04

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