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SUMMARY OF AIR-CLEANING ACTIVITIES

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ABSTRACT

The air-cleaning policy of the Lawrence Radiation Laboratory includes studies for improvement of methods and equipment. Among new developments and applications are sampling equipment and scrubbing or decontamination assemblies; further investigations are needed.

SUMMARY OF AIR-CLEANING ACTIVITIES

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General Statement

Our air cleaning policy is directed towards (a) improving the quality of air-cleaning equipment and practices, (b) reducing the contamination of air wherever processes and established routines permit, and (c) reducing the quantity of air exposed to contamination. The maintenance and enhancement of air-sampling equipment, methods, and data processing (including the interpretive reporting phase) continues as an essential portion of our air-cleaning program.

Improvements in Methods

1. Lawrence Radiation Laboratory, Berkeley, has substantially abandoned the use of fume-hood exhaust filters. Over many years the amounts of radioisotopes worked up in hoods had been decreased (as the use of total enclosures increased) to the point where hood filters were functioning as rather poor stack samplers. When adequate stack-sampling equipment became available the filters were abandoned. The sampling frequency is now weekly, and evaluation criteria shall be according to 10 CFR 20.

2. Heavy-element slug processing became 100% functional under our so-called "low leak" air-handling system. As a direct consequence, the stack samples for the first time were free of any detectable alpha activity.

3. The so-called closed dissolver prototype, referred to at the 1957 seminar, has since been used on multicurie runs with quantitative capture of fission gases. No operating difficulties are experienced, and in the collection process the gases are automatically packaged and ready for burial.

Development of Air-Handling Equipment

1. A hood-exhaust sampling assembly (Figs. 1, 2) has been devised, tested, and installed. About 3 months' data are at hand. Replicate samples show about a 70% agreement with one another on samples of 1 week's duration. Relatively minor mechanical problems awaiting solution are (a) pump shutdown and (b) rubber deterioration, in a few instances, on the sampler head assembly.

2. A general-purpose refrigerated scrubber and air-conditioning assembly for treating either recirculated or once-through process gases at a maximum rate of 18 cfm (Fig. 3) has been developed through a design study based on 8 years' experience at two sites. Several of these units have given successful service in high-level general radiochemistry. Experience shows that, through operator negligence, the Venturi throat may become plugged with crystalline deposits. A method is needed for removing these crystals from "hot" apparatus.

Exploratory data on aerosol and gas-removal efficiency during a recent high-level run indicated from 40% to 96% per pass, depending upon the isotope measured. This variation was not unexpected because of the wide range of solubilities, vapor pressures, etc., in a heterogeneous mixture of fission products and transplutonic compounds.

3. An air-sample alpha and beta-gamma counter with automatic-printout--for 4×9-inch filter paper samples--has been devised and substantially debugged, and is turning out routine data (Fig. 4). It can handle 85 samples per loading. A more detailed paper is in manuscript (M. D. Thaxter and T. C. Taussig, Automatic Filter Paper Reader, UCRL-8701, September 1959).

4. Modifications were made on a fail-safe self-checking circuit for box exhaust manifolds to employ commercially available components. We believe we now have a dependable assembly based on more than 2 years' use and development.

5. A prototype high-speed centrifugal evaporator or so-called "spin-dry" equipment shows promise; early runs indicate decontamination factors greater than 10^3. It is expected that development will proceed to both macro and semimicro hardware.

6. Safe equipment and methods for taking 15-ml process gas samples in 1/4-mil Mylar bags were developed and employed (Fig. 5). The technique permits detection of weak beta and alpha radiations and performance of pulse-height analyses on gamma emitters.

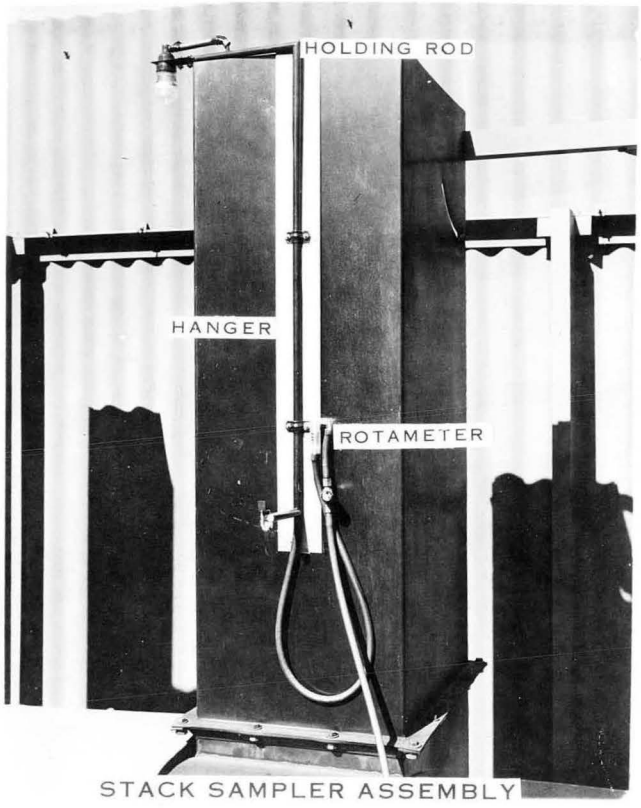
Investigations Needed or in Progress on Methods and Equipment

1. Radioactivity is found in the air near operating accelerators. A portion is airborne. The extent, nature, method of production, and evaluation of hazard (if any) of this airborne fraction is under investigation. At least a portion of the activity is collectable on dust filters and emits beta particles. Half lives ranging from $7\frac{1}{2}$ seconds to 40 hours have been observed.

2. Revelation of mechanical defects in high-efficiency filters (CWS 6 and AEC type) by visual inspection points up a need for technique and equipment to evaluate filter efficiency upon receipt. This is particularly important since only a very small part of the filter is visible to inspection.

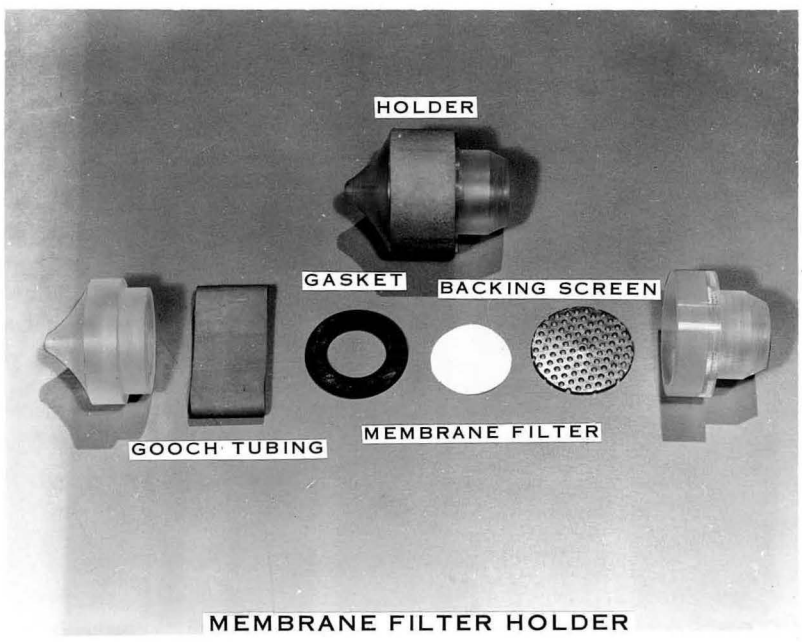
3. Prompt detection in air of alpha emitters other than radon-thoron daughters is badly needed, and we continue to plead for research and development leading to a dependable and economical method.

4. Methods for safe, rapid evaporation of radioactive solutions, in addition to the "spin-dry" technique already mentioned, are the subjects of studies planned at this Laboratory.



STACK SAMPLER ASSEMBLY

Fig. 1



MEMBRANE FILTER HOLDER

Fig. 2

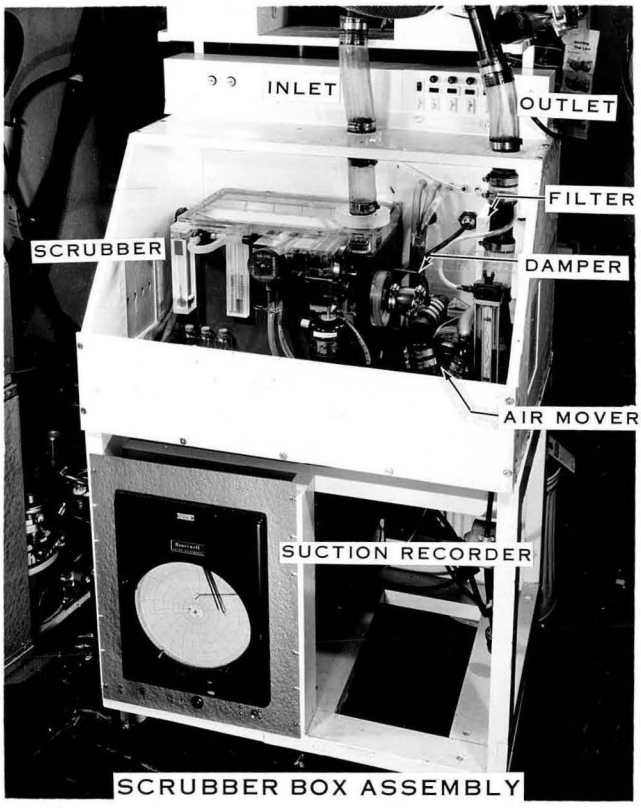

INLET
OUTLET
FILTER
SCRUBBER
DAMPER
AIR MOVER
SUCTION RECORDER
SCRUBBER BOX ASSEMBLY

Fig. 3

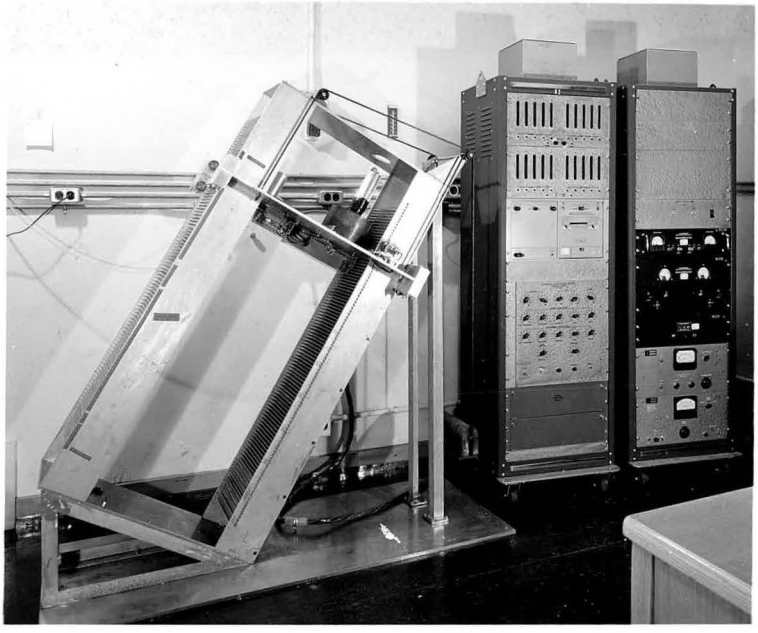
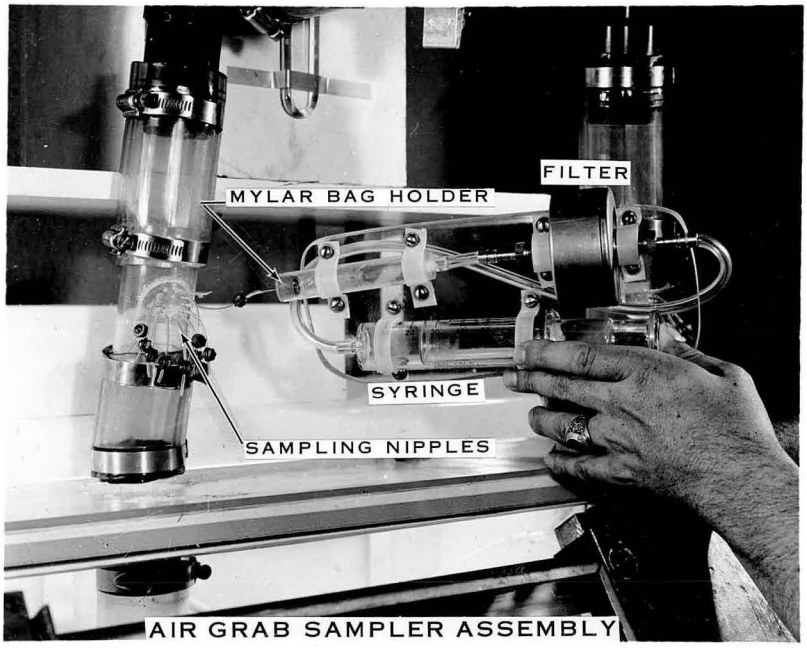


Fig. 4



AIR GRAB SAMPLER ASSEMBLY

Fig. 5