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AN ALPHA-PARTICLE DETECTOR
SYSTEM FOR MONITORING PERSONNEL

William H. Tyree

Thomas H. Bell

DOW CHEMICAL U.S.A.
ROCKY FLATS DIVISION
P. O. BOX 888
GOLDEN, COLORADO 80401

U. S. ATOMIC ENERGY COMMISSION
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Product and Health Physics Research
ELECTRONICS

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DOW CHEMICAL U.S.A.
ROCKY FLATS DIVISION
P. O. BOX 888
GOLDEN, COLORADO 80401

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AN ALPHA-PARTICLE DETECTOR SYSTEM FOR MONITORING PERSONNEL

William H. Tyree and Thomas H. Bell

Abstract. An improved alpha-particle detector system has been designed for monitoring personnel working in areas where radioactive materials are handled. The unit operates effectively to monitor clothing and booties worn by personnel, as well as body areas. No manipulation of controls is required for operator use.

Incorporating two counter modules, one as a hand monitor and the other as a foot monitor, the system provides visual and aural readout for pulses received from air-proportional detectors. As designed, the unit does not require extra housing for electronics and batteries. Thus, a cost savings has been realized over earlier models of about \$400. The system also operates more efficiently and with less maintenance.

INTRODUCTION

A new design of an alpha-particle detector system has been completed. Its primary use is for monitoring personnel working in buildings where radioactive materials are processed. The unit also effectively monitors clothing and booties worn by workers.

In addition to easier maintenance and operation, the new unit is less expensive than earlier designed hand and foot counters.¹ Thus a cost savings, as well as improved efficiency, has been realized.

NEW COUNTING MODULE

The new detection system uses two separate modules (Hand and Foot) to provide visual and aural readout for pulses received from two air-proportional detectors. Operating bias voltage for both hand and foot detectors is provided by a

single high voltage battery set to produce 1860 volts.

Each of the modules is supplied with plug-in battery packs. The quiescent battery-current drain amounts to 150 microamperes. The average battery life for each module provides approximately 16 weeks of normal counting operation.

Incorporating the Hand and Foot Modules which are mounted on a two-wheeled stand, the unit holds the batteries and air-proportional detectors as shown in Figures 1 and 2.

The modules are set to provide a full scale count for the hand detector of 500 counts per minute and 3000 counts per minute for the foot detector. A block diagram shows the interconnection of the batteries providing power to the entire system. (See Figure 3.)

FIGURE 1. Top View of Counting Module Combination.

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¹William H. Tyree. *A Dual Range Alpha Counter for Health Physics Operations*. RFP-1620. Rocky Flats Division, Dow Chemical U.S.A., Golden, Colorado. February 25, 1972.

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FIGURE 2. Hand and Foot Counter, Whole Stand Mounting.

The complete alpha-particle hand and foot detector system costs are shown in Table I. The cost of the new system represents a savings of \$400 over the earlier types of hand and foot detection systems.

CONCLUSIONS

A small mobile combination alpha-particle hand and foot detector system costing \$180 has been developed.

The unit provides separate readout for two alpha-particle detectors of 500 counts per minute for hand monitoring and 3000 counts per minute for bootic monitoring.

The system does not require any control manipulation by the operator to obtain normal counting module readout.

TABLE I. Cost Data for Detector Components.

2	Counter Module (estimated cost)	\$ 74.00
1	Hand Air-Proportional Detector	10.00
1	Foot Air-Proportional Detector	25.00
1	Plug-in Battery (2 nickel-cadmium D cells)	8.00
1	High Voltage Battery, Y-1569)	45.00
1	Mounting Stand	25.00
Complete System Total (each)		\$187.00

FIGURE 3. Block Diagram of Combination Hand and Foot Counter.