U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

Report No. 70-572/80-02

Docket No. 70-572

License No. SNM-567 Priority 1 Category B

Licensee: Monsanto Research Corporation
Dayton Laboratory
1515 Nicholas Road
Dayton, OH 45407

Type of License: Manufacturer and Distributor

Type of Inspection: Unannounced Routine

Dates of Inspection: March 19 and 20, 1980
April 14-16, 1980

Inspectors: W. J. Slawinski W.J. Slawinski 5/19/80

D. J. Sreniawski D.J. Sreniawski 5/19/80

Inspection Summary

Inspection on March 19-29, 1980 and April 14-16, 1980 (Report 70-572/80-02)
Areas Inspected: Routine, unannounced inspection of radiation protection practices at a nuclear source production facility included: response to I&E Bulletin No. 79-19; organization; training; internal audits; facilities; equipment; transfer of material; external radiation protection; internal radiation protection; posting; access control; materials control; surveys; notifications and reports; radioactive effluent controls; sealed sources; quality assurance; stack monitoring, confirmatory measurements; and independent inspection effort. The inspection involved 41 inspector-hours on-site by two NRC inspectors.
Results: There were no items of noncompliance or deviations identified.

DETAILS

1. Persons Contacted

*R. L. Schimmel, Manager, Engineered Products Dept.
*R. R. Taylor, Manager of Operations, Engineered Products Dept.
*S. D. Hoadley, Health Physicist and Radiation Protection Officer
H. L. Coleman, Manager of Manufacturing
D. Kiehne, Inventory Clerk
C. A. Garthwait, Chemist
E. A. Steinmetz, Internal Auditor
D. E. Sevy, Technical Specialist
L. Walker, Technical Trainee

*Denotes those who attended the exit interview.

2. License Action on Previous Inspection Findings

(Closed) Noncompliance (70-572/79-01): Failure to limit extremity exposure of one radiation worker to Part 20.101. The inspector found that procedures for pre-irradiation surveys of work places, and lower in-house action levels for personnel exposures were being followed.

(Closed) Noncompliance (70-572/79-01): Failure to record action taken to prevent recurrence after an individual's intake of radioactive material in excess of the equivalent of 40 MPC-hours. The licensee lists assignments of MPC-hours to individuals in their "Health Physics Log." This log includes the "Action to Prevent Recurrence." (Attachment 1, Blank Health Physics Log Form)

(Closed) Item of Concern (70-752/79-02): Concern for management control to assure adequate shielding of radiation levels during shipments of neutron sealed sources. The inspector found new procedures which require a second party inspector to review the adequacy of shipping container and shipment survey and sign-off on the survey record form NPD-4, if he approves of the shipment.

3. Organization

The licensee's organizational structure remains as described in the Licensee's Specifications Part 5.2 (March 19 8).

S. J. Dearth (formerly S. J. Mougey) of Nuclear Manufacturing Support no longer performs the inventory of Special Nuclear Material and Byproduct Licensed Material. This function has been assumed by D. Kiehne, Inventory Clerk.

No items of noncompliance or deviations were noted.

4. Radiation Protection Procedures

License No. SNM-567 was amended in its entirety on May 25, 1978, and partially amended on February 27, 1979. The major changes were an increase in the possession limit for americium-241 and a change in frequency for the formal internal audit of the licensed program from quarterly to annually. The program was as described in the License Specifications and the Operations Manual submitted with the May 25, 1978, amendment.

No items of noncompliance or deviations were identified.

5. Licensee's Internal Audit

The inspectors reviewed the reports of the licensee's Biannual Health Physics audits conducted by E. A. Steinmetz, the quality control officer, on July 24, 1979, and December 12, 1979. Included in the items reviewed were the air sampling program, film badge records, training, smear survey, bioassay, direct radiation surveys, procedures, license requirements, and general record review.

The Safety Committee Meeting minutes were reviewed by the NRC inspectors for the following days: 1980 - 1/18, 2/1, 2/15, 3/13, 3/20, 3/27, 4/4 1979 - 5/4, 5/25, 6/8, 6/21, 6/24, 7/27, 8/10, 8/24, 9/13, 9/20, 10/10, 10/19, 11/15, 12/14 and 12/22.

The licensee also maintains a "Health Physics Log" of any noteworthy events. The inspectors selected the following entries from the log for review.

Date

5/17/79 - Californium-252 sealed source shipped to Westinghouse where the source cap unscrewed from the outer body. R. R. Taylor (MRC) determined there were no 10 CFR Part 21 implications.

6/22/79 - Two Am-241 gamma window sources received at Ohmart Corporation taped together. Ohmart Corporation personnel could not remove tape because their procedures do not allow hands on sources.

10/30-10/31/79 - Air sample in old room exhaust duct was 233 MPC-hrs (Pu-238). Occurred when ventilation reversed during removal of old ducts. Air sample in room showed no levels above normal which supported finding that activity was contained in the duct and was not released.

9/19/79 - Inadvertant exposure to film badges (2) when they were not returned to rack but left on clothing in work area

containing 16Ci AmBE neutron source. Exposures were 40 and 80 mrem for the two week use period. Individuals reminded to return badges to rack for storage.

11/15/79 -Results of investigation of shipment to Diablo Canyon Power Plant of 3.5Ci Am-241-Be neutron source with radiation levels in excess of 200 mrem/hr at the bottom surface of the shipping container.

12/16/79 -Gloveline exhaust system failed, due to failed bearing in fan motor. System shutdown in the designed sequence. Air samples showed no release of activity. Licensee intends to install back-up motor with automatic changeover.

4/3/80 - Two persons assigned 12.1 MPC-hr (Am-241) exposure after air samples showed 1.5×10^{-10} uCi/ml when tape seal on duct filling failed. New, improved seal material now applied to fittings.

All problems were resolved, none were items of noncompliance.

6. Training

New employees who work in the process area are required by License Specification 5.7.1 to receive a two month apprenticeship. As they are trained they are "work certified" [Attachment 2, Work Certification - Nuclear Form Rev. 2 (2-79)]. An interview of the most recent hire showed his awareness of the process.

Retraining sessions are required to be held at least quarterly by License Specification 5.7.2. Review of the retraining records showed the following sessions were held:

Date	Topic
4/22/79	Hand exposures, radiation survey requirements.
6/21/79	Operation of new survey meters, review of exposure limits, report of last NRC inspection results.
9/20/79	Topic not recorded by NRC inspectors.
12/22/79	Topic not recorded by NRC inspectors.
3/27/80	I & E Bulletin No. 79-19 and new procedures, NPD-STD-032 for shipments and NPD-STD-002 for Waste Storage and Disposal.

No items of noncompliance or deviations were identified.

7. Facilities

The nuclear process area is located in the north wing of Building 2 with the north four rooms, Rooms No. 6, 7, 8, and 9, being used for processing material and Rooms No. 3, 4, 10, 11, 13, and 14 compromising the support area. These latter rooms involve facilities for counting and leak testing equipment, certain machine operations, QA storage, packaging and receiving of material. Diagrams and descriptions of the facility are contained in Section 7.3 of the licensee operations manual.

The licensee controls access to restricted areas by using an electronic interlock system for entrance into the control and process areas and by enclosing the outside of these areas with a chain-link type fence. The periphery of that part of the roof which houses the licensee's stack exhaust system is enclosed with a barbed wire fence. Access into any of the licensee's restricted areas is permitted for authorized persons only. The process area is padlocked during off-shift areas.

Designs have been completed and funds appropriated for construction of an underground bunker for storage of radioactive material. The design provides for tornado-proof construction.

A portion of the emergency shower facility is being converted to an in-plant laundry for protective clothing used in the process area.

No items of noncompliance or deviations were noted.

8. Equipment

The licensee utilizes glove boxes, remote boxes, hoods, hot cells and a canyon in the Process Area for the production and handling of radioactive encapsulated and unencapsulated material in a manner and within those systems which are described in Section 10 of the Licensee's Operation Manual.

The final filter bank, exhaust fans, and portions of the duct system servicing the room exhaust system have been replaced. The system provides for back-up exhaust so that if one unit fails the second fan switches on automatically. Return to power after a total power loss is sequential so that the glove boxes are either at static or negative pressure. Provisions were included for a "bag-out" filter change system.

Portable survey instruments are calibrated quarterly; records show March 3, 1980 to be the most recent date of calibration.

No items of noncompliance or deviations were identified.

9. Transfer of Materials

The licensee made approximately 285 shipments of licensed material for the period May 11, 1979, to April 9, 1980. Records of three shipments were reviewed after being chosen at random from the "Outgoing Shipment" Log, they were:

Shipping Date	Customer	Source	Curies	Transport Index
5/18/79	Schlumberger Well Service	MRC-GB 3369-3377	0.33 each	9.1
5/22/79	Combustion Engineering	MRC-AMBE 3521-3534	9.2	39.4
12/18/79	Australia	Pu-238 Be-463	3.5	4.7

The NRC inspectors verified the licensee had copies of the customer's licenses which authorized possession of the material ordered, leak tests were made of the sources before shipment, records of radiation surveys were properly maintained and the record of labels attached to the shipment was adequate.

The licensee received 42 shipments of licensed material and 243 empty returnable containers for the period May 2, 1979, to April 14, 1980. Smear surveys of the shipping containers were less than 9×10^{-6} uCi. Direct surveys of the container surfaces were less than 10 mrem/hr at three feet.

No items of noncompliance or deviations were identified.

10. Shipping Incidents

The licensee shipped a nominal 3.5Ci americium-241-beryllium special form neutron source to Diablo Canyon Power Plant in California on October 29, 1979. Radiation levels at the surface of the shipping container were in excess of the 200 mrem/hr Department of Transportation limit. The incident was the object of a special inspection (see Report No. 70-572/79-02 dated February 12, 1980).

11. Personnel Radiation Protection - External

The licensee's program for external exposure control consists of exposure rate measurements, pre-job manrem estimation, whole body and extremity wrist badges and self-reading pocket dosimeters. Film badges are exchanged on a weekly basis and pocket dosimeters are read daily.

The licensee's direct radiation monitoring program, the survey records, and the use of monitoring devices were reviewed during this inspection and found to be in accordance with the applicable sections of the Licensee Specifications, Operating Procedures and the Safety/Health Physics Program Manual.

Personnel monitoring records were examined for the second, third, and fourth quarters of 1979 and the first quarter of 1980. As a result of an evaluation made in 1976, the licensee assigns hand exposures as twice the wrist film badge results. In an attempt at ALARA (As Low As Reasonably Achievable) the licensee has reduced their action level for whole body exposures to 500 mrem per quarter. The maximum quarterly exposures were as follows:

	Second Qtr. 1979	Third Qtr. 1979	Fourth Qtr. 1979	First Qtr. 1980
Whole Body	0.54 rem	0.53 rem	0.52 rem	0.51 rem
Extremity	8.26 rem	7.40 rem	3.88 rem	6.72 rem

There are fourteen persons routinely badged.

No items of noncompliance or deviations were identified.

12. Personnel Radiation Protection - Internal

The licensee's program for internal exposure control consists of surface contamination surveys, airborne radioactivity monitoring, urine samples, and in vivo counting when necessary.

Daily air samples are taken in each room of the process area and also in three locations of the support area. The samples are located so as to be representative of the breathing zone concentrations. All of these 18 fixed station samples are collected at the rate of 20 liters per minute for periods of eight hours at a time to coincide with the work shift. Multiple counts are required on each sample due to natural airborne activity. In addition, the licensee has a constant air monitor operating in each of the four rooms in the process area. In-plant air sample records were reviewed for the period May 4, 1979, to April 4, 1980. There was one "above normal" air sample. On April 3, 1980, two persons were compacting waste in a Room 9 glovebox.

The seal on the ventilation duct failed when they placed some waste metal objects against the wall and tried to reduce the size by breaking it with hammer blows. They were assigned 12.1 MPC-hrs (Am-241) each when the 1.5×10^{-10} uCi/ml air sample result was used as their breathing concentration for the conservative assumption of an entire 8 hour shift. The incident was recorded in the "Health Physics Log." The entry includes the action taken to prevent recurrences.

Routine bioassay (urine) samples are collected on a monthly frequency for all employees involved in isotope work. All urine voids are collected between midnight Saturday and midnight Sunday of the designated weekend. Routine samples are analyzed for americium-241 and plutonium-238 by Controls for Environmental Pollution, Inc., Santa Fe, NM. Special 24 hour urine samples are collected as needed. The special samples are analyzed for various isotopes as required. The licensee utilized action levels as specified in License Specification 7.9.3(5) for resampling and investigation action. Urine sample records were reviewed for the period May 13, 1979, through February 14, 1980. Samples were 0.00 ± 0.05 dpm alpha and 0 ± 5 dpm gross beta.

Since no nasal swipes of greater than 100 dpm nor air samples in excess of 80 MPC-hrs were encountered, no whole body radiation measurements or fecal samples were taken during this inspection period.

The licensee provides respiratory protection but does not take credit for the program. The inspectors noted several instances when half face mask respirators were used and also noted that all personnel had masks in their possession when working in the process area. The Radiation Protection Officer periodically performs a smoke test to determine the unit's efficiency.

No item of noncompliance was identified.

13. Posting, Access Control, and Material Control

During several tours of the facility, the inspector noted that areas in which radioactive materials were stored and/or handled appeared to be adequately delineated and properly posted and controlled. Contaminated material and equipment appeared to be properly contained and labelled. No problems were noted with movement of contaminated materials or equipment within the facility. High radiation areas are posted in accordance with radiation fields as determined by surveys conducted by either manufacturing or supervisory personnel. Control of access to high radiation areas is established in accordance with 10 CFR 203(c)(4).

All visitors and employees not associated with the Engineered Products Department are limited entry to the restricted areas under the direct supervision of one of the Department employees. These visitors are issued a film badge, protective clothing, and are instructed as to the procedures of the area in which they are visiting.

No items of noncompliance or deviations were identified.

14. Surveys

Radiation surveys performed by the licensee include radiation level measurements at the exterior and to the normal work stations for hands inside glove boxes, contamination measurements and personal monitoring for contamination. A review was made of the records of weekly surveys made by the Radiation Protection Officer for the period May 5, 1979, to March 7, 1980. There were no incidents which deprived use of a facility for 24 hours. All records showed prompt cleanup and resurveys when levels exceeded the limits in Part 7.72 of the License Specifications.

No items of noncompliance or deviations were identified.

15. Notifications and Reports

Based on a review of records and statements by licensee representatives, there has been no loss of material, and one reportable incident since the previous inspection. The incident involved shipment of a source with radiation levels in excess of 200 rem/hr at the container surface. (See Report 70-752/80-02)

No items of noncompliance or deviations were identified.

16. Radioactive Effluent Control and Waste Control

With the exception of radioactive liquid which goes to the retention tank from the emergency shower and decontamination sink, all radioactive liquid wastes are mixed with absorbent material and disposed of as solid radioactive waste. None of the retention tank waste is disposed of into the sanitary sewer until the concentrations are below those listed for insoluble plutonium-238 as listed in Appendix B, 10 CFR 20. There was one transfer of liquid from the retention tank to the sanitary sewers for the period May 1979 to March 1980. It consisted of 190 gallons on September 6, 1979. Sampling of this water prior to transfer showed it was 0.2×10^{-6} uCi/ml (insoluble plutonium-238 concentration limit in Appendix B, 10 CFR 20, Column 2, Table II is 3×10^{-5} uCi/ml).

The licensee stores sealed solid waste drums in Building 2, Room 7a while waiting for a sufficient number to accumulate for transfer to the disposal agency. Each drum is identified by a number which is cross referenced in a log book. Several drums were in the storage building at the time of this inspection. Independent measurements conducted outside the building by the inspector and the licensee during the inspection showed radiation levels of less than two millirem per hour at the outer restricted area fence. The outside area of the building is in a restricted area for the purpose of radiation protection. Twenty-one drums (55 gallons each) were shipped on

November 28, 1979, and seventeen drums on December 5, 1979, to Chem-Nuclear Systems, Inc., Barnwell Waste Management Facility, Barnwell, S.C. for disposal as waste. Records of the shipment survey showed the drums were 20 d/m/100cm^2 alpha and 100 d/m/100cm beta-gamma on swipes and up to 1 R/hr at contact, 60 mR/hr at 3' on direct surveys. The waste was shipped in a "sole use" closed transport vehicle and produced 0.5 mR/hr at the driver's seat, 190 mR/hr at the truck's surface and 4.5 mR/hr at 6 feet from the truck's surface.

No items of noncompliance or deviations were identified.

17. Stack Effluent

All glove boxes and the hot cells are exhausted through absolute filters and into a common absolute filter in a single 50 foot high stack. This exhaust system runs continuously at the rate of 360 cubic feet per minute at a static pressure of 4.5 inches. Stack sampling is conducted on a continuous basis collecting samples covering 168 hours per week. Each hood and ceiling exit point for the rooms in the Controlled Process Area has a separate exhaust and HEPA filter and each exhaust system is sampled at the rate of 20 liters per minutes for periods of eight hours or more to coincide with the work shift.

An examination of the air sample results since the previous inspection showed a 10 MPC-hrs release on April 4, 1979, as compared to the average release concentration of less than 10% of the insoluble Pu-238 limit in 10 CFR Part 20, Appendix B, Table II, Column 1 ($1x10^{-12}$ microcuries per milliliter).

D.O.P. tests were performed on the six final filters on November 13, 1979. The ranged from 99.98 to 99.99% efficient.

The inspector noted the room area exhaust was replaced with a new improved system since the last inspection.

It was also noted that twelve soil and ten vegetation samples were taken October 10, 1979 as part of a new annual procedure. Results from the analysis were not available at the time of the inspection.

No items of noncompliance or deviations were identified.

18. Sealed Sources

Sealed sources used by the licensee were leak tested in September 1980 within the required six months interval. The tests showed less than $5x10^{-6}$ microcuries alpha and less than $4.5x10^{-5}$ microcuries beta gamma of removable contamination.

No items of noncompliance or deviations were identified.

19. Quality Assurance

A review of the Quality Assurance procedures was made during this inspection and it was noted the licensee has written quality control procedures, techniques and methods for assuring the quality of finished products which include the cataloging of the items, verifications of total activity and concentration, leak testing, and labeling. QA also has responsibility for inventory of licensed material. As of the last full inventory on March 31, 1980, the licensee was within his possession limits.

No items of noncompliance or deviations were identified.

20. Confirmatory Measurements

The inspectors measured exposure rates of direct gamma and neutrons in the controlled process area, and along the fence outside the building. Smear surveys were also taken of nineteen locations and pieces of equipment in the process area. The direct survey results were consistent with the posted readings and the licensee's records of past surveys. The smears were counted initially by the licensee and then again by NRC-Region III. The smears were less than 100dpm/100cm^2 alpha and less than 100dpm/100cm^2 beta-gamma except for one corridor floor spot (735dpm/100cm^2 alpha - 283dpm/100cm^2 beta gamma) and one bench top in Room 9 (176dpm/100cm^2 alpha-69dpm/100cm^2 beta-gamma). The licensee decontaminated both areas immediately to less than 20 dpm/100cm^2 alpha and less than 100dpm/100cm^2 beta-gamma.

Personal surveys of shoes and shoe covers by the inspector during visits to the processing area showed no contamination.

No items of noncompliance or deviations were identified.

21. Independent Inspection Effort

The inspectors observed source fabrication operations for Am-241 smoke detector sources, observed techniques, and made radiation level measurements using licensee-owned ion chamber survey meters.

No items of noncompliance or deviations were identified.

22. Exit Interview

The inspectors met with licensee representatives (listed in Paragraph 1) at the conclusion of the inspection on March 20, 1980. The inspection findings were discussed. The licensee had no questions concerning these findings.

The inspectors commented on the improvements of the process area room ventilation system, the addition of an annual soil and vegetation sampling program, and the plans to build a waste storage bunker as indications of management support.