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UNITED STATES
ATOMIC ENERGY COMMISSION
DIRECTORATE OF REGULATORY OPERATIONS
REGION I
970 BROAD STREET
NEWARK, NEW JERSEY 07102

SEP 27 1972

R. H. Engelken, Assistant Director for Inspection and Enforcement
Directorate of Regulatory Operations, HQ

RO INVESTIGATION REPORT NO. 72-01
AMERICAN OPTICAL CORPORATION
SOUTHBRIDGE, MASSACHUSETTS 01550
SPECTACLE LENSES CONTAINING THORIUM

Reference: Your letter dated February 23, 1972.

The subject investigation report is forwarded for your information.

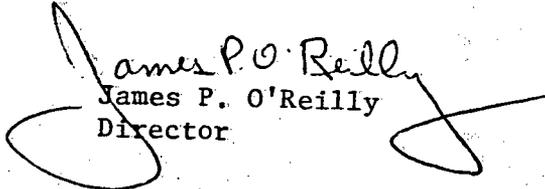
The investigation revealed that the American Optical Corporation is distributing finished spectacle lens which contain source material. An analysis of Cruxite AX type lens blank samples showed a thorium-232 content of 0.10 weight percent. The Idaho Health Services Laboratory stated that they were unable to provide the requested measurement of the dose rate at 150 millimeters from the concave surface of the lens blanks. Therefore, the investigation findings do not include an indicated dose rate to the eye as a result of an individual wearing spectacles equipped with Cruxite AX lenses.

Tinted glass is used to form lens blanks similar to the Cruxite AX lenses and these lens blanks are supplied to firms such as American Optical by a number of suppliers. To enable Regulatory to resolve the problem of source material distribution intelligently, further investigation is necessary to determine the sources of tinted glass; the magnitude of distribution of spectacles containing radioactive material; and the hazard involved. Following these determinations it is highly probable that the corrective action will require: (1) amending 10 CFR 40.13(c)(7) to permit a higher percentage of thorium in spectacle lenses during the manufacturing process; (2) require suppliers of spectacle lens blanks to furnish the customer a certificate specifying the thorium content; (3) amend 10 CFR 40.22(a)(4) to clarify that industrial use does not include the manufacture and distribution of spectacle lenses containing greater than the allowable percentage of thorium; and (4) distribution of information to all lens manufacturers informing them of the regulatory requirements.

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Region I is forwarding a letter to the American Optical Corporation in appreciation of their cooperation. In accordance with the request made by Mr. J. Metzger of your staff to Mr. R. Smith of this office on September 13, 1972, Region I will take no further action at this time regarding this matter.

Sincerely yours,


James P. O'Reilly
Director

cc: P. A. Morris, RO
H. D. Thornburg, RO
G. W. Roy, RO ←
RO:I Files

REGULATORY INVESTIGATION REPORT NO. 72-01

Directorate of Regulatory Operations

Region I

Subject: American Optical Corporation
14 Mechanic Street
Southbridge, Massachusetts 01550

Public Interest: Spectacle lenses containing thorium.

Period of Investigation: April 25, 1972

Investigator: Phillip C. Jerman
Phillip C. Jerman, Radiation Specialist

8/10/72
Date

Reviewed by: R. H. Smith
R. H. Smith, Acting Senior, Materials Radio-
logical Safety Section

9/6/72
Date

REASON FOR INVESTIGATION

Based on information contained in a letter dated February 23, 1972 to the Director of Region I from the Assistant Director for Inspection and Enforcement an investigation was conducted regarding the glass manufacturing operations of the American Optical Company, Southbridge, Massachusetts.

SUMMARY OF FACTS

The American Optical Corporation procures all tinted lens blanks, used in its products, from Corning Glass Works, Corning, New York, and Schott Optical Company, Pittsburgh, Pennsylvania. The source of thorium-232 and uranium-238 in the glass is believed to be the Monazite ore used as the source for cerium oxide, an ingredient used to fine or color glass.

Analyses performed by the Idaho Operations Office, of tinted glass lens blanks used by the American Optical Corporation to fabricate spectacles for distribution, showed that they contained up to 0.10 percent by weight of thorium-232. Other radionuclides present in the glass were potassium-40 and uranium-238.

Persons Contacted or Interviewed

American Optical Corporation, Southbridge, Massachusetts

Mr. Robert K. Miller, Vice President
Mr. Edward F. LaChance, Manager, Quality Control
Dr. E. W. Deeg, Manager, Materials Research

U. S. Atomic Energy Commission, Idaho Operations Office

Mr. C. W. Sill, Chief, Analytical Chemistry Branch
Mr. D. F. Olson, Section Chief, Analytical Chemistry

Exhibits:

- A. Letter dated February 23, 1972, with enclosures, from HQ to RO:I.
- B. Memo dated February 24, 1972, from E. W. Deeg, American Optical Corporation, to E. F. LaChance, American Optical Corporation.
- C. Letter dated May 4, 1972, from E. F. LaChance, American Optical Corporation, to RO:I.
- D. Letter dated May 15, 1972, from RO:I to Idaho Operations Office.
- E. Idaho Operations Office Sample Record Sheets.
- F. Analysis Summary.

DETAILS

Introduction

1. On January 19, 1972, the Mare Island Naval Shipyard, Vallejo, California reported to RO:V, that safety spectacles with tinted lenses, distributed by the American Optical Corporation, contained radioactivity. The Shipyard reported that they had surveyed from 100 to 125 pairs of safety spectacles received from the American Optical Corporation and found that six pairs with tinted lenses showed from 50 to 200 counts per minute above background. The radioactive material contained in the lenses was identified as thorium-232 by the Mare Island Naval Shipyard.
2. On February 25, 1972, the Director of RO:I received a letter from the Assistant Director for Inspection and Enforcement containing additional information regarding spectacle lenses containing thorium. Based on this information, an investigation of the glass manufacturing operations performed by the American Optical Corporation was conducted on April 25, 1972 by Region I. (See Exhibit A)

Interviews with the following:

Mr. Robert K. Miller, Vice President
Mr. Edward F. LaChance, Director, Quality Control
Dr. E. W. Deeg, Manager, Materials Research

3. The investigator met with Miller and LaChance at the subject licensee's plant on April 25, 1972. The investigator explained that spectacles distributed by the American Optical Corporation had been found to contain small amounts of radioactivity, and the purpose of the investigation was to obtain information regarding the manufacture of spectacle lenses. Mr. Miller stated that his company was willing to cooperate with the AEC to the fullest extent possible.
4. Mr. LaChance asked if it were not the U. S. Navy at Mare Island Naval Shipyard, Vallejo, California, who reported the radioactivity in spectacles. This was confirmed. LaChance stated that about a dozen pairs of spectacles were returned from Mare Island Naval Shipyard for replacement because of the presence of radioactivity and replacement was made. He stated that the spectacle lenses were sent to Arthur D. Little, Inc., Cambridge, Massachusetts, for analysis and the findings indicated thorium-232 was present but in quantities hardly more than the limit of detection.
5. LaChance stated that he called in Deeg to research the problem and that Deeg submitted a report (See Exhibit B). Mr. Deeg stated that cerium oxide is used as an ingredient in making tinted lenses and that these may contain thorium-232, if Monazite is used as the source for cerium

oxide. He stated that he searched company files for any specifications relative to raw materials used for making lens glass and found that, among the many suppliers, only Grace, Davison Chemical Company, Chattanooga, Tennessee, specified any thorium-232 content in their materials as indicated on page 2 of his report (see Exhibit B).

6. Deeg stated that American Optical manufactures only white ophthalmic crown glass which contains no cerium oxide as indicated by the first enclosure to his report. All tinted glass comes from outside suppliers in the form of lens blanks. He stated that tinted lens blanks are supplied by the Corning Glass Works, Corning, New York, and Schott Optical Company, Pittsburgh, Pennsylvania (formerly PPG Industries, Inc.). Deeg stated that he did not know the source of raw material used by the suppliers. He stated that the compositions of tinted glasses are those shown in the second enclosure to his report and that all tinted glasses contain cerium oxide.
7. LaChance stated that of the types of tinted glass listed, ie., Calobar B, Calobar C, Calobar D, Cruxite A, and Cruxite AX are used to make spectacles distributed by the company. The Calibar glasses contain about 1.6 percent by weight cerium oxide, and the Cruxite glasses contain about 4.0 percent by weight cerium oxide. Deeg stated that he doubted that either Corning or Schott attempted to control the amount of thorium-232 in the material used as the source of cerium oxide. He stated he strongly suspected that the amount varied widely in the lots of raw material received.
8. LaChance stated that Cruxite B, Cruxite C, Pink A, and Experimental GP glasses were experimental and that no spectacles containing these glasses have ever been distributed by the company. He also stated that the company was considering the establishment of specified limits of radioactivity in the glasses received from suppliers.
9. LaChance stated that further information might be obtained by contacting the Optical Manufacturers Association, which is made up of all firms who manufacture or import eye wear for distribution in the United States. Charles F. Oddy is Executive Director and the address is 1730 North Lynn Street, Arlington, Virginia 22209.

10. Radiation Measurements

LaChance provided a tray containing 42 finished spectacle lenses, containing Cruxite A glass. The investigator surveyed each lens with an Eberline E-120 survey meter equipped with an end window GM hand probe containing about 2 milligrams per square centimeter of total absorber. Any reading above background on any of the lenses was not discernable.

11. Analyses of Lenses

On May 13, 1972, the investigator contacted LaChance by telephone and requested that samples of each type of tinted glass be sent to RO:I. The letter dated May 4, 1972, from LaChance to RO:I (Exhibit C), was received May 8, 1972 together with the package containing the glass.

12. On May 8, 1972, the investigator contacted Claude W. Sill, Idaho Operations Office and arranged for the analysis of the glass. The glass samples were sent to the Idaho Operations Office with the letter dated May 15, 1972, from RO:I to the Idaho Operations Office. (Exhibit D)
13. The sample record sheets providing the analytical results for the glass samples (Exhibit E) were received by RO:I on June 12, 1972, from the Idaho Operations Office. Exhibit F summarizes the analytical results.
14. Lens blanks for each of the glass types, Cruxite A, Cruxite AX, Calobar B, Calobar C, and Calobar D, were analyzed. A finished lens of the Cruxite AX type, which was returned to American Optical Corporation by Mare Island Naval Shipyard, was also analyzed. During a telephone conversation with D. G. Olson, of the Idaho Operations Office, on July 20, 1972, the investigator was informed that all glass samples were analyzed by gamma scan through the full energy range. Positive results were noted for potassium-40, thorium-232 and uranium-238, as indicated on the sample record sheets. Olson stated that no attempt was made to measure the dose rate from the finished Cruxite AX lens due to lack of equipment to do so efficiently. Olson verified the thorium-232 content in the Cruxite AX blank lens to be 0.10 percent by weight.