

INSPECTION FINDINGS AND LICENSEE ACKNOWLEDGMENT

<p>1. LICENSEE <i>AMERICAN POLISH CHEMICAL CORP.</i> <i>253 ANN STREET</i> <i>WEST CHICAGO, ILLINOIS 60635</i></p>	<p>2. REGIONAL OFFICE <i>REGION III, DIVISION OF COMPLIANCE</i> <i>797 ROOSEVELT ROAD</i> <i>CHICAGO, ILLINOIS</i></p>
<p>3. LICENSE NUMBER(S) <i>STA-583 40-2061</i></p>	<p>4. DATE OF INSPECTION <i>JUNE 13, 1968</i></p>

5. INSPECTION FINDINGS

☒ A. No item of noncompliance was found.

☐ B. Rooms or areas were not properly posted to indicate the presence of a RADIATION AREA. 10 CFR 20.203(b) or 34.42

☐ C. Rooms or areas were not properly posted to indicate the presence of a HIGH RADIATION AREA. 10 CFR 20.203(c) (1) or 34.42

☐ D. Rooms or areas were not properly posted to indicate the presence of an AIRBORNE RADIOACTIVITY AREA. 10 CFR 20.203(d)

☐ E. Rooms or areas were not properly posted to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(e)

☐ F. Containers were not properly labeled to indicate the presence of RADIOACTIVE MATERIAL. 10 CFR 20.203(f) (1) or (f) (2)

☐ G. A current copy of 10 CFR 20, a copy of the license, or a copy of the operating procedures was not properly posted or made available. 10 CFR 20.206(b)

☐ H. Form AEC-3 was not properly posted. 10 CFR 20.206(c)

☐ I. Records of the radiation exposure of individuals were not properly maintained. 10 CFR 20.401(a) or 34.33(b)

☐ J. Records of surveys or disposals were not properly maintained. 10 CFR 20.401(b) or 34.43(d)

☐ K. Records of receipt, transfer, disposal, export or inventory of licensed material were not properly maintained. 10 CFR 30.51, 40.61 or 70.51

☐ L. Records of leak tests were not maintained as prescribed in your license, or 10 CFR 34.25(c)

☐ M. Records of inventories were not maintained. 10 CFR 34.26

☐ N. Utilization logs were not maintained. 10 CFR 34.27

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PDR FOIA  
RAPKINB5-30 PDR

*[Signature]*  
(AEC Compliance Inspector)

6. LICENSEE'S ACKNOWLEDGMENT

The AEC Compliance Inspector has explained and I understand the items of noncompliance listed above. The items of noncompliance will be corrected within the next 30 days.

\_\_\_\_\_  
(Date)

\_\_\_\_\_  
(Licensee Representative - Title or Position)

65

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*Mailed 6-17-68*

# SMEAR RESULTS

Building And Floor	Location	Radiation Levels mr/hr	Smear Results d/m/ft <sup>2</sup>	
			Beta Gamma	Alpha
9-1	West side of Hopper, Behind bags, during loading	Hopper 2 Africa Bags 10 Florida Bags 5	1,800	2,215
9-1	Bench top, SW corner	0.9	542	824
9-1	Scale top, SE corner near Tolhurst Centrifuge	1.2	1,575	2,251
9-1	Floor SE corner	0.35	3,369	5,615
9-4	Maintenance cart W side, Center	0.15	130	204
9-4	On scales, near hopper, weights-scale bar	1.0	263	310
9-4	Floor at scales	1.0	2,239	2,111
9-4	Floor - acid mixing pot	0.4	318	214
9-4	Floor - East center	0.4	1,706	1,583
9-4	Floor - Entrance	0.1	2,518	2,273
9	Floor - elevator	0.1	1,572	1,580
9-3½	Bench - Lunch room	-	175	326
9-3½	Floor - Lunch room	-	327	488
9-3½	Table top - Lunch room	-	160	198
9-3 to 3½	Handrail-stairway	-	118	212
W-1	Desk	-	Bkgd	111
W-1	Table	-	Bkgd	137

# AIR SAMPLING RESULTS

Building And Floor	Location	Radiation Levels mr/hr	uc/cc	
			Beta-gamma	Alpha
9-1	Air sample - SW	-	Bkgd	Bkgd
9-1	Air sample - near blender during loading	1.0	Bkgd	$14.7 \times 10^{-11}$
9-4	Air sample - near hopper	-	Bkgd	$0.15 \times 10^{-11}$
9-4	Air sample - west wall	0.17	Bkgd	$0.6 \times 10^{-11}$

# WATER SAMPLING RESULTS

Location	Alpha	Beta-Gamma
1) Pond Water Top	$4.86 \times 10^{-10}$ uc/cc	$3.4 \times 10^{-10}$ uc/cc
2) *Water from plant, inlet pipe to pond	$2.1 \times 10^{-8}$ uc/cc	$9.56 \times 10^{-9}$ uc/cc
3) Mud at bottom of pond (near edge)	$3.2 \times 10^{-9}$ uc/gram	$9.78 \times 10^{-10}$ uc/gram
* Taken from pipe from thorium plant, slurry		

Continuation Sheet #20  
American Potash & Chemical Corp.  
West Chicago, Illinois 60185  
License No. STA-583  
December 14 & 15, 1966  
& February 9, 1967

65. The licensee representatives were informed that the radiation level of 1.2 mr/hr at the fence line facing Factory Street in the unrestricted area immediately south of the garage building constituted an item of noncompliance with respect to 10 CFR 20.105(b)(2). During the February 9, 1967 visit, it was noted that this deficiency was corrected by the licensee subsequent to the December 15 visit by the removal of five tote carts which contained source material residue, thereby reducing the radiation level existing at the fence to permissible limits. An independent radiation survey made by the AEC representative revealed nothing above background radiation levels at this fence location.

✓63. [REDACTED] The radiation level at all other points of the licensee's boundary was less than 0.5 mr/hr with the exception of an <sup>unventured</sup> area immediately south of the licensee's garage building facing Factory Street. The radiation level at the fence at this area was 1.2 mr/hr. The open area immediately within the fence at this point was used to store miscellaneous items. Among these items were five wooden tote boxes approximately four feet by five feet and three feet deep filled with a gray-colored residue. Mr. Sinke stated that this material probably was some thorium residue left over from a past thorium cascade operation. The radiation level at the surface of these filled tote bins was 80 to 90 mr/hr. Mr. Sinke was informed that the resulting radiation level of 1.2 mr/hr at the fence boundary constituted noncompliance with 10 CFR 20.105(b)(2).

#### MANAGEMENT DISCUSSION

✓64. The results of this inspection were discussed with Mr. Bruce Bennett, Plant Manager, and Mr. Gerald Sinke, Safety Engineer and RSC. The correction of previous items of noncompliance which had been noted during the last inspection was discussed with Mr. Bennett and Mr. Sinke. These previous items of noncompliance concerned whole-body exposures in excess of 1.25 rem per calendar quarter, exposure of personnel to excessive concentrations of thorium airborne activity, and failure to post the prep room in Building W-1. Mr. Bennett was informed by the AEC representatives that it appeared by the diligent use of the radiation exposure sheet, Exhibit A, adequate control was being exercised in regard to this past problem. Mr. Bennett stated that he personally receives a weekly copy of this form, and that the company would continue to carefully observe exposures. Air sampling was discussed and in particular the practice of performing time studies in order to evaluate the percentage of forty <sup>MPC</sup> hours which individuals may receive during operation. Mr. Bennett was informed that the records indicated that these time studies had been performed each time any personnel had been working in an airborne concentration greater than thorium

MPC  
[REDACTED]

INDEPENDENT MEASUREMENTS

61. Independent measurements were made by the AEC representatives of the licensee's facilities during the course of this inspection. These surveys included those for beta-gamma and alpha surface contamination, direct reading measurements, airborne concentration measurements, and alpha and beta-gamma measurements of the water and the mud in the licensee's retention pond. All samples were analyzed at Argonne National Laboratory. The smear surveys were performed using HV-70 filter paper covering an area of approximately one foot square. The direct reading measurements were performed with an Eberline Model E-500B survey meter with a  $30 \text{ m}^2/\text{cm}^2$  window. The samples of airborne concentration were collected with a Staplex high volume sampler. One gallon glass containers were utilized to obtain samples of:

- a. The water from the retention pond
- b. The water which was at the time running into the retention pond from the licensee's facility
- c. Mud from the bottom of the pond.

The results of these independent measurements are attached to this report as Exhibit B.

LICENSE CONDITIONS

62. License Condition No. 9 authorizes the licensee to produce a radiation level of not more than 2.5 mr/hr at the southwest boundary of the licensee's plant. This section of the "Twelve Acres" site is used as storage of the gray mud waste from the thorium processing procedure. During this inspection an independent survey was performed by the AEC representatives of the radiation level of the licensee's fenced boundary. This independent survey revealed a radiation level of equal to or less than 2.5 mr/hr at the southwest boundary.

✓ 59. (continued)

following information:

<u>Export Licensee</u>	<u>Licensee No.</u>	<u>Date Shipped</u>	<u>Amount</u>	<u>Material</u>
Woo Brothers, Inc. Hong Kong	STE-7407	Dec. 9, 1966	2,240 lb.	Th Nitrate
Woo Brothers, Inc. Hong Kong	STE-7377	Sept. 15, 1966	2,240 lb.	Th Nitrate
Canadian Coleman 15 North Queen Toronto 18, Ontario	STE-7409	Sept. 30, 1966	1,000 lb.	Th Nitrate
Canadian Coleman 15 North Queen Toronto 18, Ontario	STF-6696	Aug. 30, 1966	1,000 lb.	Th Nitrate
Atomic Energy of Canada, Ltd. Chaulk River, Canada	STE-7329	March - 1966	20 Kilogram	Th Oxide
Atomic Energy of Canada, Ltd. Chaulk River, Canada	STE-7328	Feb. 22, 1966	400 lb.	Th Oxide

✓ 60. Information obtained from the licensee's records include the following domestic shipments:

<u>Customer</u>	<u>License No.</u>	<u>Date Shipped</u>	<u>Amount</u>	<u>Material</u>
Westinghouse Electric	AEC Contract	- - -	200 lb.	
Bettis Atomic Power Lab.	AT - 11 - 1 - Gen			
West Mifflin, Pa.	14 AEC			
Battelle Memorial Institute	General	May 3, 1966	1 lb.	
Pacific North West Lab. Richland, Washington				
Du Pont Experimental Station	SNB-301	June 17, 1966	2 lb.	
Wilmington, Delaware				
Du Pont Experimental Station	STB-489	June 17, 1966	400 lb.	Th Nitrate
Wilmington, Delaware				

POSTING AND LABELING

- ✓ 53. ~~NUMEROUS~~ bottles of thorium compound are stored in the "prep room" of the licensee's Building No. W-1 facility. Each bottle was noted to be labeled with a magenta on yellow standard radiation caution symbol. The "prep room" area entrance door was noted to be posted with a sign containing the radiation symbol and the words "Caution Radioactive Material".

TRANSPORTATION

- ✓ 54. The licensee utilizes fork-lift trucks and dump trucks to move raw material, material in process, and waste material between areas within the production facility and to and from "Twelve Acres". These vehicles never leave the licensee facility.

WASTE DISPOSAL

- ✓ 55. As stated previously, empty, plastic-lined burlap bags which had contained monazite sand are burned at the licensee's "Twelve Acres" site. This method of disposal has been approved in that the raw ore monazite sand is exempt under 10 CFR 40.13(b) since the raw ore residue in the bags had not entered the process.
- ✓ 56. Airborne radioactive material EFFLUENT is discharged through bag-type dust collectors from various hoods and stacks in the processing areas. These dust collectors are cleaned out periodically and reused, according to the licensee.
- ✓ 57. The methods of solid and liquid waste disposal and/or treatment were discussed previously in Paragraph 30. ~~NUMEROUS~~

RECORDS

- ✓ 58. Receipt records were not reviewed. The licensee is authorized to receive and possess unlimited amounts of thorium.
- ✓ 59. The licensee's transfer of material records, both domestic and export, were spot checked during this inspection. It was noted that the majority of thorium transferred was gas mantle grade thorium. The licensee's export license matters are handled by their New York office. The New York office will send the particular STE license number with each thorium order to be filled and shipped from West Chicago, according to Mr. Robert K. Cavins, the licensee's Marketing Manager. A spot check of the licensee's export shipments revealed the



- ✓ 51. The licensee's records of <sup>his</sup> ~~in~~plant air sampling program was reviewed for the years 1965 and 1966. During this review it was noted that many air sampling results were greater than ~~MPC~~ <sup>MPC</sup>. For each air sample with results greater than ~~MPC~~, the licensee had performed time weighted studies which would determine the per cent of a forty-hour ~~MPC~~ <sup>MPC</sup> week. The licensee stated that this calculation was made each time an individual was working in an area with an airborne concentration greater than ~~MPC~~. Mr. Sinke stated that various operations throughout the plant involved personnel working in areas with an airborne concentration greater than ~~MPC~~. Their present procedure was to sample these areas, determine the airborne concentration, and calculate the fractional 40 ~~MPC~~ <sup>MPC</sup> hour week for each operation as determined by the time spent in that airborne concentration. Employee rotation is utilized as the method to prevent one employee from working in areas equivalent to ~~40 MPC HOUR WEEK~~ <sup>40 MPC HOUR WEEK</sup>. Maryniw stated that routinely as he collected these breathing zone samples, he could tell immediately if the sample would be greater than ~~MPC~~ by visually looking at the amount of dirt and dust collected on the filter paper.
- ✓ 52. For environmental sampling, the licensee currently collects weekly samples at three different locations and quarterly samples at 42 different locations. All environmental samples are 60 minute samples collected at a rate of 35 ~~LITERS~~ <sup>LITERS</sup> per minute through 1-1/4 inch Whatman 41 filter paper. The weekly samples are taken at Ball's Greenhouse, 1/2 mile west of the plant, Vedder's, 1/2 mile east of the plant, and on the plant property located between the other two locations. The quarterly samples are taken at various points along the entire boundary lines surrounding the licensee's property. The environmental sampling for the year 1966 was reviewed during this inspection. With the exception of samples taken October 11, 1966, it was noted that all results of environmental samples were less than ~~MPC~~ <sup>MPC</sup>. Typical results were  $0.3 \times 10^{-12}$ ,  $0.09 \times 10^{-12}$ , and  $0.2 \times 10^{-12}$  <sup>u/c/cc</sup>. These records indicated that on October 11, 1966 the environmental sampling results indicated  $2.4 \times 10^{-12}$ ,  $2.2 \times 10^{-12}$ ,  $1.2 \times 10^{-12}$ , and  $1.4 \times 10^{-12}$  <sup>u/c/cc</sup>. Mr. Maryniw stated that on that ~~particular~~ <sup>particular</sup> day all air samples, ~~in~~plant and environmental, were high. It was noted that the next day's samples were normal,  $0.03 \times 10^{-12}$  <sup>u/c/cc</sup>.



✓48. Once each month a beta-gamma survey of the fence line surrounding the "Twelve Acre" site is performed to assure that radiation levels at that point do not exceed 2.5 ~~microcuries per liter~~ <sup>mCi/L</sup> as stipulated in License Condition No. 9.

Results of these surveys are recorded by the licensee. It was noted that no results of these area surveys exceeded 2.5 ~~microcuries per liter~~ <sup>mCi/L</sup>.

✓49. The licensee <sup>CONTENDS</sup> ~~states~~ that he has no waste streams, as such, leaving his plant site. As stated previously, liquid waste is discharged to the pond at "Twelve Acres". Mr. Sinke stated that with the exception of the sanitary sewage system all water produced throughout the facility is discharged to this <sup>RETENTION</sup> ~~discharge~~ pond. Radioactive assays of the retention pond water have been performed by Health Physics Associates. One such assay conducted March 23, 1966 revealed the following:

<u>Location</u>	<u>Gross Alpha</u> <u>d/m/ml</u>	<u>Gross Beta</u> <u>d/m/ml</u>	<u>Gross Gamma</u> <u>c/m/ml</u>
1. Plant Waste Super-nate Liquid	<0.015	<0.05	2 ± 1
2. Water - West Chicago Pump	<0.015	0.05 ± 0.02	2 ± 1
3. A. P. & Co. Plant Well Water	<0.015	<0.05	2 ± 1
4. Storm Sewer Outlet Across 12 <sup>th</sup> Street	<0.015	<0.05	2 ± 1
5. Lake Michigan Water (Highland Park, Ill.)	<0.015	<0.04	< 1

(Note: 1 d/m/ml =  $4 \times 10^{-7}$  <sup>MC</sup> ~~cc~~)

✓50. The licensee's <sup>2</sup> ~~plant~~ air sampling program is of two types. These types are breathing zones (B. <sup>Z</sup> ~~U~~.) and general air samples (G. A. S.). Mr. Maryniw, the person who takes all samples, stated that the breathing zone samples are collected at the individual operator's breathing zone while the operator is performing his assigned work function. Each of these B. Z. samples is taken for five minutes and counted and analyzed for natural thorium following a 106 hour waiting period to allow for the decay of all other natural airborne contaminants. The licensee's base line for operations within the plant is the maximum permissible concentration for natural thorium ( $3 \times 10^{-11}$  microcuries per cc), per Column 1, Table 1, Appendix B, 10 CFR 20.

✓45. (continued)

locations, badge readings, and the calculated average mr/hr. These records were reviewed for the periods September 15, 1964 through October 15, 1966. For the year 1966 the accumulated film badge readings for these specific areas were 3050 mr, 4820 mr, 5990 mr, 7880 mr, 5670 mr, and 15660 mr. The 15660 mr reading is the accumulated film badge exposure of an area badged located in the Shipping Room. According to the licensee, the majority of this film badge accumulation was received earlier during the year of 1966 when the Shipping Room was used to store large amounts of sands and processed thorium.

USE OF PLASTIC HOLDERS FOR FILM BADGES

- ✓46. The licensee uses plastic film badge holders for all film badges. The holder completely encloses the film badge and is worn on the person. This plastic holder has been in use since December 14, 1964. Mr. Sinke stated that due to the use of this plastic holder, there has been less incidents of high film badge readings due to badge contamination.

RADIATION SURVEYS AND/OR EVALUATIONS

- ✓47. The licensee maintains a separate bound book entitled "Gamma Survey of Thorium Plant". Included in this record are maps of the complete facilities, with radiation levels in units of mr/hr written on the form. It was noted that all readings averaged 1 to 10 mr/hr. Mr. Sinke stated that beta-gamma surveys are performed in order to evaluate personnel exposure to external sources of radiation in the various thorium work areas. All results of these surveys are recorded in this record. It was noted that a radiation survey of the loading dock area on December 6, 1966 in Building No. 9 was from 1 to 3.8 mr/hr. The licensee stated that the only thorium dust contamination "survey" made is a visual check of the areas. Routine daily washdown of thorium work areas is considered a sufficient control of <sup>floor</sup> contamination by the licensee. Mr. Maryniw, who normally makes all surveys, stated that in addition to these routinely scheduled area surveys he also carries a survey meter with him as he goes throughout the plant on his "rounds" and "spot checks" areas. It was observed during the course of this inspection that several areas in Processing Building No. 9 were dampened and operators were using hoses to wet down the floors of various thorium work areas in this building.

✓42. (continued) *[Signature]*

report advises the foreman of each of these worker's current exposure. It states quarterly limits, weekly limits, and advises the foreman not to exceed 80 mr/wk. It is the foreman's responsibility, according to Sinke, to rotate the workers on a job if any individual's quarterly exposure is likely to exceed 1250 m<sub>rem</sub>. Mr. Sinke stated that the information on this exposure report allows him to effectively control <sup>THS</sup> radiation exposure of plant personnel.

✓43. The licensee has chosen to restrict all personnel exposure to the 1250 m<sub>rem</sub> per quarter limit rather than obtain a prior occupational exposure history and prepare Form AEC-4.

✓44. A review of film badge records covering the period of 1965 through November 1966 was made during this inspection. It was noted that during the year 1965, the highest accumulated whole-body exposure as noted on the film badge results was 1950 m<sub>rem</sub>. The average whole-body exposure for the year 1965 ranged from 600 to 1000 m<sub>rem</sub>. The highest single weekly exposure, as noted from the film badge results, was 320 m rem. A review of the 1966 whole-body exposure records revealed that the highest individual accumulated whole-body exposure was 2540 m<sub>rem</sub>. The highest single weekly whole-body exposure for 1966 was 250 m<sub>rem</sub>. It was noted that the average accumulated whole-body exposure for the year 1966 as noted from the weekly film badge records was between 800 and 1000 m<sub>rem</sub>. A review of the monthly film badge records indicated that the highest accumulated monthly whole-body exposure was 1190 m rem. The average whole-body exposure of these monthly badges through the year 1965 and 1966 was 300 to 400 m<sub>rem</sub>. It was noted that during the period October 15, 1966 through November 14, 1966, a whole-body exposure reading of 600 m<sub>rem</sub> was received by <sup>a MR.</sup> ~~Mr. [redacted]~~. The following note was written on a film badge report "Small drums of thorium-oxide stored in next room, next to wall by ~~Mr. [redacted]~~ desk. Drums removed". The accumulated whole-body exposure for Mr. ~~[redacted]~~ was noted to be 920 m<sub>rem</sub>.

✓45. The licensee maintains a separate record book of area badges. Area badges are located in six locations throughout the plant. These badges are processed monthly, and results are maintained in a separate log book which also gives

- ✓38. The licensee possesses three locally constructed air samplers. These sample<sup>85</sup> draw 35 ~~liters~~<sup>LITERS</sup> per minute through 1-1/4 ~~each~~<sup>each</sup> Whatman 41 filter paper. For the counting of air samples, the licensee possessed two Tracerlab Model TE-13, ~~2-Pi~~<sup>2-Pi</sup> Alpha ~~SCINTELLATION~~<sup>SCINTELLATION</sup> counters, using a rubber hydrochloride window. These detectors lead into Tracerlab 1000 scalars. In addition, the licensee possesses a Tracerlab Spectrometer and Rate-Meter with a two-inch gamma scintillation detector located in a 2½" lead shield. The licensee also possesses a thin end window geiger detector, which feeds into a Tracerlab 1000 scaler. For portable instrumentation, the licensee has one Nuclear-Chicago Model 2112 Alpha Survey Meter, one Nuclear-Chicago Model 2612 Beta-gamma Survey Meter, and one Victoreen Model 440 Low Energy Survey Meter.

- ✓39. The licensee's instruments are calibrated quarterly by <sup>MR.</sup> Fields.

PERSONNEL MONITORING

- ✓40. All employees assigned to "Plant <sup>WORK</sup>" at the licensee facility are under film badge controlled service, except those classified as general office workers. Those individuals assigned to the thorium processing operations are on a weekly badge period while those assigned to the rare earth and "other" operations are on a monthly basis. All film badges are obtained from R. S. Landauer, Jr. and Company, Matteson, Illinois. There are presently approximately 200 ~~employees~~ people under monthly badge service and 38 people on weekly badges.
- ✓41. Film badge racks have been placed at the employee entrance to Building No. 9. All employees enter and leave through this entrance since time cards must be punched <sup>AT</sup> this location ~~at the entrance to Building No. 9~~. Employees are instructed to leave their film badge in the assigned rack each day according to Mr. Sinke. In addition, a guard whose office is located in the entrance area to Building No. 9, periodically checks to see if each employee leaves his badge upon leaving the building. According to Mr. Maryniw, <sup>(MR. MARYNIW)</sup> he personally makes a tour of the plant each day to see if each person has his film badge on.
- ✓42. Mr. Sinke <sup>PREPARES</sup> a weekly film badge exposure report, a copy of which is attached to this report as Exhibit A. Seven copies of this report are sent weekly to specific personnel in the plant including the Plant Manager and <sup>VARIOUS</sup> Foremen. This

✓32. (continued)

stating, "All employees working in this area must wear film badges as part of our radiation monitoring program".

✓33. Storage of the ore and of the finished product is accomplished in storage areas in the main processing area and in the "Twelve Acres" area warehouses.

✓34. The thorium workers lunchroom and locker room is located between <sup>the</sup> third and fourth floor in Building No. 9. The licensee stated that the room is mopped once every day. All people in the Thorium Plant eat their lunch here and, according to Mr. Sinke, are instructed to wash prior to eating.

✓35. During a tour of the various operating facilities, it was noted that a new lunchroom was being built in the general bay area of Building No. 3.

RADIATION SAFETY EQUIPMENT AND INSTRUMENTATION

✓36. The licensee provides respirators for his employees. The <sup>FITTING</sup> ~~fitting~~ of these respirators is accomplished under the supervision of the foreman of the production area to which the operator is assigned. Mr. Sinke stated that he has made periodic checks to determine whether the masks were properly fitted. The masks are routinely wiped inside and out after use for the sake of cleanliness, not necessarily for radiation safety reasons. The licensee stated that respirator cartridges are changed only when a man has more than normal difficulty in breathing through the cartridge and not on a routine basis. Respirators are kept in the individual's locker when not in use. Mr. Sinke stated that the use of respirators is a secondary precaution for protection against airborne contamination, while good ventilation is the primary course of action.

✓37. The licensee cited three specific areas in which the use of respirators is required. They are:

- a. At the sand hopper in the loading area of the first floor of Building No. 9
- b. At the twin-shell blender operation area in Building No. 9
- c. At the T-7 Tank Area

The T-7 Tank Area consists of open-top tanks. Mr. Sinke stated that the respirators are required in these areas only when thorium processing is actually performed.

- ✓30. The Thorium Building is equipped with a variety of typical chemical processing equipment for the conversion of the monazite ore into rare earth and thorium compounds. The transfer of material within the Thorium Building, after the introduction of the dry monazite sand into the acid-digestion pot, is accomplished with the material in a liquid dissolved state or in a ~~slurry~~<sup>WET</sup>-solid state with a consistency approaching mud. All liquids are transmitted by closed piping. The "mud" may be transmitted either in ~~ductwork~~<sup>DUCT LINES</sup> from one floor to another or in uncovered portable bins by use of cranes or fork-lift trucks. On the first floor level, the chemical form of thorium is thorium nitrate. The thorium is converted into thorium-oxide by the process of calcination. This calcination process is performed in Building No. 3 Furnace Room. The twin-~~shaft~~<sup>shell</sup> blender which is used in the production of thorium nitrate is located in Building No. 9.
- ✓31. Immediately south of the processing area, the licensee maintains an enclosed fenced area known as "Twelve Acres". Within the "Twelve Acres" area, the licensee stores semi-processed rare earth salts "~~Thorium~~<sup>Rare</sup> Salts", and gray-mud waste from his thorium process. The gray-mud waste has a thorium concentration of 0.25%, and may be of commercial value at some later date, according to Mr. Sinke. In this "Twelve Acre" area, a pond has been formed which is approximately fifty feet in diameter and about twenty-five feet deep. All liquid ~~process~~ waste generated within the plant discharges to this pond. The liquid waste in the pond is allowed to seep through the ground. The entire "Twelve Acre" area is enclosed with a chain-linked fence approximately six foot high. In recent months the licensee has acquired the adjacent three acres of land immediately south of this fenced-in area. This additional three acres of land is not enclosed by a fence. The licensee has a burn pit ~~AND A TRASH PILE WITHIN THE "TWELVE ACRES" AREA.~~
- ✓32. Posted at the entrances and throughout the production facility and "Twelve Acres" are magenta on yellow signs showing the standard radiation caution symbol and the words "Caution Radiation Area, Airborne Radioactivity Area, Radioactive Material, Containers, Tanks, Etc., In This Area May Contain Radioactive Material". Posted by a time clock at the main entrance to the facility is a Form AEC-3. In addition, posted at the main entrance to the processing facility is a sign



✓27. (continued)

is packaged in burlap bags which are lined with plastic. As ~~fork~~<sup>fork</sup>-lift trucks remove the sand from the railroad cars, the sand is stored in the immediate vicinity of the sand hopper. An operator will place one bag inside ~~an~~<sup>an</sup> open-faced hood, known as a "sand hopper", and rip open the bag. For this operation the operator's body is partially inside the hood to afford him sufficient leverage for ripping open the bag. The operator wears a respirator and gloves during this operation. The empty bags are placed in a tote which is a metal container with a lid approximately three foot high by five foot long and four foot wide. The empty bags are then transferred to an area known as Twelve Acres and burned in an open pit.

✓28. The monazite is transferred from the sand hopper on the first floor to the fourth floor of Building No. 9 by way of a worm gear and enclosed duckwork. At the fourth floor level, the sand is emptied into another large sand hopper and carefully dumped into other totes. On this fourth floor level, the sand is carefully measured out into one ton quantities into these totes. The totes are then carried by crane to baking pots where they are dumped and the sand baked with  $H^2 SO_4$  <sup>(sulfuric acid)</sup>. The pot-baking operation takes about six hours after which the material is allowed to sit for about two days. There are a total of 24 of these sand-baking pots of the fourth floor level of Building No. 9. From four to five workers plus a foreman are located on the fourth floor.

✓29. After baking, the material is unloaded into hopper-type portable bins and again carried by crane to the front part of the building. The material is then allowed to fall into a funnel-type duck into dissolving tanks located on the third floor. At this point in the process, the material has a consistency of molasses. Also located on the third floor are the filter presses to which the material goes from the ~~dissolving~~<sup>dissolving</sup> tanks. Filter cakes from the filter presses are transferred to redissolving tanks on the second floor. Evaporating tanks and rotary filter presses are also located on the second floor. Additional dissolving tanks are on the first floor.



FACILITIES

- ✓25. The licensee maintains two separate facilities which make up the West Chicago Plant. A research and development facility, known as "W-1" or "Special Products" is located at West Washington and Wood Streets in West Chicago, Illinois. The licensee's production facilities are located at 258 Ann Street, West Chicago, Illinois.
- ✓26. At the research and development facilities, the licensee has Research and Chemical Laboratories and small scale pilot plant operations. It was noted that at the door of the small laboratory containing many boxes of specific samples, there was posted the conventional radiation symbol and the wording "Caution Radioactive Materials". The room contained ~~many~~ many cans filled with various samples and bottles of not only ~~thorium~~ thorium compounds but also rare earth compounds. The general <sup>radiation</sup> area working background was 1.5 mr/hr. One polyethylene bottle labeled "thorium oxide" indicated 50 mr/hr at contact. On one bench top was a package which had just been delivered through the mail. The package had come from Humphreys Mining Company, P. O. Box 8, Folkston, Georgia 31537. It was addressed to the attention of Mr. Lee Thompson of the American Potash & Chemical Corporation. A radiation <sup>survey</sup> made of this package revealed 1 mr/hr at the surface of the package. According to Mr. Sinke, Mr. Lee Thompson generally receives samples of ore from several mining companies for analysis.
- ✓27. The production facility covers an area approximately 300 yards by 100 yards in size. With the exception of moving the blender area which was previously located in the southwest section of Building No. 1 to Building No. 9, the production facility remained the same as reported in previous inspection reports. Within this area, the licensee produces both thorium compounds and rare earth compounds. The production facilities for thorium now consist of the four-story Thorium Building, Building No. 9, and the Furnace Room or Calcinating Room which is yet located within Building No. 3. The majority of the production of thorium is located in Building No. 9. Railroad cars are brought near the building and ~~from~~ <sup>from</sup> lift trucks will remove ore directly from the railroad car and bring it into the building. The sand ~~consists~~ <sup>consists</sup> of ores from various places throughout the world

- ✓21. Indoctrination of employees is accomplished by several different methods according to Mr. Sinke. The licensee has devised a full page statement drawing a new employee's attention to the fact that he is working with radioactive materials and requiring his signature. Each new employee is given a lecture on radiation safety by Mr. Sinke. Safety meetings are held every two weeks. Included in these meetings are radiation safety lectures. All employees had recently viewed the film "Radiation In Perspective". Mr. Sinke uses training material of the Robert A. Taft courses.
- ✓22. When asked by the AEC representatives if film badges are provided to outside contractors doing work in the facility, Mr. Sinke stated that this had been done on occasion, but the usual practice is to perform a radiation survey in the area prior to beginning of work. At the time of this inspection, outside contractors were in the process of drilling a well on the site and were not badged.

RADIOLOGICAL SAFETY PROCEDURES

- ✓23. No radiological safety procedures are written as one specific manual. However, Mr. Sinke stated that each operation has definite procedures written as necessary to insure safe and correct operating procedure. Included in these instructions are procedures which insure that the equipment will be operated in a manner that will minimize both the possibility of releasing gross amounts of radioactive airborne material and the possibility of creating high radiation levels. These procedures also inform personnel when respiratory protection is required. It is also the responsibility of the foreman to verbally instruct personnel to wear respirators at those locations when required.
- ✓24. The licensee provides rubber shoes, boots, gloves, splash goggles, raincoats, and hard hats. Shower rooms and wash-up areas are provided in conjunction with lunchrooms. The licensee provides five minutes at noon and fifteen minutes at the end of a shift for cleanup. The employees are instructed to bathe or wash thoroughly after their work shift. Mr. Sinke stated that in general most employees ~~do~~ shower and change clothes at the end of the work day.

✓18. (continued)

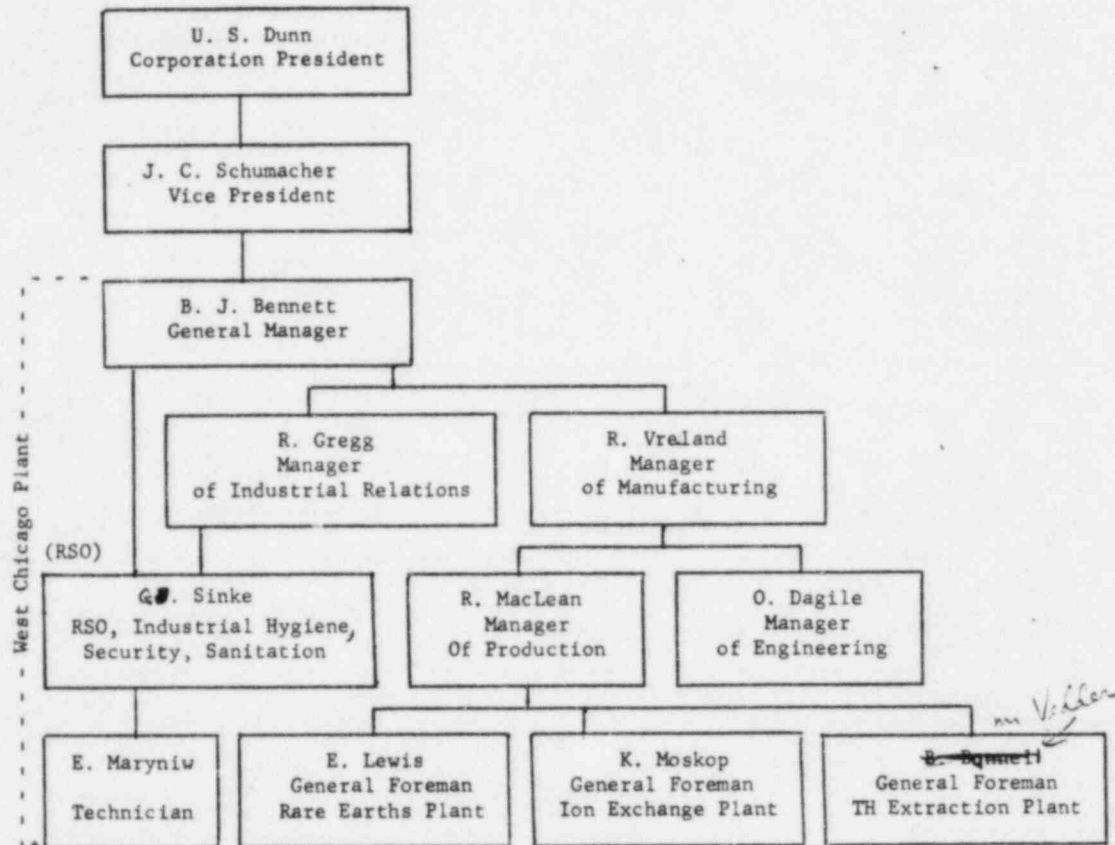
three general plant foremen for the Rare Earths Plant, The Ion Exchange Plant, and the Thorium Extraction Plant. These three men supervise the line foremen and the line workers.

- ✓19. The licensee has no Radiation Safety Committee. Mr. Theodore Fields, Radiological Physicist, Health Physics Associates, Limited, Highland Park, Illinois, is retained by the licensee on a consulting basis. Mr. Fields reviews the licensee's data, records, changes in process, and discusses up-to-date regulations on a quarterly basis.

ADMINISTRATIVE CONTROL

- ✓20. As RSO, Mr. Sinke has full responsibility for the health physics operations of the entire facility. ~~\_\_\_\_\_~~  
Mr. Sinke stated that he submits written monthly reports to Mr. Bennett, and frequently discusses various aspects of the plant operations relating to health physics practices. Mr. Sinke also has the authority to go directly to the licensee's control office in Los Angeles, if necessary. He has done this on occasions in the past. His most frequent method of administrative control is direct contact with the line foremen or one of the three general foremen. With this line contact, Mr. Sinke is able to control the amount of time during which workers are exposed to external radiation and/or airborne activity. Rotation of workers pose no problems. Workers are promoted according to the number of operations or machines in which they are skilled. Being a production plant, the primary method of controlling radiation exposure to employees is the philosophy of employee rotation rather than shutting down an operation. In the past, operations have been delayed or stopped. However, after years of operating and making changes, procedures and facilities are now fairly constant. Mr. Sinke stated that one recent change has been effected which improved not only production procedure, but also alleviated a past radioactive airborne problem. The twin shell blender (tumbler), originally installed in Building No. 1, has now been installed in Building No. 9 with improved air filtering features.

✓ 18. (continued)



Mr. Bennett, the General Manager of the West Chicago Plant reports to J. C. Schumacher, a corporation Vice President who has offices in Los Angeles but visits the West Chicago Plant frequently. Mr. Gerald Sinke is RSO. However, his primary duty is industrial safety. Mr. Sinke also has duties relating to security and sanitation. As RSO, he reports directly to Mr. Bennett, [REDACTED] to Mr. R. Gregg, Manager of Industrial Relations in capacities other than RSO. Mr. E. Maryniw is the Industrial Hygiene and Health Physics Technician. He devotes full time to this capacity while Mr. Sinke devotes approximately 20% of his time towards RSO duties. R. Vreland is Manager of Manufacturing. Mr. O. Dagile, Manager of Engineering, and Mr. R. MacLean, Manager of Production, report to him. Mr. MacLean in turn supervises [REDACTED]

- ✓14. Reinspection No. 4 conducted December 15, 16, and 17, 1964 revealed the following items of noncompliance:
- a. 10 CFR 20.201(a) "Exposure of Individuals to Radiation in Restricted Areas"
  - b. 10 CFR 20.201(b) "Surveys" (Airborne Concentrations)
  - c. 10 CFR 20.201(b) "Surveys" (Radiation Levels)
  - d. 10 CFR 20.203(e)(2) "Posting"
- ✓15. A follow-up inspection was conducted May 6, 1965 and revealed adequate correction of the specific items of noncompliance noted during the previous Reinspection No. 4.
- ✓16. During this Reinspection No. 5, it was further noted that the specific items of noncompliance as noted during Reinspection No. 4 had been adequately corrected as <sup>per the REPORT</sup> ~~noted~~ in the May 6, 1965 follow-up inspection report.

PROGRAM

- ✓17. The licensee's facilities consists of the West Chicago Plant of the American Potash and Chemical Corporation. The primary purpose of this plant is to produce thorium and rare earth <sup>elements</sup> from monazite sands. At the present time approximately eight tons of sand are processed each day on a one-shift operation. The maximum capacity of the plant is 25 tons per day. The sand is shipped to the plant from Africa, Florida, Malaya, and Georgia. The sand consists of approximately 45% rare earth oxides and 6% thorium oxides.

ORGANIZATION

- ✓18. Following is an organizational flow sheet for the West Chicago Plant of American Potash and Chemical Corporation:

DETAILS

GENERAL INFORMATION

- ✓ 9. This was an announced Reinspection No. 5 conducted December 14 and 15, 1966 and February 9, 1967 by C. D. Hampleman, G. A. Phillip, E. J. Moretti, and D. L. Foster. Mr. Bruce J. Bennett, General Manager, was notified by telephone of this forthcoming inspection on December 12, 1966.
- ✓ 10. Mr. Russ Courtney, Illinois State Health Department, was notified by telephone December 12, 1966 of this inspection. The AEC representatives were not accompanied during this inspection.
- ✓ 11. The following persons were interviewed during this inspection:
  - Mr. Bruce J. Bennett, General Manager
  - Mr. Gerald Sinke, Safety Engineer and RSO
  - Mr. Edward Maryniw, Radiation Hygienist, (Technician)
  - Mr. Robert K. Cavins, Manager-Marketing

INSPECTION HISTORY

- ✓ 12. Reinspection #2 conducted April 19 and June 2, 1961 revealed four items of noncompliance as follows:
  - a. 10 CFR 20.201(b) "Surveys"
  - b. 10 CFR 20.203(d)(2) "Posting"
  - c. 10 CFR 20.206(c) "Employee Instruction"
  - d. 10 CFR 20.401(b) "Records"
- ✓ 13. Reinspection #3 conducted on April 30 and August 16, 1962 revealed four items of noncompliance as follows:
  - a. 10 CFR 20.101(a) "Exposure of Individuals to Radiation in Restricted Areas"
  - b. 10 CFR 20.103 "Exposure of Individuals to Concentrations of Radioactive Materials in Restrictive Areas"
  - c. 10 CFR 20.105(b)(2) "Radiation Levels"
  - d. 10 CFR 20.201(b) "Surveys"

American Potash & Chemical Corp.  
West, Chicago, Illinois 60185  
License No. STA-583  
December 14 & 15, 1966  
& February 9, 1967

HEALTH PHYSICS ANALYSIS

It is the opinion of the AEC representatives that this licensee's Health Physics Program can be considered to be acceptable.

No whole-body exposures in excess of 10 CFR 20.101(a) have occurred since 1964. It appears that the licensee has recently been able to control these exposures. This control was without doubt achieved by a good system of record keeping combined with strict attention given to accumulated exposures. Weekly film badges are used and all accumulated exposures are listed on a form which is distributed to the line foreman and other supervisors, including the plant manager. At the present time, all film badges are enclosed in plastic covers. This has eliminated any high readings which might have been originally due to contamination of the badge. With the present use of plastic holders for film badges, the licensee may now be considerably certain that any readings are valid and are not subject to contamination.

Airborne concentrations of thorium continue to be above mpc during certain plant operations, however, the licensee has been able to perform time weighted studies which indicate that no personnel have been exposed to mpc amounts of airborne activity during any seven consecutive days. At any time that personnel are present in an area with airborne thorium concentration above mpc, the licensee records the concentration, the employee's name, time and the area, and the fractional percent of forty mpc hours. The licensee's records showed that no personnel had been exposed to the equivalent of forty mpc hours during any seven consecutive



REPORT COMPILED SHEET

Identifying Information

Type Report

(circle)  
591 592

- ✓1. Licensee American Potash & Chemical Corporation  
✓2. Address 258 Ann Street  
West Chicago, Illinois 60185  
✓3. License No(s) STA-583  
✓4. Date of Inspection December 14 & 15, 1966 & February 9, 1967  
✓5. Inspector Carroll D. Hampleman, David L. Foster, G. A. Phillip, E. J. Moatti  
✓6. Status of Compliance Noncompliance

Items of Noncompliance

- ✓7. Section of Regulation or License Condition
- |                        | Details Paragraph:  |
|------------------------|---------------------|
| A. <u>20.105(b)(2)</u> | A. <u>63 AND 65</u> |
| B. _____               | B. _____            |
| C. _____               | C. _____            |
| D. _____               | D. _____            |
| E. _____               | E. _____            |
| F. _____               | F. _____            |
| G. _____               | G. _____            |

Classified Information

- ✓8. This report contains classified or business confidential information.  
Yes No

Carroll D. Hampleman 2-16-67  
Inspector Date

EJH 2-17-67  
Reviewer Date