Form AEC-317
(Rev. 58)

UNITED STATES ATOMIC ENERGY COMMISSION

COMPLIANCE INSPECTION REPORT

1. Name and address of licensee
Mallinckrodt Chemical Works
Second & Mallinckrodt Streets
St. Louis 7, Missouri

2. Date of inspection
January 11, 13, and 14, 1960

3. Type of inspection Initial

4. 10 CFR Part(s) applicable
20 and 40

5. License number(s), issue and expiration dates, scope and conditions (including amendments)

License No.	Date	Expiration	Scope and Conditions
R-226 Amend. No. 1	4-1-59	3-31-60	Licensed to receive possession of and title to uranium concentrates at Euxenite plant for processing. Licensed to transfer and deliver possession of and title to refined source material to any person licensed by the AEC, within the limits of his license. Permitted to incinerate waste containing source material in accordance with the procedures described in letters dated October 2, 1958, January 30, 1959 and March 5, 1959. Required to maintain records of inventories, receipts and transfers of refined source material. License is subject to all the provisions of the Atomic Energy Act of 1954 now or hereafter in effect and to all valid rules and regulations of the U. S. Atomic Energy Commission, including 10 CFR 20, "Standards for Protection Against Radiation."

6. Inspection findings (and items of noncompliance)

The licensee's program involves the processing of a uranium, rare earth and thorium bearing ore, euxenite. The licensee began processing the ore in 1956 and expects to discontinue processing the material about February 1960. The process was designed to extract columbium and tantalum with uranium occurring as a byproduct. The last of the uranium is expected to be shipped by March 1, 1960, and all the columbium and tantalum is expected to be shipped by June 1, 1960. The licensee tentatively plans to then devote the euxenite facility to processing columbite ore which is not thought to contain amounts of radioactivity that require licensing. The licensee's radiological health and safety program is directed by Mr. J. W. Miller, Head, Industrial Hygiene Department. Mr. Miller's training, experience, and knowledge impressed the inspector as being adequate to competently conduct a satisfactory radiation safety program. Records of material receipts, waste disposals, and transfers are maintained. Radiation surveys have been made and a record maintained of the survey findings. Personnel exposures to external radiation is monitored with a film badge program and a record of the film readings is kept. Licensee's plant areas and containers are posted as required by 10 CFR 20.203 (c)(1), (e)(2), and (f)(2). Although deficiencies exist in the licensee's radiation safety program, effective and positive action has been taken to correct the causative conditions except in the case of concentrations in licensee plant effluent that have exceeded the limits of 10 CFR 20.

(continued on reverse side)

7. Date of last previous inspection
None

8. Is "Company Confidential" information contained in this report? Yes ☐ No ☒
(Specify page(s) and paragraph(s))

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FOIA- 2005-0141

William W. Peery
William W. Peery
(Inspector)

Approved by Jack T. Sutherland
Jack T. Sutherland
Oak Ridge Operations Office
(Operations office)

February 1, 1960
(Date report prepared)

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If additional space is required for any numbered item above, the continuation may be extended to the reverse of this form using foot to head format leaving sufficient margin at top for binding, identifying each item by number and noting "Continued" on the face of form and appropriate item.

RECOMMENDATIONS SHOULD BE SET FORTH IN A SEPARATE COVERING MEMORANDUM

- Inspection findings (and items of noncompliance) (continued):

The only items of noncompliance observed or otherwise noted during the course of this inspection are as follows:

10 CFR 20.101 Exposure of individuals in restricted areas.
(a)(2)(i)(ii) Exposure to radiation. Licensee film badge records indicate that licensee personnel have received exposures in excess of the limits of the above section of the regulations (see paragraphs 27 through 29 of report details).

(b) Exposure to radiation. Licensee records indicate that personnel have received exposures to airborne radioactive material in excess of the limits of this section of the regulations (see paragraphs 31 through 33 of the report details).

10 CFR 20.303 Disposal by release into sanitary sewerage systems.
(b)(1),(c),(d) Licensee records indicate that licensed material discharged to the sanitary sewer system has exceeded the limits set forth in this section of the regulations (see paragraphs 34 through 36 of report details).

10 CFR 20.403 Notifications and reports of incidents.
(c) Thirty-day reports. The licensee did not report personnel exposures in excess of the limits of 10 CFR 20.101 as required by this section of the regulations (see paragraph 29 of report details).

10 CFR 20.105 Measures to be taken after excessive exposures.
The licensee did not follow exact steps to be taken after excessive personnel exposures as required by this section of the regulations (see paragraph 29 of report details).

DETAILS

I. GENERAL

9. On January 11, 13, and 14, 1960, an initial announced inspection was made of the source material activities being conducted, under License No. R-226, by the Mallinckrodt Chemical Works at Second and Mallinckrodt Streets, St. Louis, Missouri.

10. Licensee personnel interviewed and furnishing information during the inspection are as follows:

    Mr. C. W. Swartout, Manager of Operations
    Mr. D. P. March, Euxenite Area Superintendent
    Dr. G. W. Tompkin, Manager, Research and Development
    Mr. Arthur C. Schemer, Process Engineer
    Mr. J. W. Miller, Head, Industrial Hygiene Department

11. The inspection was conducted by W. W. Peery, Inspection Division, OROO, accompanied only on the afternoon of January 11, 1960, by Mr. John Sears, Inspection Division, NEOO.

II. ORGANIZATION

12. The Mallinckrodt Chemical Works is one of the older chemical companies in this country and one of the first commercial producers of uranium feed material. The company is a prime contractor of the U. S. Atomic Energy Commission and operates the Commission's uranium refinery plant at Weldon Springs, Missouri. Mallinckrodt also formerly operated a similar plant for the WEAMC on Destrehan Street, St. Louis, Missouri. The Mallinckrodt Chemical Works has also been issued Source Material Licenses Nos. C-2731 and D-217 and Special Nuclear Material License No. SNM-276. On January 1, 1959, the Mallinckrodt Chemical Works transferred all special nuclear material activities conducted at the Hematite plant to a wholly-owned subsidiary, the Mallinckrodt Nuclear Corporation, which has been issued Special Nuclear Material Licenses Nos. SNM-33 and SNM-230 and Source Material License No. C-4495.

    Gulf Rd Area

13. The licensee is a stockholder company having seven major operating groups of which two are the Operations Division and the Uranium Division. The Operations Division is responsible for the activities conducted under R-226 while the Uranium Division conducts the contract operation of the Commission-owned facility in Weldon Springs. Mr. J. M. Moore is Vice President in charge of the Operations Division. Mr. C. W. Swartout, Operations Manager, reports to Mr. Moore. The Manufacturing Department of the Operations Division conducts the program involving the actual processing done under License No. R-226. Dr. J. M. Jones is Manager of the Manufacturing Department. Mr. D. P. March is Process Superintendent, reporting to Dr. Jones. Three process engineers and five foremen report directly to Mr. March. Other personnel involved in the program include 3 engineers, 3 laboratory technicians, 26 operators, 1 mechanic, 1 clerk, and 3 transient employees.

14. Mr. J. W. Miller, Head of the Industrial Hygiene Department, Mallinckrodt Chemical Works, conducts a radiation protection

program which includes various phases of personnel and area radiation monitoring. Mr. Miller reports directly to Vice President Moore and he is also responsible for the radiological health and safety program of the Mallinckrodt Nuclear Corp. at Hematite, Missouri. Mr. Miller has 2 technicians, 1 secretary, and 1 clerk working in the industrial hygiene program. Mr. Miller is a chemical engineer by academic training and he was employed as an industrial hygiene engineer from 1950 to 1954 by the St. Louis County Health Department. During the period from 1954 until September of 1956 he was employed by Mallinckrodt's Uranium Division as an Industrial Hygienist. Since September 1956 to the present time he has been working for the Mallinckrodt Chemical Works.

III. PROCESS AND PROCEDURES

15. The licensee's activities under License No. R-226 involve the processing of a uranium, rare earth and thorium bearing ore, euxenite. The ore is shipped to St. Louis from a mill which belongs to the Porter Brothers Corporation. The mill is located in Bear Valley, Idaho. Mallinckrodt processes the ore for Porter Brothers to recover the uranium which Porter Brothers sells to USAEC. Some byproducts from the process containing thorium and rare earths are furnished by Mallinckrodt to the General Services Administration. The GSA holds Source Material License Nos. D-195 and C-4223 and stores the thorium and rare earths at the U. S. Army Engineering Depot, Granite City, Illinois. There is question as to who has title to non-licensable materials that are byproducts of this process, some of which contain Ra-226. These materials are currently stored by Mallinckrodt at the euxenite plant.

16. The licensee began processing euxenite ore in March of 1956 and the current contract will end in June 1960. However, it was learned that the last of the euxenite ore to be processed, at present time, for Porter Brothers has been charged into the process and the processing of this last batch is expected to be completed about the first of February. It is tentatively planned that the euxenite process equipment will be cleaned and the processing of columbite ore will be started in the facility in the near future. The columbite is not expected to contain amounts of radioactivity that require licensing. No uranium is expected to be in the plant after March 1, 1960. All columbium and tantalum is expected to be shipped by June 1, 1960.

17. An effective accountability program is in effect which reflects receipts, losses, on hand and transferred or shipped licensed materials. The euxenite ores are assayed by Porter Brothers and Mallinckrodt. A clerk, who reports to Mr. Murch, makes a monthly input-output inventory. A more detailed inventory at six-month intervals is also made which involves sampling and analysis of process equipment contents. Mallinckrodt is generally able to maintain a 90% yield for the Porter Brothers finished product and under the contract over 90% yield results in a bonus and under 90% draws a penalty for Mallinckrodt. The finished product is assayed by Mallinckrodt and Porter Brothers from the same sample. The National Bureau of Standards serves as referee if differences arise. Approximately 95-96% uranium recovery is realized from the process. Losses are said to be attributed to six sources as follows: (1) Columbium-Tantalum product; (2) rare earth thorium cake; (3) press wash water; (4) sump liquors; (5) dusts to filters; and (6) incinerator ash. The product lost from

the process to (4), (5) and (6) are recycled when analysis shows product content warrants saving. Total unaccountable losses are approximately 0.5%. To give meaning to the above quoted percentages, representative processing figures show that for the first three years 3,360,017 pounds of ore were processed with about 247,303 pounds of uranium and 235,299 pounds of thorium being shipped for the same period. Analysis of the concentrates show approximately 1 curie of activity per 6,000 pounds of ore which is said to be 0.6 curies of alpha activity and 0.4 curies of beta activity.

18. The licensee's euxenite process was designed primarily to extract columbium and tantalum. However, thorium, uranium, rare earths, titanium and silicon occur as byproducts of the process. The titanium and silicon are considered wastes while the uranium, thorium and rare earths are drummed and transported to Weldon Springs, Missouri, and Granite City, Illinois, by commercial truck.

19. The process is almost entirely one of wet chemistry except the charging of dry ore into the first steps of the process and the drying of concentrates. The handling of ashes from the incinerator is also a potential dust problem. Masks are worn for the potential airborne activity problem areas. Radium undergoes chemical separation at one point in the process. Some process equipment is coated with rubber to protect it against the corrosive action of chemicals used in the process. The chemical form of the separated radium seems to have an affinity for the rubber coating. This results in an accumulation of amounts of radium and daughters on the interior of the process tanks and the sides of filter presses that creates levels of radiation higher than those normally encountered for the remainder of the process area. In an attempt to reduce the radium collections and thereby reduce radiation levels, polyethylene has been used to replace the rubber liners in earth-acid filter presses which reduced the radium deposition; however, other properties of the polyethylene have not been completely investigated to be sure that it is suitable enough to be widely used for this particular purpose. Various leaching agents have been used in an attempt to remove the radium from the filtrate tanks, thorium, rare earth and uranium residue vessels located on the first floor of Building 230. No acceptable results were seen from the leaching attempt. A program was initiated to clean the tanks by simple scrubbing. Radiation measurements were taken on the various tanks involved using partially shielded dosimeters to determine which tanks make the major contribution to the radiation level so that cleaning efforts could be concentrated on the main offenders. The tanks have been cleaned twice. Mr. Miller stated that a 50% reduction in radiation readings on the tanks had been realized.

20. The licensee receives the euxenite ore from Porter Brothers by railway freight in 500 pound barrels. The ore is unloaded within the licensee's restricted area and the empty barrels are returned to Porter Brothers in the same railway cars in which the licensee received them.

21. Written radiological health and safety instructions have been formulated for daily routine process activities as well as for specific operations that require special precautionary procedures to insure radiation safety. For example, special instructions are expected to be followed in the operation of the incinerator. Mr. Miller stated that written copies of radiation safety instructions are given to supervision and he directs his efforts

toward educating and familiarizing supervision with the safety procedures. Supervision has the responsibility for educating their personnel in the written procedures and training them to routinely follow the procedures in their jobs. Mr. Miller stated that employee compliance with radiation safety procedures has been satisfactory. Mr. Miller indicated that management has given him the necessary support to enforce radiation safety procedures through uranite plant supervision.

IV. FACILITIES

22. The licensee's plant is located in an industrial area of northeast St. Louis, Missouri, and is situated along the Mississippi River near the McKinley Bridge. The major part of the processing equipment is located in a two-story building which is designated as Building 238. Attached to this building is a blender room, a "crusher" unit and a gas fired furnace. The uranite building is approximately three-sixteenths of a mile from the Mississippi River and is surrounded by other licensee buildings. Residues, unreacted ores and ashes are stored on a fenced concrete pad adjacent to the uranite building. Some of the uranite plant streets and concrete storage pads of buildings adjacent to the uranite building are used as storage areas for raw ore and final product. The nearest uncontrolled public area is Destrehan Street which is approximately 150 feet north of the plant.

23. Radiation survey instrumentation and other equipment available for use in the licensee's program include the following:

2	Nuclear Measurements Proportional Counters
2	Victoreen Model 356 Alpha Survey Meters
2	Technical Associates Juno Survey Meters
2	Victoreen Thyac G.M. Survey Meters
1	End Window Attachment for Proportional Counters
8	Gast Air Sampling Pumps with Attachments
1	6-volt Gelman Portable Air Sampler
45	Pocket Ion Chambers
1	Victoreen Pocket Chamber Minimeter

24. Licensee employee Richard Rogers, electronics technician, performs maintenance on the survey instrumentation and routinely calibrates most instruments on a quarterly basis and others on a semiannual frequency. The instruments are gamma calibrated with a radium source that has been calibrated by the National Bureau of Standards. Mr. Miller stated that for beta calibration the instruments' beta response has been assumed to be near enough to linear with the gamma response to be acceptable. Operable survey instruments are said to be set aside for emergency or incident situations.

25. Complete protective clothing is furnished by the licensee to operating personnel. Clothing includes underwear, coveralls, shoes, caps and gloves. Research personnel and visitors are supplied laboratory coats and shoe covers. There are two separate clothing change rooms for operating personnel. The two change rooms are separated by a shower room so that operators can change company clothing in one room, shower and change personal clothing in the other. All company clothing is prelaundered before being sent out to a commercial laundry. Mr. Miller stated that pre-laundry wash water has not been monitored but that it is not expected to significantly contribute to the radioactivity concentrations in the over-all plant effluent.

V. RADIATION MONITORING

26. Routine biweekly radiation surveys are made of the general uranium processing and storage areas. Records of the survey results are maintained in the form of floor plans, with pertinent process equipment, on which survey readings are recorded. Transferability of surface contamination is not checked by smears; however, general housekeeping in the plant appeared good. The survey records indicate that areas of highest potential personnel exposure involve the rubber lined process equipment where radium has collected and storage drums containing incinerator ash and unreacted ores. Representative readings at above locations show radiation levels at contact with side of equipment in range of 20 mr/hr to 360 mr/hr. Miscellaneous readings on equipment such as raw ore, rare earth and thorium drums range from 2.5 to 28 mrad/hr. The areas of highest potential personnel exposure are either generally inaccessible to personnel or are areas that do not require continual presence of personnel. The recorded readings for the general process area ranging from less than 2.5 mr/hr to 40 mr/hr represent the radiation levels that the uranium plant personnel are exposed to the majority of the time. The 2.5 mr/hr level is lowest recorded reading for the purpose of expediency and readings to 40 mr/hr are isolated cases where personnel do not spend appreciable time. Records of independent surveys of the incinerator facility indicate contamination levels to 50,000 d/m/m² for the area immediately in front of incinerator. However complete protective clothing, including respirator, is worn by personnel during work around the incinerator. ?

27. The licensee's uranium plant operating personnel exposures are monitored with film badges that are processed weekly by the licensee. Previously, the licensee used a film badge service which was furnished by the St. John's Laboratory; however, the service was not considered satisfactory and was therefore discontinued. The licensee now has his own film badge program and uses a stainless steel film badge with open window and shielded film readings. The film are developed and read on a densitometer in a dark room facility located in the plant medical department. A National Bureau of Standards radium source is used for gamma calibration of film and a natural uranium source is used for beta calibration. The film badge program is said to be patterned after the program developed by the licensee's Uranium Division and currently in effect at the AEC's Weldon Springs plant. Pocket ion chambers are available for use in specific radiation measurement problems but are not used routinely for personnel monitoring. Comprehensive and adequate personnel exposure records are maintained that reflect weekly, quarterly, yearly and weekly-accumulative exposures to each individual. Quarterly exposure records are distributed to management by Mr. Miller. Each individual's exposure card also shows airborne radioactivity exposures, urinalysis and blood count results.

28. The weekly film badges are routinely furnished to 35 operating personnel of which 2 are laboratory personnel. Approximately 125 maintenance personnel are subject to spending limited, infrequent periods in the uranium plant and of this number only about 4 to 5 will work in the uranium plant at the same time. These badges are processed on a monthly basis.

29. Personnel exposures, as reflected by the records, may be summarized as follows:

Exposures to licensee personnel that have exceeded limits set forth in 10 CFR 20 are:

Name	Quarter	Maximum Quarterly Exposure	Maximum Weekly Exposure
	2nd - 1958	3210 mrem	900 mrem
	3rd - 1958	3020 "	500 "
	4th - 1958	3110 "	425 "
	1st - 1959	3210 "	960 "

Ex. 6

The above quarterly personnel exposures were received as accumulative day-to-day operating exposures and as indicated by the maximum weekly exposures are not attributable to any single abnormally high incident type exposure. Mr. Miller stated that the four quarterly and one weekly exposures that exceeded the limits of 10 CFR 20.101 were discussed with D. C. Hubbard, CHOO, at the time of another visit in April of 1959. Mr. Miller stated that the discussion with Mr. Hubbard dealt with the reporting requirements of 10 CFR 20.403. Several personnel exposures fluctuated slightly above and below the permissible 300 mrem weekly dose allowed by 10 CFR 20.101(a)(1) but in these cases the permissible 900 mrem/7 consecutive day and 3000 mrem/13 consecutive week limits were not exceeded as permitted by 20.101(a)(2). The personnel exposures in excess of 10 CFR 20.101(a)(2) were discussed with Mr. Miller and he stated that these exposures are attributed to the gamma radiation created around rubber lined process equipment as a result of the previously described radium collections on the rubber liners. The exposure records show no personnel exposures in excess of the limits in 10 CFR 20 for soft radiation. Mr. Miller stated that rotation of personnel, the use of polyethylene in processes and the cleaning of rubber lining in other process equipment have been done as corrective measures for excessive exposures. The effectiveness of these measures can perhaps be judged by the fact that no exposures in excess of 10 CFR 20 limits are reflected in the records since the first quarter of 1959 and while there were three overages in 1958 there was only one in 1959. Mr. Miller did not initiate corrective measures for the specific purpose of holding excessive exposures to above personnel at levels required by 10 CFR 20.105. However, the corrective action which was taken did bring personnel exposures back within permissible limits of 10 CFR 20.101. ?

30. Licensee uranite plant operating personnel submit urinalysis samples on a 3 - 6 months basis depending on job assignment. Records of urinalysis results since 1957 show a high of 329.9 d/m/l uranium a and an average of 3 - 5 d/m/l a as compared to a 45 d/m/l tolerance for such samples. Mr. Miller stated that in all cases where the count exceeded tolerance the individual involved has been required to re-sample under direct supervision to lessen the probability of sample contamination. The concentration under controlled sampling conditions has always decreased to below the permissible 45 d/m/l concentration.

31. Airborne radioactivity studies have been made of the general air concentrations in the uranite plant and breathing zone samples taken for evaluation of airborne activity exposures of individuals on specific jobs. Approximately three months is devoted to each study for reliability of data. The studies have also taken into consideration the seasonal variation factor. The more general sampling programs have been carried out on about a two year frequency while studies of specific problem areas have been more frequent. Process foremen submit a weekly record to Mr. Miller of each uranite process individual's job assignments for the week and these data along with a factor developed from the over-all air concentration exposure data are used to assign an airborne activity exposure to the individual's record for the week involved. It appears that the approach to problems of airborne radioactivity

concentrations has been to isolate and ventilate to outside atmosphere any areas of potential airborne problems. The licensee has established an implant tolerance of 70 d/m/m³ as compared to the 10 CFR 20 limit of 110 d/m/m³ for natural uranium which is equivalent to the 10 CFR 20 Appendix B limit of 5×10^{-11} μc/ml. Samples are allowed to age 4 days before counting.

32. Air samples have been taken of incinerator exhaust gases and a record of the results for 7 samples taken from 12-4-58 to 4-1-59 show average gross activity of 2.54×10^{-9} μc/ml alpha and 4.13×10^{-9} μc/ml beta. Mr. Miller indicated that the study has not been completed and that the samples were taken from a 4 inch pipe which leads from the incinerator to the stack. The stack is 18 inches in diameter and approximately 60 feet high. The effluent from the top of the stack would be appreciably diluted at the point of exit to atmosphere. Samples were taken of the ammonia plant and other licensee plant areas to determine air concentrations resulting from stack effluents. Maximum fall out from the incinerator stack was expected to occur within the area sampled. During the period from 9-17-58 to 10-1-58 eleven samples showed an average of 0.5 d/m/m³ gross alpha activity as compared to 11 d/m/m³ permissible concentration applied by licensee to area monitored. In addition, during period from June 16 to July 9, 1959, areas adjacent to the ammonia plant were sampled and results showed an average concentration of 0.5×10^{-12} μc/ml alpha. Sampling techniques took into consideration pertinent factors such as prevailing winds.

33. Records reviewed showed that during the period from December 1958 through August 1959 four individuals received exposures in excess of the permissible limit of 10 CFR 20 of 5.0×10^{-11} μc/ml alpha for 7 consecutive days. The exposures ranged from 5.4 μc/ml to 6.3 μc/ml alpha activity for 7 consecutive days; however, any 7 consecutive days chosen from the weeks before and after the 7 consecutive exposure days would show an exposure less than 10 CFR 20 limits. All other airborne activity exposures were reported as less than the 10 CFR 20 permissible limit of 5.0×10^{-11} μc/ml alpha. Mr. Miller stated that personnel are now rotated more frequently in areas of higher airborne radioactivity concentrations. In addition, in areas of higher concentration personnel wear independent positive air hoods (Reese hoods). However, no attempt is made to consider the effect of the air hoods in establishing personnel exposures and it was understood that as far as Mr. Miller's program is concerned the hoods are an added safety factor.

Info correct from Sutherland 2/24/60 REC

34. Liquid effluent from the licensee's ammonia plant has been sampled with grab samples from the sewer through which all effluent, from the ammonia plant proper as well as effluent of remainder of the licensee's plant facilities at Second and Mallinckrodt Streets, flows to the Mississippi River. Sampling data reviewed for the period from 3-31-59 to 9-21-59 show that more recent sampling was done on a weekly basis. Noncontinuous sampling of the effluent has been made. Records of effluent samples show the following:

		Average μc/ml Alpha & Beta	Alpha
33 samples	8-8-58 to 3-16-59	18.6×10^{-7}	1×10^{-6}
22 samples	3-31-59 to 9-21-59	102.4×10^{-7}	46.6×10^{-7}

The 10 CFR 20 permissible concentration value of 1×10^{-7} μc/ml for unidentified mixtures of alpha and beta emitters discharged

to an unrestricted area is applicable to the licensee's effluent monitoring values. Sample results for grab samples taken near point of entry of licensee effluent into the Mississippi River are as follows:

	Gross Activity µc/ml	
	Alpha	Beta
200 yards above outlet	None detectable	None detectable
100 yards below outlet	1.44×10^{-7}	" "
150 yards below outlet	3.68×10^{-7}	" "

Mr. Miller made some hasty calculations on total curies of alpha and beta activity discharged by the licensee facility during 1959 and it appears that the 1 curie limit of 10 CFR 20.303(d) has been exceeded by a factor of about 5.

35. Noncompliance of the licensee's program with 10 CFR 20.303, Disposal by release into sanitary sewerage systems, was discussed with Messrs. Swartout and Miller. Mr. Swartout stated that thought has been given to possible solution to the problem, namely, (1) chemical removal of radioactivities in the process or just prior to disposal; (2) additional dilution of the effluent stream to decrease concentration per unit volume to acceptable limits by introducing into the effluent, just before it empties into the Mississippi, additional water taken from the Mississippi above the point of discharge of the effluent to the river; and (3) additional dilution of concentrations by fencing an area of the Mississippi river at the point of effluent discharge to the river. Mr. Swartout stated that it was realized that the best approach to the problem would be the actual removal of radioactivities from the effluent. The inspector agreed with this philosophy and further pointed out that approach (2) and (3) above were not desirable for the reason that dilution of the effluent would not decrease to amounts below the 1 curie yearly total allowed by 10 CFR 20.303(d). In addition, it was pointed out that the dilution of the effluent by the addition of water above the discharge to an unrestricted area was not in keeping with the purpose of the regulations in promoting the health and safety of the public. Further, it was pointed out that fencing of the Mississippi River in an area around the effluent discharge to gain dilution was an unsatisfactory approach also since licensee control of such a situation is questionable.

36. Incidental to waste disposal data is information as follows:

(1) Cleaning solutions from rubber lined tank 332-2 were analyzed and found to contain gross radioactivities reflected in the following data:

Solution

5-28-58	Gross Alpha 9.32×10^{-3} µc/ml Gross Beta 1.41×10^{-2} µc/ml
6-1-59	Gross Alpha 1.5×10^{-2} µc/ml Gross Beta 4.7×10^{-3} µc/ml

Scale from Inside Tank

Gross Alpha 7.9 µc/g
Gross Beta 6.4 µc/g

Each tank contained approximately 1,000 gallons of solution and 4 tanks have been cleaned twice for a total of approximately 8,000 gallons of solution containing orders of magnitude of radioactivity indicated in the data from the above two samplings.

(2) Dilution in the licensee's effluent comes from the concrete plant and other plant facilities on Destrehan Street. The total effluent volume is said to be 1,230,000 gallons/day.

VI. POSTING

37. Licensee plant areas are posted as required by 10 CFR 20.203(c)(1) and (e)(2). Storage and shipping containers are labeled as required by 10 CFR 20.203(f)(2).