Type [illegible]: This material was made into the following lots. Some of the additional material came from type 206, 288 and 290 material. All of these lots are remelt material after pickling and/or de-cladding.

1K-207-0101	Box #1	812 pounds	Slugs with small amounts of residual clad
	#2	818	
	#3	821	
	#4	816	
	#5	826	
	#6	837	
	#7	805	
		5,735 pounds	
1K-207-0102	Box #1	379 pounds	Slugs with large amounts of residual clad
	#2	383	
	#3	412	
	#4	350	
	#5	383	
	#6	387	
	#7	380	
	#8	412	
	#9	398	
		3,484 pounds	
1K-207-0103	Box #1	716 pounds	Slugs with thick aluminum clad
	#2	366	
	#3	446	
		1,528 pounds	
1K-207-0104	Box #1	494 pounds	Miscellaneous size slugs and pieces
1K-207-0201	Drum #1	1,159 pounds	Duds
	#2	835	
	#3	997	
		2,991 pounds	
1K-207-0301	Drum #1	988 pounds	Billets and billet pieces
	#2	900	
	#3	849	

[illegible]	Drum #4	1,036	pounds	
	#5	970		
	#6	1,031		
	#7	341		
		6,115	pounds	
1K-207-0302	Drum #1	741	pounds	Billets from ISC
	#2	722		
		1,463	pounds	
1K-207-0401	Drum #1	893	pounds	Electrodes
1K-207-0501	Drum #1	1,046	pounds	Solid scrap, rod ends, buttons, crops, pieces, etc.
	#2	840		
	#3	1,223		
	#4	1,215		
	#5	500		
		4,824	pounds	
1K-207-0601	Drum #1	384	pounds	Clean flats and solids
	#2	830		
	#3	1,062		
		2,276	pounds	

Type 208: This material was made into two lots. Both lots of material are good remelt metal after pickling.

1K-208-1001	Drum #1	414	pounds	Clean crops
	#2	1,133		
	#3	940		
	#4	1,104		
		3,591	pounds	
1K-208-2001	Drum #1	1,227	pounds	Crops
	#2	868		
		2,095	pounds	

Type 210: These briquettes were left intact but they were recoded. They

are very good briquettes that were made by SYL. (RF-210-2012)

1X-210-1001 24 boxes 3,256 pounds

Type 211: All of this material was redrummed. The change in metal weight was due to oxidation or corroding of the metal to a sludge. None of this material can be used as remelt metal and it should be burnt at Plant 6 thorium furnace. Some of the material came from 207, 249, 270, 271, 273, 286, 288, 289, 290 and 293.

1X-211-0101	Drum #1	443	pounds	Small, corroded pieces (fist size and under)
	#2	711		
	#3	676		
	#4	901		
	#5	850		
	#6	672		
	#7	713		
	#8	448		
	#9	410		
	#10	399		
		6,123	pounds	

1X-211-0201	Drum #1	620	pounds	Medium, solid, corroded, spongy, prilly, spill metal pieces
	#2	719		
	#3	702		
	#4	755		
	#5	597		
	#6	734		
	#7	642		
	#8	712		
	#9	500		
	#10	713		
	#11	770		
	#12	612		
	#13	924		
	#14	1,038		
	#15	1,056		
	#16	350		
	#17	761		
	#18	573		
	#19	274		
	#20	545		
	#21	315		
	#22	823		
		14,735	pounds	

1K-211-0301	Drum #1	906	pounds	Large massive spongy, corroded pieces. (larger than a coconut)
	#2	987		
	#3	902		
	#4	737		
	#5	760		
	#6	650		
	#7	857		
	#8	593		
	#9	696		
	#10	585		
		7,673	pounds	
1K-211-0401	Drum #1	826	pounds	Solid dense pieces
	#2	723		
	#3	783		
	#4	801		
	#5	891		
		4,024	pounds	
1K-211-0501	Drum #1	630	pounds	Clad pieces
	#2	859		
	#3	317		
	#4	962		
	#5	742		
		3,510	pounds	
1K-211-1001	Drum #1	1,046	pounds	Derby pieces slightly corroded and oxidized
	#2	1,164		
	#3	1,082		
	#4	1,102		
		4,394	pounds	
1K-211-1002	Drum #1	968	pounds	Derby pieces corroded and oxidized
	#2	952		
	#3	919		
	#4	1,070		
	#5	997		
	#6	1,278		
	#7	1,110		
	#8	1,188		
	#9	1,081		
	#10	961		
	#11	1,308		
		11,832	pounds	

1K-211-1003	Drum #1	202 pounds	Derby pieces high corroded
	#2	701	
	#3	437	
	#4	664	
	#5	933	
	#6	945	
	#7	1,061	
	#8	1,052	
	#9	988	
	#10	1,147	
	#11	933	
	#12	744	
	#13	1,169	
	#14	769	
	#15	759	
		12,560 pounds	

1K-211-2001	Drum #1	841 pounds	Corroded briquettes
	#2	1,076	
	#3	735	
	#4	824	
	#5	953	
	#6	677	
		5,106 pounds	

Type 214: This material was redrummed.

1K-214-1001 421 drums 134,763 pounds

I believe the assay of this material should be less than stated on the tab run.

Type 216: This material was redrummed.

1K-216-1001 1,234 drums 370,069 pounds Original sump cake

Type 224: This material is intact and consists of a number of sample bottles in one drum. This drum was not weighed.

1K-224-1001 1 drum Not weighed

Type 226: Delete - This material was in an acid or organic solution and was being neutralized with dolomite. Many of the stainless steel drums were leaking and the material in these drums has crystallized or salted out. There was a definite loss of weight on this material and approximately nine drums (55 gallon) of liquid TNT leaked out and was lost to the storm sewer. The material is being recoded to 1K-216-2001 and will be discarded to some off site burial area, there were 167 drums that were discarded.

Type 236: This material was left intact but redrummed into the following lots:

1K-236-1001	24 drums	9,827 pounds	Bad material
1K-236-2001	13 drums	5,899 pounds	Clean dry
1K-236-2002	18 drums	8,564 pounds	Clean damp

Type 238: All of this material is a product from Plant 9 and should be good metal grade material. Both remaining lots are intact.

Type 242: All of this material is a product from Plant 6 thorium oxidation furnace.

I have the approximately spec and analyses of each lot.

Type 243: Delete - This material was sent to Plant 6 thorium furnace for oxidation. This material was quite corrosive and there was a large loss of this residue to the storm sewer.

Type 249: This material was redrummed, recoded and made into the following lots. This material can be remelted after pickling or de-cladding.

1K-249-0201	1 drum	521 pounds	Billets

380-1K-249-0401	Drum #1	459 pounds	Clad slugs
	#2	829	
	#3	826	
		2,114 pounds	

Type 250: This material was redrummed, recoded and made into the following lot. This material was left intact.

1K-250-1001	10 drums	2,061 pounds

Type 253: This material was redrummed, recoded and made into the following lots. This material was left intact.

1K-253-0001	1 drum	1,121 pounds	Heavy tubes
1K-253-0101	1 drum	310 pounds	Small tubes
1K-253-0201	1 drum	114 pounds	Small pieces
1K-253-0301	Drum #1	833 pounds	Clad slugs and pieces
	#2	931	
		1,764 pounds	

Type 254: Delete - This material was recoded to type 285 material.

Type 256: This material was recoded and weighed.

1K-256-0101	1 box	438 pounds	Two pieces of 7" ingots

(Note - this material is being held for P.O. D-427 for a future shipment to G.E. Co. Hanford)

Type 258: This material was recoded to type 276 material.

Type 263: This material was redrummed, recoded, and weighed. The weights are drained weights. This material should be oxidized. Some of the increase came from type 288 and 293 material.

1K-263-0201	48 drums	9,407 pounds	Flat type of turning and chips
1K-263-0401	1 drum	64 pounds	Foil and thin flats

Type 270: This material was redrummed and weighed. This metal can be remelted after degreasing and pickling.

1K-270-1001	Drum #1	513 pounds	Skulls
	#2	475	
		988 pounds	

Type 271: This material was redrummed and weighed. This metal can be remelted after degreasing and pickling.

1K-272-1001	Drum #1	1,[illegible]7 pounds	Solid crops and pieces
	#2	[illegible]	
	#3	993	
	#4	767	
	#5	455	
		4,425 pounds	

Type 273: Delete - All this was recoded to 211 or oxidized at Plant 6.

Type 275: This lot is new. This is good remelt metal after pickling.

1K-275-0101	Drum #1	890 pounds	Clean slugs
	#2	433	
	#3	886	
	#4	854	
		3,063 pounds	

Type 276: This material was boxed, recoded and made into the following lots. This is good remelt metal after pickling.

1K-276-0101	Drum #1	893 pounds	Clean "C" slugs
	#2	893	
	#3	893	
	#4	893	
	#5	893	
	#6	894	
	#7	893	
	#8	772	
		7,024 pounds	

426-1K-276-0101	Drum #1	891 pounds	Clean "C" slugs
	#2	203	
		1,094 pounds	

380-1K-276-0301	Drum #1	1,218 pounds	Clean slugs

1K-276-0201	Drum #1	892 pounds	Clean "4" slugs
	#2	892	
	#3	893	

Drum #4 444 pounds

3,121 pounds

(Note - These four boxes of slugs are being held on P.O. L-127 for G.E. Co. Hanford. Shipment is to be made in near future.)

Type 284: These lots are intact and have not been reweighed.

Type 285: This material was redrummed and weighed.

1X-285-1001	Drum #1	188	pounds	Wet and lumpy
	#2	585		
	#3	527		
	#4	528		
		1,828	pounds	

Type 286: Delete - All of this type material was recoded to type 211 or oxidation feed for Plant 6.

Type 287: Delete - All of this type material was recoded to type 207 or 276 material.

Type 288: Delete - All of this type material was recoded to type 207, 211, 216, 263, 276, pit material or oxidation feed for Plant 6.

Type 289: Delete - All of this type material was recoded to type 211, 263, pit material or oxidation feed for Plant 6.

Type 290: Delete - All of this type material was recoded to type 207, 211, 263, pit material or oxidation feed for Plant 6.

Type 291: Delete - All of this type material was oxidized at Plant 6 or pit material.

Type 293: Delete - All of this material was recoded to 211, 263, pit material or oxidation feed for Plant 6.

Type 295: This material is being held for historical purposes and consists of thorium metal and some non-metallic samples. The

Rev. effective 7-1-55

THORIUM

201	TNT (solid)
202	ThF_4, white salt
203	Derbies, dezinced
204	Ingots, induction melt
205	Rods, induction melt
206	Slugs, induction melt
207	Solid scrap - induction melt
208	Ingot crops
209	Turnings, induction melt, (nonbriquettable)
210	Briquettes, arc melt
211	Metal high in impurities, induction melt
212	Graphite - carbon scrap
213	Ceramics
214	Sweepings
215	Contam. cloth
216	Sump cake plus F or Cl
217	Sawdust, induction melt, from areas I, [redacted] or F
218	C-liner
219	Contam. zinc
220	Grinder sludge - reacted - sludge only
221	
222	Eggs
223	Oil - soluble - coolant
224	Brazilian sludge
225	Sump cake, no F or Cl
226	TNT (liquid)
227	Contam. wood and paper
228	Rolling sludge
229	Contam. H_2O
230	Contam. steel, equipment
231	Contam. soil, sand, rock, etc.
232	Contam. glass
233	Furnace salt and sludge
234	Briquettable turnings, arc melt
235	Th $(C_2O_4)_2$ oxalate
236	ThF_4 scrap
237	Cu and Zn contam. fines, chips and turnings
238	ThO_2 - Finished
239	Contam. solvents
240	
241	Briquettable turnings - induction melt
242	ThO_2 scrap
243	Th $(C_2O_2)_2$ oxalate scrap
244	Straightener sludge
245	
246	Derby scalps, dezinced
247	Partially oxidized metal + metal X
248	Contam. lime
249	Solid scrap - arc melt
250	High Th C-liner - bad reduction
251	Contam. ZnCl
252	Sawdust, arc melt from areas [redacted] C or F
253	Solid scrap-arc melt from rolling and extrusion
254	$ThCl_4$, thorium tetrachloride
255	Briquetts, induction melt
256	Ingots, arc melt
257	Rods, arc melt
258	Slugs, arc melt
259	Sludge, pickling bath
260	Contam. furnace salt
261	Contam. Kinney oil, etc.
262	Derby sawdust before dezincing
263	Turnings, arc melt, nonbriquettable
264	Metal high in impurities, arc melt
265	Metal samples, induction melt; ingot and rods
266	Metal samples, arc melt; ingots, roc
267	Derby metal samples, dezinced
268	Derby metal samples, non-dezinced
269	Incinerator residue
270	Ingot crops, arc melt, primary
271	Ingot crops, arc melt, secondary
272	Scrubber liquors
273	Dezinced derby pieces, remeltable

AREAS

Arc Melt Casting	C
Reduction	D
Machining	F
Induction Melt Casting	I
Fluoride (ThF_4)	4

thorium metal can be removed only by the approval of [illegible] Cuthbert or J.E. Carvitti.

11-295-2001	1 box	2,261 pounds	Thorium metal
11-295-2001	4 drums	271 pounds	Non-metal samples

After all of the thorium material was redrummed, segregated, recoded and weighed, the area was thoroughly cleaned. There were 22 drums of floor sweepings generated which were coded 11-200-2001. This material was discarded to an off site burial ground.

The above information completes the entire thorium inventory. An attempt was made to properly code all the residues in order that they go into the proper class code. Data and typical analyses are available upon request. If any questions should arise about the thorium, please contact me.

Joseph E. Carvitti

J. E. Carvitti

JEC/jm

copies were sent to Larry + Russell

cc: M. M. Cawdrey - J. L. Padgett
C. R. Chapman - S. F. Audia
J. J. Costa - W. J. Strattman
P. L. Cuthbert
P. C. Feist - E. E. Gompf
J. G. Mead
R. E. Mersman
F. J. Milesky
J. H. Noyes
J. A. Quigley - D. L. Flowers
J. M. Teufel

Central Files

IWO-115

NATIONAL LEAD COMPANY OF OHIO

P. O. BOX 39158 CINCINNATI, OHIO 45239

March 19, 1968

If CaO (lime) is used for neutralization then consideration must be given to residue burial

Mr. C. L. Karl, Area Manager
Cincinnati Area Office
P. O. Box 39188
Cincinnati, Ohio 45239

Subject: Request for Authorization to Remove Thorium Residues from Inventory to Burial Ground

References: 1. Letter, Noyes to Karl, 1/16/68, Same Subject.
2. Letter, Karl to Noyes, 2/13/68, Disposal of Low-Grade Thorium Residues.

Dear Mr. Karl:

Request No. 115 for Commission approval to remove a number of low-grade thorium residues from our inventory to a suitable burial ground has been revised to include additional drums of contaminated non-burnables and floor sweepings. The corrected request form is attached. The total quantity of thorium to be discarded is 9,747 pounds. The number of drums of thorium residues requiring off-site disposal now totals 349; however, it has been estimated that 25 to 50% of these drums require redrumming because of their highly deteriorated condition.

In response to your letter of February 13 (reference 2), our Health and Safety Division reviewed the possibilities for on-site burial as an alternate to off-site disposal. It was determined that there is sufficient radium-228 in these residues to contaminate the Miami River from surface runoff or the ground water from seepage, to levels 1,000 times the MPC level for drinking water. It was calculated that the Miami River could become contaminated for periods of up to three years. Similarly, calculations were made to show that our own water supply, or supply from a larger well located near the river, could be contaminated to the MPC level for periods up to 10 years. It was therefore reasoned that on-site disposal at this time would be risky and that off-site burial is preferable.

Inasmuch as the ORNL burial grounds are not available to us for this purpose, the possibility of disposal in other Commission facilities located a greater distance from Fernald than the Oak Ridge burial grounds was eliminated because of the problems involved in transporting these radioactive materials over the road. It has been determined that burial at the Nuclear Engineering Corporation facility at Morehead, Kentucky, offers the best possible solution to the problem. The cost of burial has been determined to be approximately $2,500. Shipment would be made in Nuclear Engineering Corporation trucks, using their drivers, at an estimated cost of $615.

The problem of redrumming the thorium residues is of particular concern to us. The redrumming operation is slow and tedious; the possible health hazard must be considered. It has been estimated that redrumming can proceed at a rate of one to two drums per hour, using teams of two laborers and an industrial truck operator. However, one truck operator could provide service for a number of two-man labor teams. Although reconditioned drums presently on site would be used, it is apparent that the redrumming cost will be extensive; the out-of-pocket cost has been calculated as $1,600.

In view of our current financial plan situation, we are reluctant to allocate funds estimated at a total of about $5,000 for the burial, shipment, and redrumming operations. Nevertheless, from a health and safety standpoint, it appears to be highly desirable to dispose of these radioactive materials as expeditiously as possible.

Sincerely yours,

J. H. Noyes

J. H. Noyes
Manager

BG/wbb

cc: C. L. Karl (w/request form)
J. E. Carvitti
C. R. Chapman-S. F. Audia
S. Marshall-J. H. Cavendish
J. A. Quigley
G. A. Schwan-B. Gessiness (w/request form)
W. A. Smith

Central Files

2500
615
3115 / 349 drums = $8.93/drum.

OFFICIAL USE ONLY

NATIONAL LEAD COMPANY OF OHIO

CINCINNATI 39, OHIO

2236848

July 6, 1964

SUBJECT THORIUM NCG

TO J. A. Quigley, M.D.

FROM R. H. Starkey

REFERENCE

This is to confirm our discussion with R. C. Heatherton concerning a NCG for thorium. This came about by increased processing of thorium at the FMPC with proposals for further increases.

NBS Handbook #69 - "Maximum Permissible Body Burdens and Maximum Permissible Concentrations of Radionuclides in Air and in Water for Occupational Exposure" contains two maximum permissible concentrations for thorium, one in the table ($2x10^{-12}\mu c/cc$) along with other radionuclides, and one in the subscript ($3x10^{-11}\mu c/cc$). The following statement is included in the subscript:

"Provisional values for Th^{232} and Th-nat. Although calculations and animal experiments suggest that Th-nat is perhaps as hazardous as Pu and indicate the values listed above, industrial experience to date has suggested that the hazard of Th-nat is not much greater than that of U-nat. The NCRP has recognized that a certain period of time may be required for adjustment of operations to comply with new recommendations. Therefore, pending further investigation the values $(MPC)\alpha=3x10^{-11}\mu c/cc$ for the 40-hour week and $(MPC)\alpha=10^{-11}\mu c/cc$ for continuous occupational exposure (168 hr/wk) are recommended as permissible levels. These values are essentially those that have been generally used in this country (Federal Register 1957). However, the values given in Table 1 are listed to indicate the possibility that further evidence may require lower values and to urge especially that exposure levels of Th-nat be kept as low as is operationally possible. The exception indicated here applies only to the $(MPC)\alpha$ values for Th-nat and Th^{232}."

The $3x10^{-11}\mu c/cc$ value for a 40-hour week is equivalent to 133 α $d/m/M^3$. For a 48-hour week this would be 110 α $d/m/M^3$ and for a 56-hour week it would be 95 α $d/m/M^3$. The $2x10^{-12}\mu c/cc$ listed in the table would be only 9 α $d/m/M^3$. This MPC would be virtually impossible to achieve in an operation of the type being carried out and proposed at the FMPC. Also the above statement recommends the $3x10^{-11}\mu c/cc$ value on the basis that industrial experience to date suggests that it is still a safe concentration for a 40-hour work week.

For the previously mentioned reasons we decided that a practical NCG for thorium is 100 α d/m/M^3. We plan to use it in our thorium airdust surveys.

R. H. Starkey

R. H. Starkey

RHS/mjs

cc: J. H. Noyes
R. C. Heatherton
J. F. Wing

NATIONAL LEAD COMPANY OF OHIO

Cincinnati, Ohio 45239

March 8, 1976

2117274

SUBJECT: HEALTH PROTECTION ASPECTS OF THORIUM PRODUCTION

TO: R. C. Heatherton

FROM: M. W. Boback

Consideration of future thorium production work in the Pilot Plant has led to questions directed to the Health & Safety Division about health protection and the need for control equipment to be included in the budget submissions. This is a review of thorium work in the recent past and comments about what is needed for future work.

In order to determine if the health protection aspects of a thorium operation are acceptable or not we are required to start with the Concentration Guides given in Manual Chapter ERDAM-0524. The most recent revision, dated April 8, 1975, in Table I of Annex A, gives an airborne limit of 133 $d/m/m^3$. Concentrations in this table were selected on the basis that 40 years of continuous exposure, at these concentrations, would not produce a quantity of radionuclides in the body which would have any adverse health effects. Therefore, there would be compliance with ERDA's Table I regulation if all daily time-weighted thorium exposures did not exceed this level. The National Lead Company of Ohio Concentration Guide (NCG) for both thorium and uranium has been set at 100 $d/m/m^3$ to insure that the Manual Chapter limit was not exceeded. All recommendations for respirator use, clean-up, equipment changes, etc. have been based on the NCG of 100 $d/m/m^3$.

In addition to considering the Table I limit, ERDA contractors must also consider the requirements of Part V, ERDAM-0524. This section, titled "Guidance On Maintaining Exposures To As Low As Practicable," notes that adherence to exposure limits "is, in itself, insufficient" because it is ERDA policy that "operations shall be conducted in a manner to assure that radiation exposure to individuals and population groups is limited to the lowest practical levels technically and economically practicable."

037385

[redacted]

Although this ALAP (as low as practicable) philosophy has been around several years, it has not been emphasized until recently and we can expect greater emphasis by ERDA in the future. Part V contains several pages of ALAP guidance. It is clear that ERDA will expect visible thorium dusts in the workplace to be eliminated, even though the time-weighted thorium exposures are within the Table I limit.

Finally, after making sure that the Table I limit is not exceeded and exposures have been made ALAP, a contractor must make use of whatever means are available to determine how much of a thorium intake his operators received. For NLO, this means using the in vivo (whole-body) counter. In fact, we are fortunate that this counter is available for assessing thorium lung burdens. Assessment by any other means is almost impossible.

There are, then, three questions to be answered in determining if a thorium operation meets ERDA requirements and is acceptable from a health protection standpoint:

(1) Is the time-weighted thorium exposure less than 100 $d/m/m^3$?

(2) Have the obvious and easily controlled sources of exposure been eliminated?

(3) What are the operators' lung burdens? Are they within the ERDAM-0524 limits for internally deposited thorium?

In order to speculate about the acceptability of future thorium operations we should answer these questions for the most recent thorium operation, production of thorium oxalate for the Bettis plant.

(1) Air sampling showed, many times, that high dust levels existed from the opening of the filter press to the canning operation. To stay within a time-weighted exposure of 100 $d/m/m^3$ it was recommended that respirators be worn. They were worn regularly. It was also recommended that full use be made of the filter press hood to control dust. Except for equipment or procedure changes, these are the only two methods available to reduce thorium deposition in the lung--use control features properly and use respirators when recommended. In my opinion, these two methods, when fully utilized, were capable of keeping the operators' time-weighted exposures within 100 $d/m/m^3$.

(2) During the Bettis operation, the concept of keeping exposures as low as possible was not given high priority. Clean-up occurred when the production schedule permitted and, as a result, there were times when the filter press area and canning hood were coated with dust. You may recall that at one point Bettis representatives questioned if health control problems would interfere with the production schedule. They did not ask that question because of a knowledge of thorium intakes--it was asked because the area looked dirty.

(3) According to the in vivo data, operators who worked on the Bettis job did not suffer any observable increase in lung burden. It is likely that the thorium workers did have some deposition of thorium in the lung tissue but the counter sensitivity is about 30% of a permissible burden and a small increase would not have been detected. However, if there were increases in lung burdens, the increases were well under the AECM-0524 limit. Its worth repeating that this limit is the quantity a worker could have in the lung for 40 years without having any adverse health effects. As we all know, there is a comfortable degree of "safety" in all of the 0524 limits.

In summary, the filtering and canning of Bettis thorium looked dirty at times and could have been cleaner with improved attention to housekeeping and the use of controls. Actual deposition of thorium in lung tissue was within limits.

What should be done for future thorium work? Control equipment should be put in good order. Procedures should be improved, if needed, so that operators will not improvise steps or movements which increase their exposure. Health & Safety should monitor, as we intend to do. And an adequate schedule of in vivo monitoring be carried out as the final determination of deposition levels.

Some reduction in exposure levels could be made by having Engineering design equipment improvements for that purpose. However, reductions are not guaranteed by such changes because of the tendency to use equipment in a manner other than that intended by the designer.

We should not overlook ERDA's seriousness in regard to their ALAP philosophy. Since we know that certain parts of the thorium operation can easily become dusty, the production schedule should make allowances for frequent, specified cleanup.

M. W. Boback
M. W. Boback

MWB/vvs

cc: W. J. Adams
J. E. Beckelheimer
G. G. Briggs
J. H. Cavendish
L. M. Levy
C. E. Polson
K. N. Ross
R. M. Spenceley
S. F. Audia
J. F. Schiltz

A2

October 12, 1956

RADIATION LEVELS OF MORE THAN 0.05% THORIUM RESIDUES

J. E. Carvitti 2128871

R. H. Starkey

Following are the radiation levels found upon contact with the outside of the drums containing thorium residues, with the exception of those marked with an asterisk which indicates contact readings of the material.

All readings were taken with a GS-3 survey meter without any regard of the background radiation level, which generally was 5.0 mreps/hr.

Code Type	Material	Activity Mreps/hr.
203*	Derbies dezinced	30
204	Ingots - induction melt	30
205*	Rods - induction melt	35
206*	Slugs - induction melt	45
207	Solid scrap - induction melt	25
208	Ingot crops - induction melt	30
209	Turnings - induction melt - non-briquettable	10
210*	Briquettes - arc melt	30
211	Metal high in impurities-induction melt	25
224	Brazilian sludge	10
237	Cu and Ln contaminated fines, chips and turnings	10
238	ThO_2 - finished	15
245		25
246	Derby scalps, dezinced	10
254	$ThCl_4$	20
257*	Rods - arc melt	75
258*	Slugs - arc melt	75
262	Derby sawdust before dezincing	20
265	Metal samples	20
267	Metal samples	20
270	Ingot crops	20
276	Reject slugs	10
284	Th metal powder	15

Original Signed By
R. H. STARKEY

R. H. Starkey [redacted]

081782

DF/mjs
cc: A. O. Dodd

541a

AT Kimak 11/24/70 — w. comment

2128227

HFS

November 19, 1970 11/23/70

AIR DUST CONCENTRATIONS IN THE PILOT PLANT THORIUM PROCESS

M. W. Boback

K. N. Ross

The attached table contains average air dust concentrations of all thorium metal production operations sampled during the 1970 campaign. The air dust concentration data has been arranged to follow the production flow where possible. A few air dust sample results included are new. These new results did not materially change the average air dust concentrations previously reported. The causes for these high air dust levels have been reported in previous studies.

The Pilot Plant is equipped with dust collectors and scrubbers. The total capacity of this ventilating equipment exceeds 40,000 cubic feet per minute. It appears that if this capacity were utilized to ventilate properly designed equipment through properly designed hoods, these air dust levels would be reduced.

Right!

Type Sample	Description	No. Samp.	$a\text{-}d/m/m^3$ High	Low	Avg.	X-
GA	Sampling pump located four feet south of ThF_4 precipitation tank on platform. The tank is ventilated to a scrubber. North door open.	3	150	30	93	.9
"	Sampling pump located four feet east of ThF_4 precipitation tank on platform. The tank is ventilated to a scrubber. North door open.	3	200	40	117	1.2
	Operator scoops ThF_4 from west filter box with a metal scoop and dumps it into the Fitzmill. After the pan is full, the operator removes the pan and places it on a portable cart to go to the drying ovens. No respirator worn. No ventilation. North door open.	3	9800	3300	6833	68

[redacted]

WET AREA

Type Sample	Description	No. Samp.	$a\text{-}d/m/m^3$ High	Low	Avg.	X-MPC
GA	Sampling pump located five feet east of the west filter box area.	3	[illegible]	11[illegible]	257	2.5
GA	Sampling pump located two feet west of the west filter box area.	3	[illegible]	[illegible]	1[illegible]7	1.
BZ	Operator shovels wet thorium filtrate cake from filter box and dumps it into an empty 55-gallon drum which has a plastic liner inside. No ventilation. No respirator worn.	2	87[illegible]	4[illegible]0	670	6.7
BZ	Operator scoops wet ThF_4 from 55-gallon drum with a plastic scoop and places it in the empty trays. When the trays are full, they are placed on a portable cart and taken to the drying ovens. No respirator worn. No ventilation. North door open.	[illegible]	[illegible]	50	1367	13.6
GA	Sampling pump located 10' east of W-2 tank while the above operation was being performed.	3	[illegible]	15	41	.4
GA	Sampling pump located four feet west of the east wall while the above operation was being performed.	[illegible]	30	11	23	[illegible]
BZ	Operator removes full pans of wet ThF_4 from portable cart and places it in drying ovens. No respirator worn. No ventilation. North and west door open.	2	21,[illegible]	[illegible]	18,000	18
BZ	Operator removes full pans of ThF_4 from ovens and places them on portable cart and transports them to ventilated enclosure.	3	7200	[illegible]	4400	4
GA	Sampling pump located six feet south of drying ovens #5 and 6. West door open. No ventilation.	3	14	[illegible]	110	1.

WET AREA

Type Sample	Description	No. Samp.	a-d/m/m³ High	a-d/m/m³ Low	Avg.	X-!
BZ	Operator removing ThF_4 from drying pans with a metal scoop and dumping into a retort pan ~~inside a ventilated~~ enclosure. No respirator worn. North door open.	3	4400	170	1890	19
BZ	Operator removing ThF_4 from a 10-gallon can with a plastic scoop and dumps it into an empty retort pan inside the ventilated enclosure. Respirator worn. North door open.	3	3600	2500	2967	30
BZ	Operator takes full retort pans of ThF_4 from ventilated enclosure and places on retort pan holder. Respirator worn. North door open.	3	100,600	3000	29,300	293
GA	Sampling pump located four feet south of the ventilated enclosure while removing ThF_4 from drying pans. North door open.	3	5800	4700	5166	51.
GA	Sampling pump located five feet north of ventilated enclosure while removing ThF_4 from drying pans. North Door open.	3	4300	1900	2180	22

PILOT PLANT ANNEX

Type Sample	Description	No. Samp.	High	Low	Avg.	X-!
BZ	Operator removing retort pans from retort chamber which contains ThF_4 and dumping into Sturtevant Mill. Removing five-gallon can from under mill and dumping ThF_4 into twin shell blender. Average face velocity on tray above mill 1000 fpm. At the dropout of the mill, 350 fpm. Ventilation was not used at the blender. Respirator worn.	8	4400	410	1117	11

PILOT PLANT ANNEX

Type Sample	Description	No. Samp.	a-d/m/m³ High	a-d/m/m³ Low	Avg.	X MPC
BZ	Operator removes ThF_4 from blender by placing a five-gallon can under the blender and turns a valve. When the can gets half full, the operator removes it from under the blender and dumps it into a 10-gallon can located on the scale. Average face velocity at blender 300 fpm. The only ventilation at the scale is a Hoffman vacuum hose. Respirator worn.	4	720	340	542	5.4
GA	Sampling pump located three feet west of the semicontinuous reduction enclosure. The retort pot holder and all the pots on it are lifted from the large furnace pot left standing in this location to cool off. South door open.	3	2100	1200	1633	16.3
GA	Sampling pump located three feet east of the semicontinuous reduction enclosure.	3	520	290	423	4.2
GA	Sampling pump located inside the semicontinuous reduction enclosure between the twin shell and the Sturdevant Mill.	3	530	140	296	3

REDUCTION AREA

Type Sample	Description	No. Samp.	High	Low	Avg.	X MPC
BZ	Operator putting empty furnace pot into jolter. Respirator worn.	2	220	120	170	1.7
BZ	Operator removing MgF_2 from 55-gallon drum. Respirator worn. No ventilation.	6	3150	450	1729	17
BZ	Operator dumping five-gallon can of MgF_2 into furnace pot located in the jolter. Average face velocity 200 fpm. Respirator worn.	4	5800	1190	3022	30

REDUCTION AREA

Type Sample	Description	No. Samp.	a-d/m/m³ High	a-d/m/m³ Low	Avg.	X-
BZ	Operator removing furnace pot from jolter.	3	90	40	62	.6
BZ	Operator removing mandrel from furnace pot. Respirator worn. No ventilation.	3	670	130	333	3.3
BZ	Operator charging ThF_4 and ZnF_2 into twin shell blender located on platform. Average face velocity 150 fpm. Respirator worn.	8	16,850	760	6970	70
BZ	Operator charging calcium into twin shell blender. Average face velocity 150 fpm. Respirator worn.	3	1000	410	640	6.[illegible]
GA	Sampling pump located five feet north of dumping station on platform.	3	490	160	330	3.3
GA	Sampling pump located two feet south of dumping station on platform.	3	230	150	183	1.8
BZ	Operator discharging ThF_4 and ZnF_2 and calcium into furnace pot from twin shell blender. Average face velocity 50 fpm. Respirator worn.	3	14,250	2700	9050	90
BZ	Operator packing or tamping charged furnace pot with a metal bar. Respirator worn. No ventilation.	3	21,400	10,000	14,353	14[illegible]
BZ	Operator capping furnace. Respirator worn. No ventilation.	4	1930	630	1255	12.[illegible]
BZ	Operator lidding furnace pot. Respirator worn. No ventilation.	4	600	250	400	4
BZ	Operator putting furnace pot into Rockwell. No ventilation.	4	58	30	42	.4

REDUCTION AREA

Type Sample	Description	No. Samp.	a-d/m/m^3 High	Low	Avg.	X-M
BZ	Operator removing furnace pot from Rockwell furnace.	1	53	53	53	.
GA	Reduction area.	9	430	10	129	1
BZ	Preparing liner material at Ball Mill.	2	790	240	515	5
GA	Ball Mill area.	10	53	17	37	0

DERBY BREAKOUT

Type Sample	Description	No. Samp.	High	Low	Avg.	X-M
BZ	Operator turns graphite pot upside down on a metal skid and removes thorium derby. South door open. __No ventilation.__ No respirator worn.	1	126,200			1,262
BZ	Same as above __with ventilation.__ (West wheelabrator in operation)	2	3900	230	2065	21
GA	Pump located three feet east of the doorway to the plazma spray booth. __No ventilation.__	2	30,300	1350	15,725	157
GA	Same location as above, with west wheelabrator in operation.	2	200	95	147	1
GA	Pump located three feet north of the doorway to the plazma spray booth. __No ventilation.__	1	6300	6300	6300	63
GA	Same location as above with west wheelabrator in operation.	2	100	29	64	(

SAWING THORIUM DERBY

Type Sample	Description	No. Samp.	High	Low	Avg.	X-M
BZ	Operator sawing derbies, loading and unloading saw, stamping derby pieces and samples. Respirator worn. Ventilation at saw blade only.	3	45,570	630	15,910	159
GA	Saw area.	12	650	13	190	

P.P. Has been installed with permanent vent sys.

DUST COLLECTORS

Plant	Collector Number	Remarks	Exhaust Airflow	Location
P.P.	G37-5011		7,000 CFM	Outside, north side of pla
P.P.	735-13-7041		7,000 CFM	Outside, south side of pla
P.P.	735-13-7050		16,000 CFM	Outside, southeast corner.
P.P.	108843		7,200	Outside, northwest corner.
P.P.	G6-93A	AAF Rotoclone	Unknown	Outside, southeast corner.
P.P.	G-20-20	Mikro	4,600	Inside 3620 area (not in use).

Original Signed By

K. N. Ross

KNR/jm

cc: P. G. DeFazio - A. Pennak
W. J. Adams

jaa

RCH saw M. Boback's copy

October 7, 1970

2117284

AIR DUST LEVELS AT THORIUM METAL OPERATIONS

M. W. Boback

K. N. Ross and C. E. Long

Letter, K. N. Ross to M. W. Boback, dated September 25, 1970, Air Dust Evaluation of Various Operations During Thorium Metal Production - Pilot Plant

The following is a compilation of air dust levels found in the Pilot Plant thorium metal operations. Some of the sampling is yet to be completed and some of the air dust concentrations are high enough to deserve resampling. This is marked where appropriate. Where the source of a particular air dust level is known, it is mentioned. In many places, possible remedies are suggested. The following is an early approximation of air dust concentrations in the Pilot Plant.

		MCG
GA	ThF_4 Precipitation Platform	1.0

Since all operations on this platform concern only slurries and solutions of thorium, it is believed the general air dust levels are caused by adjacent operations. These are (1) preparing CaF_2 liner in the Ball Mill area and (2) charging retort pots at the canning station.

BZ	Removing ThF_4 from the filter boxes and dumping it into Fitz Mill. Loading drying trays from Fitz Mill.	68
GA	Filter box and Fitz Mill area	1.9

The ThF_4 in the filter boxes is almost dry and is made airborne by the scooping and dumping action as well as the mechanical action of the Fitz Mill. The area is liberally sprinkled with ThF_4 during this operation. The floor and mill are hosed down after each operation. Hosing will not clean the overhead and much of the equipment is electric and cannot be hosed down. This material dries and becomes airborne. It

[redacted]

NCG

has been noticed that thorium compounds are quite hard to remove from any surface by use of water alone. The drying pans which are filled contribute to the air dust levels at this operation since they are covered with a crust of dried ThF_4. This, of course, becomes airborne when the pans are moved.

BZ	Loading drying trays from 30-gallon cans of ThF_4.	14

This operation is performed when there is more ThF_4 taken from the filters than there is drying room. Air dust levels and their causes are comparable to those mentioned previously.

(Only Partially Sampled)

BZ	Loading drying pans of wet ThF_4 into dryers.	180
GA	ThF_4 drying area.	1.1
BZ	Removing pans of dry ThF_4 from dryer.	44

It is expected that completely sampling these operations will show they are not quite this high. The causes of air dust is again the ThF_4 crust on the drying pans, loose ThF_4 and crusted ThF_4 on the carts, and ThF_4 on and in the drying ovens. Keeping this equipment clean should aid in lowering these air dust levels, but the job of cleaning them will be another source of airborne dust.

BZ	Dumping ThF_4 from drying pans into retort pots.	19
GA	Canning station area.	22
BZ	Removing retort pots from holder and dumping into Sturdevant Mill.	15
GA	Outside west door of semicontinuous reduction enclosure.	16
GA	Inside west door of semicontinuous reduction enclosure.	4.2

These operations were discussed previously.

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MCG

(Only Partially Sampled)

BZ	Preparing liner material at Ball Mill.	5.2

This operation involves using a sledge hammer on large pieces of material to reduce their size so they can go through a jaw crusher. It would be difficult to ventilate a sledge hammer operation. It is possible that slag liner could be reduced in size at the breakout station to make sledging unnecessary. Air dust levels will still be high, for although both the crusher and Ball Mill are ventilated, they both leak and cause high air dust levels. This equipment was not designed for work on radioactive toxic material. Dust escaping from these pieces of equipment has contaminated the area and the equipment itself. This is a source of secondary air pollution when air movement through - or vibration of - the equipment causes it to become airborne.

(Partial Sample Only)

BZ	Dumping charge to blender.	44
GA	Top deck of charge station area	3.3

The operator opens the cans of charge material (ThF_4-ZnF_4) outside the influence of the ventilation. This alone should not cause concentration levels of this size. It is probable that complete sampling of this operation will show a smaller air dust concentration or a reason for the larger one.

BZ	Lining a pot with CaF_2.	9.7
BZ	Charging pot with ThF_4, ZnF_4 and Ca	69
BZ	Capping charged pot.	17

Air dust levels at these operations are caused by hand operations outside of ventilated enclosures. In the pot lining step, the operator scoops CaF_2 into a bucket from a 55-gallon drum, carries the bucket to the jolter and dumps it into the pot. The jolter

MCG

is ventilated but the small amount of ventilation here is not enough to contain the dust generated by this action. The bucket loading and carrying is, of course, not ventilated.

The furnace pot is charged in a ventilated enclosure but the operator must pull the pot out of the enclosure into the open floor to tamp and compact the charge. This must be done at least once per charge or more, depending on the density of the charge.

The capping operation involves tamping the final addition of charge material, scooping a bucket of liner material from the drum, putting it on top of the charge and tamping it firmly in place. This is done in the open, east of the charge station. There is a ventilated booth on the west side of the charge station that might reduce the air dust levels.

BZ	Removing dezinced derby from pot.	20
GA	Outside Plasma spray booth.	1.5

The high air dust level during this operation is not surprising. The dezinced derby is dumped from the graphite pot to the floor. The inside of the pot is coated with ThO_2 and the outside of the derby is covered with oxide, carbides, and other compounds of Th. All of this becomes dust when the derby is dumped from the pot. The ventilation at this location is plentiful but probably the enclosure and hooding could be improved.

Air dust levels at this same operation when the ventilation was left off by mistake showed a BZ dust concentration of 1262 MCG and area concentrations of 157 MCG.

(Partial Sampling Only)

BZ	Sawing derbies, loading and unloading saw, stamping derby pieces and samples.	159
GA	Saw area.	3.7

037419

NCG

This operation is ventilated only above the saw blade. High air dust concentrations are known to be caused by moving derbies and pieces on the saw table and stamping derby pieces. Fires in the fines under the saw are also a source of air dust. The use of coolant at this operation would greatly reduce the air dust concentrations caused by it. Ventilation of the saw table and in particular the area where stamping is done would also reduce air dust. 3.7

Original Signed By

K. N. Ross

Original Signed By 'K R

C. E. Long

KNR/CEL/jm

cc: W. J. Adams
S. F. Audia
J. A. Quigley, M.D.

cfh

NATIONAL LEAD COMPANY
OF OHIO

AUG 1 1 1978

CENTRAL FILES

Mr. H. Doran Fletcher, Director
Uranium Enrichment Operations Division
Department of Energy
Oak Ridge Operations Office
P. O. Box E
Oak Ridge, Tennessee 37830

Dear Mr. Fletcher:

MONTHLY THORIUM INVENTORY POSITION AT NLO AS OF AUGUST 1, 1978

Attached is the monthly inventory position of thorium, in metric tons, at NLO as of August 1, 1978.

Sincerely yours,

Original Signed By
S. F. AUDIA
Manager

S. F. Audia
Manager

RLB/mw

Distribution: W. J. Adams
J. H. Cavendish
L. H. Harmon
N. R. Leist
L. M. Levy
J. F. Schiltz
D. A. Tippenhauer

Central Files

SEC-EMPC

PE 541

[redacted]

MONTHLY THORIUM INVENTORY POSITION AT NLO AS OF 8/1/78
REPORTED IN METRIC TONS

	Thorium M-BG-0108-232
ThO_2 Dense (GE-Bettis)	17.4
ThO_2 Sol Gel	31.7
Pilot Plant - WIP:	
TNT for Commercial (Pure)	8.8
Hanford Thorium Nitrate (Impure)	58.1
Misc. Scrap and Lab Samples	2.2
Impure Thoria Gel from Hanford TNT	222.0
Thorium Oxides in Plant 8 Silo	174.6
Thorium Oxalate Cake	1.1
Thorium Nitrate Crystals	0.3
Off-Site Thorium Hydroxide	10.8
Off-Site Thorium Oxides	57.3
Thorium Nitrate Solution	0.9
ThF_4	0.8
Metal	73.5
Clad Metal	4.4
Alloyed Metal	0.8
Material Held for Historical Purposes	0.5
High Grade Residues (30% Th)	38.2
Low Grade Residues (30% Th)	7.9
TOTAL INVENTORY	711.3

SUBJECT: THORIUM PROCESSING AT FMPC

7/17/70

TO: File #2

FROM: J. O. Davis

Thorium File

215940

Thorium processing was initiated at FMPC in mid-1954. The first operations consisted of precipitating ThF_4 from aqueous solution by adding HF solution to thorium nitrate solution. The ThF_4 was filtered and dried with hot air in a rotary kiln. The dried ThF_4 was mixed with purchased anhydrous $ZnCl_2$ and purchased calcium metal, both of special high purity, and the mixture fired in a refractory-lined steel vessel to give a thorium-zinc alloy regulus and a calcium fluoride slag. The regulus was dezinced by heating in a retort under vacuum, and then the pure thorium metal was melted in a zirconia crucible in an induction furnace under vacuum and poured into an ingot mold. The "wet" ThF_4 precipitation process was soon abandoned because of excessive corrosion. The ThF_4 was then made, starting in the fall of 1954, by (1) precipitating thorium oxalate by addition of oxalic acid to thorium nitrate solution, (2) filtering and drying the thorium oxalate, (3) roasting the oxalate in a rotary calciner at red heat in air to thorium oxide, (4) hydrofluorinating the thorium oxide to thorium fluoride (ThF_4) by contact with anhydrous HF in a ribbon-screw reactor.

The reduction to a Th-Zn regulus and dezincing continued as previously described. The vacuum-induction crucible melting and ingot casting process was replaced by a consumable electrode electric-arc melting process early in 1955. The dezinced thorium regulus was sawed into pieces which were welded together to make an electrode rod. Arc-melting this rod gave a

[redacted]

primary ingot which was rough machined to remove surface impurities and arc-melted a second time to give a secondary ingot which was surface-machined for clean-up. This product ingot was shipped off-site (Adrian, Mich.) for extrusion to rods and returned to FMPC for finish machining to product "slugs" which were shipped to DuPont, Savannah River, for canning and insertion in a nuclear reactor. This production operation was concluded in mid-1956.

The large volume of sawdust and machine turnings generated was stored in drums, some of which ignited spontaneously in storage and burnt up. In early 1960, 3-1/2 years after the thorium metal production was abruptly terminated, a campaign was initiated of roasting the thorium metal fines in a multiple-hearth furnace to avoid the hazard of spontaneous ignition. This operation continued for 3-1/2 years, to mid-1963, and produced an impure thorium oxide which was drummed and stored for later recovery (1(

In a five-month campaign, May to September 1964, some 30 tons of assorted thorium residues, mostly chips, powder and massive metal, were remelted in a vacuum furnace in an induction-heated, coated graphite crucible and bottom-poured into an ingot mold. The ingots were machined at FMPC and hot-extruded to rods at RMI, Ashtabula, Ohio and shipped to DuPont, Savannah River, for further fabrication and eventual reactor use.

The AEC supply of pure thorium nitrate was exhausted by January, 1965, so a thorium refining operation was started in existing solvent-extraction equipment in the FMPC Pilot Plant at that time. This operation has conti since then, with a variety of feed materials, mostly impure crystalline thorium nitrate. Some of the thorium refinery feed has been thorium nitrate solution recovered from irradiated thorium reactor cores, and some has been metallic or oxide residues of process operations. The residue materials were dissolved in nitric acid prior to the refining operation. The refined thorium nitrate solution was either shipped off-site, principally to Mallinckrodt, Weldon Spring, Mo., during 1965 or Nuclear Fuel Services Erwin, Tenn., in 1966-1967, or used at FMPC for production of thorium oxide or metal. The solvent extraction refining process employs an organic phosphate solvent, diamyl amyl-phosphonate, at 30% concentration in an aromatic hydrocarbon diluent.

Thorium oxide needed for reactor use at Hanford, Washington was furnished starting in mid-1967 by a special process of ammonia-precipitation of thorium hydroxide, developed by NLO. The precipitate was dried to a glass gel, which was then ground to desired size distribution and fired to fully-dense thorium oxide at the General Electric Co., NSP Laboratories, at Evendale near Cincinnati, Ohio. The powder was shipped to Hanford for canning and reactor use. This operation continued a little over two years into the fall of 1969.

Production of thorium metal was resumed at the FMPC in mid-1969 at a lower production rate than in 1955-56, but using a very similar process route. The aqueous precipitation of ThF_4 was revived, using plastic equipment to avoid corrosion. The partly dried ThF_4 is dehydrated at elevated temperature in inconel batch retorts, and zinc fluoride is substituted for zinc chloride in the co-reduction with calcium to produce the Th-Zn alloy regulus. The dezinced regulus is sawed for a sample slice, packaged and shipped to the customer at Oak Ridge. Very high purity of the thorium metal has been achieved. The thorium refining and metal production operations continue at FMPC.

Bb 6/25

MHS –
File:
Inventory

NATIONAL LEAD COMPANY OF OHIO

JUN 25 12 57 PM

P. O. BOX 39158

CINCINNATI, OHIO 45239

JUN 2 5 1968

Mr. C. L. Karl, Area Manager
USAEC, Cincinnati Area Office
P. O. Box 39188
Cincinnati, Ohio 45239

Subject: **ANNUAL STORAGE INVENTORY OF NORMAL URANIUM CONCENTRATES AND THORIUM**

References: 1) Letter, J. H. Noyes to C. L. Karl, subject "Annual Thorium and Depleted Uranium Storage Inventory," dated May 21, 1968

2) Letter, C. L. Karl to J. H. Noyes, same subject, dated May 22, 1968

Dear Mr. Karl:

In response to your request, comments were obtained from the three-member team from Production, Production Recording and Nuclear Materials Control, which inventoried the normal uranium concentrates stockpile and the Thorium Storage Account. It is not practical to develop detailed records on the condition of individual lots in the closely packed stockpile. The following observations are an attempt to estimate the over-all condition of the drums based on observations from the top of the stockpile, overlooking the blocks of drums, and also from the ground, surveying the perimeter.

1) The drums of South African concentrate are the most weathered; up to 20% of the lids at the upper level of a single block of 1,080 drums may not last another year. A few lids have rusted to the point where concentrate is visible within the drum. Many South African drums are rusting on the drum walls; this is more serious than corrosion of the lids since it may eventually affect the strength of the pile and future drum handling. Only a slight trace of material loss is visible between blocks of drums at this time.

[redacted]

BEST COPY AVAILABLE

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2) The drums of domestic concentrate are in much better condition than the South African drums. While some light rusting is noticeable on the lids at the upper level, no significant rusting of the drum walls was observed.

3) About 1% of the 2,840 drums of French TNT crystals in Quonset #1 are leaking. Many additional drums show signs of corrosion.

4) Several drums of TNT crystals in Building 71 are leaking, however, the number of leakers is not great.

5) More than 50% of the drums of thorium residues stored on the pad area west of Building 65 are leaking and are in need of redrumming. Identification on many of the drums of thorium residues is badly faded and needs to be restenciled.

The total drum count obtained in the physical inventory agreed with the drum count as recorded in our book inventory.

Sincerely yours,
Original Signed By
J. H. NOYES
Manager

J. H. Noyes
Manager

BG/mas

cc: C. L. Karl
S. F. Audia - J. J. Costa
C. R. Chapman
C. A. Schwab - E. Gessiness

Central Files

6/10

June 8, 1970

2117287

THORIUM METAL PRODUCTION HOUSEKEEPING

J. E. Beckelheimer

K. N. Ross

Inspection of the thorium metal production facilities during the past several weeks has pointed out some housekeeping problems that I wish to call to your attention.

? Pilot Plant

1. Probably the worst housekeeping problem in the facility is the Ball Mill. This equipment leaks excessively at practically every joint. All horizontal surfaces have a thick covering of dust. In operation, this dust becomes airborne and adds to the dust coming from the leaks. Since the ventilation is inadequate and there is no proper enclosure, a bucket was placed under the largest leak to help contain the spilled dust. This is not adequate. It is recommended that Engineering Division be requested to inspect the Ball Mill and associated equipment and recommend methods of improving both the dust problem and the housekeeping problem.

2. During the operation of removing the calcined ThF_4 and CaF_2 from the retorts, the stack of trays is left standing on a skid near the south annex door. The door is left open to aid in cooling the trays. The wind coming through the door blows the loose powder from the trays and spreads it generously through the annex. Removing the trays from the support requires heavy effort and this dislodges more powder to be spread by the wind. It is recommended that this stack of trays be put inside the enclosure used for grinding, weighing, and blending their contents. If faster cooling is necessary, a ventilated enclosure could be built there. It is suggested that a method of removing the central pipe from the trays would use much less effort and cause less airborne dust.

General

Prompt cleanup of all spills is the keystone of good housekeeping. In every inspection, it has been noticed that thorium

037425

[redacted]

containing material was spilled in many locations. Some of these repeated spill locations are the drying pan unloading station, the drying pan carts, the drying oven area, the bottom of the blending enclosure, the saws and saw area, the entrance to the furnace room when used to remove dezinced derbies from their holders, the top deck of the furnace room, the ThF_4 grinding enclosure and area surrounding it, and others. These spills are caused by human frailties and would be of no consequence if they were promptly and properly cleaned up. Vacuum cleaning and/or washdown with water is recommended.

All work stations should be cleaned before the operator moves to his next job. This method, when rigorously enforced, has been found to decrease the number of spills since more care is used to prevent a long tedious cleanup. Where the operator works at one station all shift, he is responsible for that area's cleanliness. Supervision must be alert and insist that each area be clean before the next operator or shift moves in.

Original Signed By

K. N. Ross

KNR/jm

cc: W. J. Adams
M. W. Hoback
J. A. Quigley, M.L.

File 1-91

NATIONAL LEAD COMPANY OF OHIO
Cincinnati, Ohio 45239

November 17, 1965

2223507

DEFENDANT'S EXHIBIT 3668

SUBJECT: VENTILATION FOR REDRUMMING OF THORIUM RESIDUES

TO: S. F. Audia

FROM: P. G. DeFazio

REFERENCE: Request for Engineering Services dated October 20, 1965
Engineering Project 1-91

The thorium residue drums are disintegrating. Mr. Costa started redrumming these residues but was stopped by the IH&R Department due to high levels of contamination arising from dust generated by the redrumming operation. Prior to the IH&R shutdown of the redrumming operation, the sump cake had been redrummed in 900 drums and 100 drums of floor sweepings had been redrummed.

Upon the stoppage of the work, an Engineering Request was issued requesting design of ventilation to enable the redrumming to continue. A preliminary investigation of the problem revealed a number of facets involving IH&R, Technical, and Production in several areas of the project. Accordingly, a meeting was called to gather all of the outstanding information on the problem of handling, storing and eventual disposal of the thorium residues.

About 30% of the drums are so corroded that they cannot be lifted off their pallets without falling apart. This is the fourth time that this material has been redrummed. There are approximately 2000 drums of this material. Originally, it was drummed separately under the following headings as: ThF_4, Metal Scrap, Sump Cake, ThO_2, Floor Sweepings, ThF_4 and Scrap, Miscellaneous Scrap, Material held for historical purposes and General Scrap. These drums were marked and stored on the outdoor pad. Due to the corrosive nature of the material and exposure to the elements, the drums corroded and disintegrated on the pad with a resulting loss of marking on individual drums. Even though the general area of storage for separate lots is known there has been mixing of the drummed materials. The degree of mixture was increased as each redrumming of the material was accomplished. As a result, we have an increasing amount of general scrap and miscellaneous residues and scrap.

On November 10, 1965, a meeting was held to discuss this problem. In attendance were: W. Strattman, J. Costa, K. Ross, R. Bipes, J. Cavendish, J. Carvitti, A. F. Pennak and R. B. Boies. An attempt was made to delineate this problem of redrumming thorium residues. The following possible courses of action were established in the meeting:

1324663

PLAINTIFF'S EXHIBIT

P-582

1. We must redrum this material at its present location prior to any handling.

2. We should investigate burying it. (AEC, at the present time, believes that it is of sufficient value to be economically feasible to process.) Mr. Carvitti will investigate burying costs, which will include pickup at the site and burial at the Morehead, Kentucky site.

3. Mr. Costa will estimate the cost of crushing and drumming of the material at Plant 1 in order to provide a better feed material of equal sized particles of material. The present drummed material has hardened into a solid mass.

4. Mr. Carvitti will investigate costs of processing the material to a neutral homogeneous slurry feed in Plant 8 so as to provide an improved feed material and at the same time neutralize the corrosion products which are destroying the storage drums.

5. The Laboratory will run tests on drum samples to determine the types of chemicals causing this corrosion.

6. R. Boies will investigate procurement of a drum which will withstand the corrosion of this material for long periods of storage.

7. R. Boies will design and estimate the cost of a processing station to handle redrumming at the storage pad if it is deemed necessary.

8. Mr. Cavendish will investigate the cost of processing the various residues to determine economic feasibility.

On November 15, 1965, J. Cavendish, R. Leist, A. F. Pennak and R. B. Boies discussed the possibility of processing a homogeneous feed produced by mixing all of the thorium residues together. The reason for reviewing this approach was the mixing which has taken place between the stored residues. Mr. Carvitti has informed us that the only true analysis of this material would be by taking a core sample from each drum. This would be a time consuming operation and the cost would be prohibitive. Mr. Cavendish and Mr. Leist voiced strong objections to a homogeneous feed since the chemical separation process is made much more difficult and costly. They will investigate the oxalate process proposed for use in the Plant 8 Winlo and see if this program would handle this material as a homogeneous feed. At least 30 to 45 days will be involved to obtain the test samples and collect the necessary data.

3324564

A decision as to what will be done with these residues must be made prior to February or March of 1966, when the Pilot Plant will be out of thorium feed.

The Project Engineering Department has been in touch with the IH&R Department and they have agreed to allow the redrumming to continue at the present location of the residues on the following bases:

1. All personnel in the area shall wear an airline respirator, proper clothing, and all personnel shall be cleaned up by the use of a portable vacuum cleaner prior to removal of respirators.

2. A canvas wind break shall be installed around the work area.

3. Clean up of work area by vacuum cleaner shall be performed at the end of each shift.

Drums are available for this purpose. The use of polyethylene drum liners is recommended where wet material is encountered. Precautions should be exercised to prevent further mixing of residues during the redrumming operation.

Conclusions:

It is agreed by all concerned that regardless of whether we process the material and extract the thorium, or process it in Plants 1 or 8, or bury it in any burial site other than that of the licensee at Morehead, Kentucky (who would pick up as is and perform the redrumming) the material must be redrummed at the pad. It is recommended that the material be redrummed at once for greater ease in handling when the final decision is made on disposition of the residues.

After the investigations of the possible courses of action outlined heretofore are completed we will be able to determine whether processing is economically feasible. This information will be issued as a report with recommended solutions.

P. G. DeFazio

RBB/AFP/wfk

cc: H. M. Beers
J. Carvitti
J. Cavendish
C. R. Chapman
J. Costa
R. H. Starkey
W. J. Strattman

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OFFICIAL USE ONLY

2117328

NATIONAL LEAD COMPANY OF OHIO

April 11, 1963

Mr. C. L. Karl, Area Manager
U. S. Atomic Energy Commission
P. O. Box 39188
Cincinnati, 39, Ohio

SUBJECT: THORIUM OPERATIONS AT NLO - PRESENT AND FUTURE

Reference: Letter, C. L. Karl to J. H. Noyes, subject "Thorium Turnings at Sylvania", dated 2-20-63.

Dear Mr. Karl:

In view of the recent request by Sylcor to ship a large quantity of thorium turnings to FMPC for oxidation in the Plant 8 facility, the entire thorium operation has been reviewed.

While developing the shipping information requested presents no major problem, continued operation of the thorium furnace in Plant 6 does. A basic problem exists and must be solved.

The solution decided upon with respect to the furnace can be used to determine just what should be done with the turnings at Sylcor. Summarized below are the principal considerations in this matter:

1. The current operation is unsatisfactory from both a hygiene and a fire and safety standpoint.

2. It is being continued only as terminal operation until July 1963. By that time the present inventory of thorium feed material is expected to be consumed.

3. Air dust levels in some operations now exceed 50 MAC; they range from 10-1300 MAC. Even the general air samples are 2-3 MAC. This stems from many deficiencies with the materials handling and ventilation systems.

4. To consume an additional 20,000 pounds of thorium turnings will add five months to the schedule. To continue an already unsatisfactory situation for an extended period, without major improvements, is intolerable.

5. Fire and safety hazards add to the problem. The roof over the furnace is not fire-proof, and should be.

OFFICIAL USE ONLY

[redacted]

NATIONAL LEAD COMPANY OF OHIO

CINCINNATI 39, OHIO

July 17, 1964

SUBJECT THORIUM OPERATION - PILOT PLANT

TO R. H. Starkey RHS

FROM J. F. Wing

REFERENCE

2118943

We were given advance information in May that some thorium work was to be done in the Pilot Plant. This came to me from you from R. Heatherton from S. Marshall. The general work was outlined to us as was a tentative schedule. I personally discussed the proposed work with J. O. Davis by phone at that time (probably May 27 or 28). Their plans were still somewhat "fluid" so I told Jim I'd check back the next week. On Monday afternoon, June 1, I went to the Pilot Plant and talked with Jim Davis and Steve Cseplo in detail and at some length (at least an hour) about their proposed plans. Others from IH&R were there as were representatives of Fire & Safety.

There were no approved procedures; however, as "fluid" as things were, this was not pressed until June 4 and met with virtually no success. The matter of "no procedures" was passed on to you the same day and, as I understand, you passed this on to Dick Heatherton.

At no time do I recall anyone mentioning that the crucibles were to be BeO-coated. I did not ask. Neither did I ask if tri-nitro-tolvene, cyanide, or nerve gas was going to be used. In the face of the tin-can and bailing wire set-up that was visible, there was already enough to ask about. With the reputation that Be work has and with the background of the Pilot Plant supervisory force, I am surprised that they didn't mention it. I would expect that a supervisor of such an operation would have done so if he gave a d___ for health and safety.

I did not learn of the use of BeO until the night of 7/14. Our investigation began the morning of 7/15. We learned that 7/15 was to be the last day for using the BeO-coated crucibles on this thorium run. We also learned from a Pilot Plant supervisor on 7/17 that "we've used BeO from the start." The first thorium metal arrived at the Laboratory Machine Shop on June 9 (3 ingots This means that the metal was probably poured not much over two to three days before --- maybe as late as June 8. This would mean that the Pilot Plant supervisor responsible for the project was probably very aware of the possible or intended use of BeO at the outset (late May or early June).

Thorium Operation - Pilot Plant
R. H. Starkey
July 17, 1964

The limit for Be in air is 2 μg/M^3 whereas our limit for uranium is approximately 67 μg/M^3. The difference is more than simply one of numerical comparison. There is no positive evidence that anyone has died of exposure to natural uranium. The same cannot be said for beryllium.

J. F. Wing

J. F. Wing

JFW/mjs

NATIONAL LEAD COMPANY OF OHIO

CINCINNATI, OHIO 45239

September 26, 1966

SUBJECT BeO AIR DUST EVALUATION OF PLASMA FLAME SPRAY FACILITY - PILOT PLANT

TO R. H. Starkey

FROM R. L. Bipes

REFERENCE

An air dust survey was conducted in March on the plasma flame spray facility while coating crucibles with BeO. The actual coating operation was accomplished in an inert atmosphere. There was a potential BeO exposure to the operator when placing BeO into the feeder, cleaning the interior of the spray chamber and conducting maintenance on the flame spray gun.

The following table summarizes the results of data which was collected.

Date	Type of Sample	No. of Samples Collected	Description	Results µg Be/m^3	X TLV*
3/21/66	GA	1	While coating crucibles in an inert atmosphere	0.04	0.02
3/21/66	BZ	1	While loading feeder and cleaning interior of spray facility	13.8	6.9
3/22/66	GA	1	While cleaning interior of spray facility	0.55	0.28
3/22/66	BZ	2	While cleaning interior of spray facility and removing insulation from gun	11.8	5.9
3/24/66	GA	1	While cleaning plasma spray gun	4.0	2.0
3/24/66	BZ	1	While cleaning plasma spray gun	15.3	7.7

The results of the collected data indicate high Be air dust levels whenever performing any work inside of the enclosure after spraying BeO.

Since the air dust survey was conducted, a portable ventilation hood has been designed to encompass the door of the plasma spray facility before opening. The construction and installation of this hood has gone out for subcontract bid. This hood should minimize spillage of material on the floor when the door is opened. The inner face of the door should be vacuumed clean as it is opened. Extensions should be obtained for the vacuum cleaner so that entire interior of the spray facility can be cleaned without having to lean into the facility.

Dust type respirators with ultra filters were worn by the operators when the survey was conducted. Until the effectiveness of the ventilated hood can be determined, the operators should continue to wear dust type respirators with ultra filters while conducting the following operations.

1. Preparing feed for the feeder
2. Cleaning the interior of the spray facility
3. Conducting maintenance on the spray gun.

* Recommended threshold limit value as established by the American Conference of Governmental Industrial Hygienists (2 $\mu g/m^3$ of air).

R. L. Bipes

RLB/mjs

cc: D. L. Elston
J. O. Davis

2232169

~~EH~~ 10/17/54

Plant 6

NATIONAL LEAD COMPANY OF OHIO

U. S. ATOMIC ENERGY COMMISSION

0368080

[redacted]

PROJECT PROPOSAL

A. **PROPOSAL NUMBER**

CP-59-79

B. **TITLE OF PROJECT**

Sludge Furnace Alterations for Oxidation of Thorium Residues - Plant 6

C. **DATE**

October 20, 1959

D. **DISCUSSION AND JUSTIFICATION**

1. **Problem**

The metal oxidation facilities at FMPC are not available, due to the lack of isolated dust removal systems, for the processing of pyrophoric thorium residues such as sludges, chips or turnings. There is a considerable inventory of such material now being stored here, and more is received from time to time from other sites. Stockpiling of these pyrophoric residues creates handling and storage problems due to their hazardous nature.

During the past four years there have been 30 known fires with these materials, some of which burned for several days. Clean up after these fires is a difficult job. In one case, the fire burned through a concrete storage pad. Storage of the drums on soil resulted in a worse situation, when a fire contaminated a considerable area, and much stone and dirt had to be removed. As long as these residues are in the unoxidized state, the hazard and expensive housekeeping problems will exist. Corrosion from prolonged storage of the drums has resulted in oil leaks, and redrumming and clean up problems. Attempts to redrum these materials have resulted in violent reactions exposing personnel to possible serious injury. At present, because of limited outside pad storage space, it is necessary to store these residues without the desired spacing or isolation for preventing the spread of possible fires.

2. Solution

Use of the Plant 6 sludge furnace for the oxidation of these pyrophoric thorium residues is proposed. This will require alterations to the charging facilities and dust removal system.

The sludge furnace was originally installed for processing sludge from contour grinding operations. Production requirements have changed, and contour grinding of fuel elements is no longer done. The furnace is not now in use.

3. Justification

In recent correspondence from the Commission, National Lead Company of Ohio was requested to properly stockpile all thorium material not meeting the disposal criteria. The oxidation of these thorium residues will enable NLO to fulfill the Commission's request by safely storing all of these residues. The constant danger from pyrophoric materials will be eliminated.

The oxidation of these thorium residues will improve housekeeping conditions through the elimination of leaking oil used for covering chips, turnings, etc. Furthermore, the oxidation of this material will greatly reduce the individual drum inventory because the oxide is of higher density than are turnings, chips, and the like.

The reduction of drum inventory will release more storage pad area to the Special Products Plant for storage of enriched residues.

The thorium residues which will be processed in this furnace total approximately 80 tons, and consist of the following:

a. Turnings - approximately 65,000 pounds, net weight.

b. Grinder Sludge - approximately 14,000 pounds, net weight.

c. Saw Dust - approximately 63,000 pounds, net weight.

d. Misc. Solids - approximately 17,000 pounds, net weight.

Also, an unknown quantity of pyrophoric residues in 1,300 additional drums is now in storage.

Upon completion of the oxidation of the thorium residues, estimated to take about six months, this furnace will be cleaned and made available for the campaigning of other pyrophoric materials, particularly those which would require a special Accountability campaign.

E. PRELIMINARY DRAWING

Drawing No.	Title
6-4730	Oxidation of Thorium Residues - Proposed Equipment Installation

F. OUTLINE SPECIFICATIONS

Following is a brief description of the work required to modify the existing sludge oxidation furnace and supplementary facilities to make them suitable for thorium residue oxidation in compliance with Health & Safety, Accountability and housekeeping requirements.

1. Alterationsto Existing Facilities:

   (a) The fire barrier trough shall be removed, decontaminated and stored for the duration of the thorium oxidation program.

   (b) The exhaust duct work connecting the furnace to the Acme ventilation system shall be removed.

   (c) The slide valve connecting the fire barrier trough to the furnace inlet shall be removed.

   (d) The power hack saw shall be relocated to the south portion of the east pad area.

   (e) The 8" diameter charge tube between the furnace valve and the second hearth shall be removed.

2. New Facilities:

   (a) Individual sludge collection trays shall be installed for each of the three clarifier units, replacing the fire barrier trough. The sludge will be scraped manually off the trays into drums.

(b) New dust collection facilities incorporating a wet scrubber shall be provided as a permanent installation. New duct work shall be installed from the furnace to the scrubber. A recirculating tank and pump shall be obtained from excess property and installed in conjunction with the scrubber.

(c) A single flapper type charge valve shall be provided for furnace charging. Valve operation will be controlled from the skip hoist.

(d) A power driven skip hoist shall be installed to mechanically transfer the packaged thorium charge from the work table to the point of discharge into the furnace. This hoist shall consist of two parallel strands of double pitch conveyor chain (to enable carrying the charge cradle in a vertical position) and shall be powered by a variable speed reversing drive. The hoist frame and supporting members shall be of structural steel construction.

The operator will manually place a packaged charge of approximately 30 pounds in the cradle of the hoist and press the start button. The hoist will carry the charge up to the furnace, actuate a limit switch, and stop with the charge in the charging station located above the valve opening. At the same time, the unloading air cylinder will be actuated to mechanically push the packaged charge from the cradle and simultaneously open the flapper of the charge valve. A time delay will retract the unloading cylinder and close the valve as soon as the charge has fallen free of the valve onto the second hearth of the furnace. The hoist will then automatically return to the loading position.

An exhaust hood connected to the new ventilation system shall be installed over the charging station area to remove any possible flash-back or fume release occurring during the brief interval the valve is open.

(e) A steel work table (approximately 4'x8') shall be provided for the purpose of dumping and mixing the thorium residues. A discharge opening complete with a loading funnel shall be located at the discharge end of the table. The working surface of the table shall be pitched to the loading end, and shall have a suitable oil discharge to permit drained oil to be collected into drums.

(f) A mechanical drum dumper shall be provided to pick up 30 gallon and 5 gallon drums from the floor and position them for dumping on the table. Suitable shovels, rakes, hoes, etc., shall be provided for handling the material on the table.

(g) The area used for the storage and handling of the thorium residues shall be temporarily enclosed by 6 ft. cyclone fencing to prevent cross-contamination of thorium and uranium materials. An access gate shall be provided for fork truck access.

(h) A new stainless steel charge tube, approximately 11" I.D., shall be installed between the furnace valve and the second hearth.

(i) The existing floor collection trench within the area enclosed for the thorium oxidation program shall be blanked off to prevent cross-contamination. A portable sumppump shall be provided to empty the trench as required.

3. Proposed Method of Handling Thorium Residues:

The residues consist of turnings, fines, sludge and miscellaneous solids. It is proposed to limit the unit furnace charge to 30 pounds of residue. It is further proposed to package each charge in a plain, unlidded paper carton or tub approximately 8" dia. x 8" to 10" high. The container and material will be charged into the furnace, where the container will be reduced to ash, and the thorium charge will be reduced to a passivated oxide.

G. PRELIMINARY ESTIMATE OF COST

The estimated cost of the proposal is:

$29,000.

A breakdown of this estimate is shown on the attached estimate sheets.

H. ESTIMATED TIME REQUIREMENTS

	Start	Finish
1. Design	2 wks. after approval	12 wks. after approval

H. ESTIMATED TIME REQUIREMENTS (Cont'd)

		Start	Finish
2.	Procurement (Purchase Orders)	5 wks. after approval	8 wks. after approval
3.	Equipment Delivery	12 wks. after approval	16 wks. after approval
4.	Installation	16 wks. after approval	24 wks. after approval

I. STATEMENT OF METHODS BY WHICH WORK WILL BE PERFORMED

1. The design and procurement will be by National Lead Company of Ohio.

2. The installation will be by a Subcontractor on a lump sum basis.

J. SPECIAL CONDITIONS

None.

K. BUDGET DATA

Funds are available in Activity 2900 and in the Operating Budget (Other Than Activity 2900). Costs will be charged as follows:

Activity 2900	$23,000
Operating Budget (Other Than Activity 2900)	6,000
Total	$29,000

NATIONAL LEAD COMPANY
OF OHIO
Cincinnati 39, Ohio

72-1-1-1

November 14, 1960

SUBJECT AIR DUST EVALUATION OF THORIUM FURNACE OPERATIONS, PLANT 6

TO J. E. Carvitti

FROM K. N. Ross

11/14/60
72-1-1-1

The attached evaluation shows that most of the operations performed in the thorium oxidation area are greater than the MAC. This evaluation also shows the volume of ventilation to be 84 percent of the rated capacity. This should be sufficient ventilation to control the dust in this area. It is recommended that a ventilation survey of these operations be made to determine why the high air dust levels are not controlled. In addition, the results show that the dust controls on the sifting operation (not approved by the Fume & Dust Control Committee) are grossly inadequate and need correction.

A dust-type respirator should be worn while performing these operations until a new air dust evaluation shows the air dust levels to be less than the MAC.

Keith M Ross
K. N. Ross

KNR:br

Attach.

cc: C. R. Chapman
G. C. Coon
R. H. Halcomb
J. A. Quigley, M.D.
R. M. Spenceley
R. H. Starkey
J. F. Wing

Central File

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CENTRAL FILES

NATIONAL LEAD COMPANY
OF OHIO
Cincinnati 39, Ohio

72-1-1-1

November 14, 1960

SUBJECT AIR DUST EVALUATION OF THORIUM FURNACE OPERATIONS, PLANT 6

TO K. N. Ross

FROM R. N. Halcomb

On October 18 and October 31, 1960, air dust samples were collected on all operations connected with the thorium furnace operation, east end of Plant 6. Results of the survey show that five of the six operations sampled exceed the MAC of 70 alpha disintegrations per minute per cubic meter of air. These six operations are:

		X MAC
1.	Sifting drums of thorium oxide - outside	33.0
2.	Changing drum at product canning station	4.0
3.	Putting drum of thorium residue into outside dumping station and working controls	4.0
4.	Unplugging furnace discharge line	4.0
5.	Hand feeding thorium chips and turnings into second hearth - 2nd level	3.0
6.	Raking thorium residue into paper buckets	0.8

The first four operations listed above are short-termed operations; i.e., performed about three minutes each per shift, while the other two are performed from 60 to 90 minutes each per shift. The operation of sifting thorium oxide is performed once per week, usually on Monday morning while waiting for the furnace temperature to increase to the proper level.

However, it is recommended that a dust-type respirator be worn during those operations which exceed the MAC for airborne radioactive dust.

A 10-point traverse was taken on the exhaust stack on November 8, 1960. Results show that the fan is delivering a volume of 5400 cfm with a velocity of 1100 fpm, which is an efficiency of 84 percent of the rated capacity of 6400 cfm. This indicates that the fan is therefore delivering near what it was designed to deliver.

In case the ventilation and/or scrubber systems are altered or any operational procedures are likewise altered, a re-evaluation will be conducted

[redacted]

and a report submitted.

R. N. Halcomb
R. N. Halcomb

RNH:bg

OFFICIAL USE ONLY **CENTRAL FILES**

72-1-1-1

April 14, 1961

ATTACHED REPORT – AIR DUST RE-EVALUATION OF THORIUM FURNACE OPERATIONS – PLANT 6
J. E. Carvitti

K. N. Ross

Letter – K. N. Ross to J. E. Carvitti, 11-14-60, subject, Air Dust Evaluation of Thorium Furnace Operation – Plant 6. 72-1-1-1

Holcomb 4/14/61 72-1-1-1

The attached air dust evaluation shows the air dust concentrations in the Thorium furnace operations to be above MAC. It is recommended that respiratory protection be worn while performing the operations listed in the attached evaluation.

From all appearances, air dust sources in this operation have not changed appreciably since the former evaluation (October, 1960). All recommendations made then are still valid and should be investigated.

ORIGINAL SIGNED BY
K. N. Ross

KNR/bw

cc: C. R. Chapman
R. M. Holcomb
R. M. Spenceley-G. C. Coon
R. H. Stierley
J. A. Quigley, M.D.
J. F. King
Central File

OFFICIAL USE ONLY

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OFFICIAL USE ONL 2260758

To file

NATIONAL LEAD COMPANY OF OHIO

P. O. BOX 158 CINCINNATI 39, OHIO

Mr. C. L. Karl, Area Manager
U. S. Atomic Energy Commission
P. O. Box 39188
Cincinnati 39, Ohio

SUBJECT: Thorium Turnings in Sylvania

Dear Mr. Karl:

This is in reference to your request of February 20, 1963 to supply Sylcor with instructions for shipping 20,000 pounds of thorium metal turnings to the FMPC.

We should like to call to your attention that the furnace in Plant 6 used for the burning of thorium is not a satisfactory installation. Approximately two years ago the NLO Health and Safety group recommended that the facility be improved or shut down following the consumption of the thorium materials which were then on hand on the site.

The furnace provides a fire hazard because of the type of roof over the furnace and because of its location near the center of a valuable building. It also provides a health hazard in exposure of operating personnel to air-borne radioactive dust. The MAC which we have been using for thorium is approximately 20 times that presently recommended by the National Committee on Radiation Protection. The Committee in 1959 gave a provisional value of about two times the MAC but urged that the exposure of personnel to natural thorium be kept as low as operationally possible. Precautions, such as a low rate of burning, the use of respirators, and the rotation of personnel, have been taken by NLO in the processing to date. However we feel very strongly that it is unwise to process in the present facility beyond the time required for materials presently at hand. This will be about July 1, 1963. The Sylcor turnings can not be included and meet this date.

[redacted]

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We should appreciate your advice on the matter of a capital expenditure to provide a safe and efficient facility for future burning of thorium materials. We shall be pleased to submit a proposal if it is considered that there is a need for such a facility.

Sincerely yours,

J. H. Noyes
Plant Manager

CRC:mb

cc: C. L. Karl, 1x
C. R. Chapman
P. G. DeFazio
S. Marshall - P. McCreery - B. Gessiness
J. A. Quigley
W. A. Smith

Central Files

NATIONAL LEAD COMPANY OF OHIO

CINCINNATI 39, OHIO

March 26, 1963

SUBJECT: AIR DUST RE-EVALUATION OF THE THORIUM FURNACE - PLANT 6

TO: C. R. Chapman

FROM: R. H. Starkey

REFERENCE:

On December 10 and 11, 1962 an air dust re-evaluation was conducted of the Thorium Furnace. Results of the air dust samples taken during this survey are shown below and they are compared with the results of samples collected during October, 1960 and January, 1961.

Operation or Location	X MAC* 1962	1961	1960
BZ Raking excessive cold residue from edge of top hearth into furnace	1260	-	-
BZ Unplugging furnace discharge line	417	4.0	4.0
BZ Loading thorium metal into 5 gallon can from 55 gallon drums to be carried to furnace for charging	69	-	-
BZ Raking thorium residue into Rotex sifter	27	31	33
BZ Changing drum at product canning station	19	4.0	4.0
BZ Charging furnace with pieces of metal	7	3.0	3.0
GA Approximately 12 feet southeast of furnace	2.5	-	-
GA 1 foot west of furnace	1.8	-	-

* MAC - maximum allowable concentration (70 α d/m/M3)
\- Denotes operation or area did not exist or was included in another classification at the time of sampling.

Although the Thorium Furnace and Rotex sifter have ventilation, it is completely inadequate. In addition, a majority of the operations performed in conjunction with the furnace do not have local ventilation at all. It should be mentioned also that the plexiglass window in the product canning station is broken. This is reducing the ventilation efficiency of the station. The rabbeling arms in the top hearths of the furnace have been removed, thus the excessive cold residue on the edge of the hearths is raked into the furnace by hand (this operation is 1260 X MAC).

As was discussed in a meeting in your office this morning, this furnace should be shut down immediately after processing the thorium now on site. J. Carvitti estimates this should be completed by approximately July 1, 1963.

R. H. Starkey

R. H. Starkey

RHS/mjs

cc: J. A. Quigley, M.D.

NATIONAL LEAD COMPANY
OF OHIO

March 10, 1970

SUBJECT: MEETING HELD ON MARCH 10, 1970, TO DISCUSS CUTTING UP OF THORIUM DERBIES IN PLANT 6

TO: Memo to Files

FROM: J. H. Cavendish

A meeting was held on March 10, 1970, to discuss the cutting up of thorium derbies in Plant 6. J. L. Burke, C. W. Baer, R. W. Mode, C. R. Armstrong, K. N. Ross, S. O. Samoriga, and J. H. Cavendish attended the meeting.

Items discussed were:

1. <u>Health and Safety Considerations</u>

   a. <u>Airborne Contamination</u>

   Keith Ross reported that the results of air samples taken during the test conducted March 2 indicated that the level of activity directly over the shear was 2000 $d/m/m^3$. At a distance of six feet from the shear, the level was 600 $d/m/m^3$. Since the maximum allowable concentration is 100 $d/m/m^3$, it is concluded that ventilation and/or wearing of respirators by personnel would be necessary.

   b. <u>Mechanical Safety</u>

   Armstrong indicated that it was Health and Safety's recommendation that a method be provided for mechanically holding the thorium pieces during the cutting operation. Holding of the pieces by the operator in his hand would not be permitted. It was felt that some form of tongs would be best for this purpose. He also indicated that better lighting in the area should be provided.

2. <u>Equipment Modifications</u>

   a. <u>Ventilation</u>

   Provision for adequate ventilation to reduce the activity level below the <u>100 ppm</u> maximum was felt to be required. This should preferably be vented outside.

   b. <u>Improvement of Lighting in the Area</u>

   c. <u>Provision of an Argon Station</u>

[redacted]

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d. Provision of Screening Facilities for Removal of the Minus 1/4-inch Fraction

Bob Mode was given the assignment to prepare a preliminary design and estimate of cost and time involved in making these modifications.

3. SOP Preparation

It was agreed that C. Baer and S. Samoriga would prepare the SOP as soon as possible.

4. Training of Operators

It was agreed that S. Samoriga would spend the first two operating days in the area training the operators for that shift.

J. H. Cavendish

J. H. Cavendish

JHC/blr

cc: W. J. Adams
C. R. Armstrong
S. F. Audia
C. W. Baer
J. L. Burke
P. G. DeFazio
S. Marshall
R. W. Mode
M. S. Nelson - C. R. Chapman
J. A. Quigley
K. N. Ross
S. O. Samoriga
R. M. Spenceley

March 6, 1963

IH&R DEPARTMENT MONTHLY REPORT FOR FEBRUARY, 1963

J. A. Quigley, M.D.

R. H. Starkey

Air Hygiene Studies

The 1963 complete in-plant air dust surveys of Plants 1 and 9 have been started.

Air dust samples of the general air at various locations in Plant 4 were taken in starting the Plant 4 survey. The results were higher than in the past, therefore sampling has been discontinued until the general plant clean-up, started in February, is completed.

Evaluations:

Slug Degreaser - Plant 9:
An air dust evaluation of operations at the slug degreaser in Plant 9 showed no air dust levels greater than MAC. Respiratory protection was not recommended.

Winlo Process - Plant 8:
An air dust evaluation of the Plant 8 Winlo process showed air dust levels resulting from the changing of mobile hoppers to be 10 MAC. All other air dust levels were below MAC. Respiratory protection is recommended for this operation. It is understood that a CP is being prepared that includes provisions to control this dust source.

Enriched Packaging Station - Plant 5:
An evaluation of the new enriched packaging station, Bank 12, showed breathing zone air dust levels of 6 to 7 MAC. The probable cause of these high air dust levels is the incorrect use of equipment. Plant supervision indicated they would re-instruct the operating personnel and that they will request some revisions to the station.

Thorium Furnace - Plant 6:
Air dust samples taken during the operation of the thorium furnace show levels far exceeding the MAC for thorium. Breathing zone air dust levels of various operations range from 10 to 1,770 MAC. This is believed to be due to the decrease in ventilation (the fan is delivering less than 1/2 of its rated capacity) and to

[redacted]

lack of adequate maintenance. The exposure levels have exceeded acceptable values since as early as 1960; however, the current conditions are by far the worst on record. This problem was discussed with the General Superintendent who agreed that minimum maintenance should be performed inasmuch as the unit should be shut down approximately July 1.

Special Radiation Studies

Instrument surveys of the external radiation levels at the Plant 9 remelt, ingot separation, charging and burnout areas were conducted during the past three months. The purpose of these surveys was to point out problem areas to determine the cause of a gradual increase in monthly film badge exposures. It was found that under present operating conditions and design capacities, housekeeping problems have resulted in increases in the background radiation levels. Due to this relatively high "background" a more precise survey could not be made. Recommendations concerning housekeeping and other conditions affecting the radiation exposure in this area were sent to Plant 9 supervision. These conditions will be discussed with them in detail at a later date. A follow-up survey, after the preliminary improvements or revised practices are accomplished, will then be initiated to determine additional radiation protection methods.

The semi-annual survey of the radiographic facility revealed that no radiation hazards exist during the use or storage of the source.

Miscellaneous Special Studies

A surplus electro-plating cleaner was checked to see if it could be safely used for general cleaning service. It was concluded that this material could safely be used with the protection of rubber gloves and splash goggles. This information was passed on to the plant Labor Pool foreman.

Fume and Dermatitis Investigations

A Plant 8 Winlo area chemical operator became nauseated after spending approximately one hour without respiratory protection cleaning damp material from the base of the scrubber column. Measurements of the HF concentrations were found to be low but exceeding the threshold limit values. The operator returned to work the second day after his exposure and sickness and was examined by a NLO physician. It was determined that the gastro-intestinal disturbance could not have been caused by the low HF level encountered during this exposure but rather was of non-occupational origin.

CENTRAL FILES

NATIONAL LEAD COMPANY
OF OHIO
P. O. BOX 158, MT. HEALTHY STATION
CINCINNATI 31, OHIO

F2-1-1-1

October 20, 1952

SUBJECT Survey of 3620 Operations

2277983

TO C. Chapman

FROM R. C. Heatherton

REFERENCE

In the period from October 8 to October 12, a number of air dust samples were taken of the 3620 operations in the Pilot Plant. The results of these samples indicate that operators are exposed to breathing zone concentrations in the range from 2 to 35 times the maximum allowable concentration while performing the various operations. Process samples of the exhausts of the Lewyt and Invincible vacuum cleaners were about 1-1/2 times the maximum allowable concentration.

In addition to high air dust concentrations, there have been reports of skin irritations from HF which is carried on to the product receivers, and explosions in the Lewyt vacuum cleaners caused by an accumulation of hydrogen. One of the explosions was of sufficient force to blow the cleaner apart. In addition to being a safety hazard, it is almost certain that in explosions of this kind Industrial Hygiene problems are created by the sudden release of radioactive dust.

It is my opinion that high air dust concentrations, HF burns and hydrogen explosions have resulted from the total inadequacy of the ventilation which is provided by the Lewyt vacuum cleaners. The prediction as to their inadequacy was made prior to their use and I now wish to state that they cannot serve the purpose for which they were intended in this operation. Aside from the fact that they do not have the capacity which is needed, the ones being used are installed in a manner that the maximum benefit from their use cannot be obtained.

It is also my opinion that if we are going to continue the operation we may be doing something that would seriously affect the health and safety of workers in the area. On the basis of this we would recommend that the operation be shut down until the ventilation which has been provided is installed.

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NATIONAL LEAD COMPANY
OF OHIO
P. O. BOX 158, MT. HEALTHY STATION
CINCINNATI 31, OHIO

213211

December 9 1952

SUBJECT ·ORT ON OVEREXPOSURES

TO DR. J. A. QUIGLEY

FROM DR. WM. A. McCLELLAN

CENTRAL FILES

REFERENCE

During August and September 1952, seventeen men were known to be directly exposed to uranium hexafluoride in varying amounts while working in the Pilot Plant. The exposures were uniformly of short duration. As closely as we can determine, flood conditions were not present, but in two instances there were relatively heavy acute exposures. In view of the toxicity found in the Rochester radiation experiments and chronic toxicity found at Harshaw, these men have been studied for possible renal damage. This was not a controlled condition but an actual on-the-job occurrence and consequently the findings will depend on the cooperation of the men and the necessity of going ahead with production without lowering of morale. The findings are open to criticism in several respects, in my estimateion; one of the most serious being, rectal examinations to check for prostatis have not been done on these men.

The criteria we have used:

1. Known exposures to uranium hexafluoride,
2. Urinary findings, in most instances possibly indicative of renal damage, and in some cases, certainly indicative of renal damage where no findings previously existed.
3. Recovery of uranium from the urine.

The men in the September exposure had a physical examination of their hearts, lungs, abdomen and mucus membranes within an hour after their exposure. Urinalysis were started on the day of exposure and have been continued as long as any renal damage has been shown. Of the seventeen men in the two exposures there has been only one man with any initial pathological urinary findings and all seventeen men have shown some abnormal urinary findings at some time within nine weeks following exposure.

F/W 0401

PE107C

Conclusion: There is possibly some dgree of urinary damage associated with uraniun hexafluoride inhalation. It occurs on very brief exposure and is apparently moderatly persistent. Known exposures should be carefully observed for renal damage in all institutions using this compound. Careful records over a period of years should be kept on the men exposed to this compound since little is yet known of its human toxicity and its chronic effects.

Summary: Seventeen men were exposed to uranium hexafluroide. 100% showed urinary damage. There have been some suggestive findings in other organs, notably mucus membranes of the eyes, following uranium hexafluoride exposure, but no mention other than this was made in this report. Careful observation of known exposures should be carried out.

WAM:rnk

NLO-25-LOTZ

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CENTRAL FILES

F

May 29, 1953

2124475

SUBJECT Air Dust Samples - Pilot Plant

TO J. O. Davis

FROM R. C. Heatherton

REFERENCE

The following is a tabulation of some recently collected air dust samples in the Pilot Plant.

3013 Area

Description	No. of Samples	Results (d/m/M3) High	Low	Avg.	X MAC
BZ Operator dumping ore to hopper	2	38,500	1,112	15,400	220

3620 Area

Description	No. of Samples	High	Low	Avg.	X MAC
BZ Maintenance men removing micro dust collector bags	9	22,600	322	7,700	110
BZ Removing and breaking up carbon rods	4	18,588	816	7,800	112
BZ Cleaning Adams filter with wire brush and scrapper.	5	[illegible],900	306	2,840	41
BZ Removing UF_4 collector in off gas stream for sampling	1			404	5.9

3037 Area

Description	No. of Samples	High	Low	Avg.	X MAC
BZ Grinding ingot sample-no ventilation	7	30,500	23	3,890	55.5
BZ Removing slag from derby station & chipping slag from derby	2	1,123	113	585	8.4

While some of these operations were reported in the recently issued Pilot Plant Study #1 others were not included in that study. The results reported here are sufficiently high that action should be taken in order to reduce as much as air contamination at each source. This can possibly hrough more careful operation and improved housekeeping asis on clean up at the completion of each step of the

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CENTRAL FILES 72-1-1-1

December 13, 1960

AIR DUST EVALUATION OF CLEANING AND REPAIRING ROCKWELL FURNACES, PILOT PLANT

K. H. Ross

F. J. Klein

On December 5, 1960, an air dust survey was made at the Pilot Plant while Maintenance Department personnel were making element repairs inside #2 Rockwell Furnace.

The furnace interior was cleaned of debris prior to monitoring and entering. External radiation was measured at 10 mrad/hr beta plus gamma, using a GS-3 survey instrument.

Breathing zone air dust samples were collected while Maintenance Department personnel made the necessary repairs. The repair men doing the work wore a full-face air-supplied respirator. The analytical results of the air dust samples collected are as follows:

Type	Sample Description	% MAC
BZ	Maintenance man inside Rockwell Furnace removing center element ring and placing new insulators.	52
BZ	Maintenance man placing and adjusting insulators, holding rods, and placing new element in Rockwell Furnace.	32

MAC (Maximum Allowable Concentration) = 70 α d/m/M3

The radioactive dust concentration is well above the MAC and it is extremely doubtful that a dust-type respirator will provide adequate respiratory protection for anyone working in such air concentrations. Therefore, air line respiratory protection is recommended for anyone entering and/or working inside the Rockwell Furnace.

ORIGINAL SIGNED BY
F. J. Klein

FJK:bg

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NATIONAL LEAD COMPANY
OF OHIO
CINCINNATI 39, OHIO
March 22, 1961

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CENTRAL FILES

SUBJECT: ATTACHED REPORT-AIR DUST EVALUATION OF PILOT PLANT REDUCTION AND BREAKOUT OPERATIONS

Given to Starkey 3/22/61 4-24-61

TO: J. O. Davis

FROM: R. H. Starkey

The attached air dust evaluation shows most operations in the Pilot Plant Metallurgical Area are potential sources of air dust exposure. Recommendations for alleviating these conditions are included.

Because of the temporary nature of many Pilot Plant operations, ventilation and enclosures are often makeshift since time and economics do not allow proper design.

This is not the case in the Metallurgical Area. The equipment in this area appears to be at least semi-permanent and deserves properly designed enclosures and adequate ventilation. It is recommended that the Engineering Division and/or the Fume and Dust Control Committee be contacted in regard to this matter and permanent ventilation for these operations be procured with their assistance.

In this evaluation, it is mentioned that respirators are not worn while performing operations that require respirators according to NLCO 668 "SOP For Pilot Plant Metallurgical Area Reduction to Metal of Enriched UF_4 Containing up to 3% U-235". It is recommended that these violations of SOP be investigated and the proper action taken by Pilot Plant supervision to prevent their future occurrence.

R. H. Starkey

R. H. Starkey

KNR/bw

cc: F. J. Klein
J. F. Wing
F. L. Cuthbert-W. E. Shaw
C. E. Polson

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SAFETY GUIDE

NATIONAL LEAD COMPANY

OF OHIO 2/18/66

MAJOR INJURY #1

DATE

February 14, 1966

TIME

8:40 a.m.

DEPARTMENT

Technical - Pilot Plant

LOCATION

UF_6 Vaporization Facility, North side of Pilot Plant Building

INJURY

The inhalation of UF_6

EQUIPMENT INVOLVED

UF_6 Cylinder

TYPE OF ACCIDENT

Contact with noxious substances

DETAILS

A chemical operator was exposed to a serious release of UF_6 vapors while attempting to start up the UF_6 vaporization system prior to the day's operation. The employee was given emergency treatment on site and then transferred to a local hospital. It is expected that he will be released from the hospital soon and will probably be able to report to work the week of February 20. A committee, selected by the A.E.C., has been directed to investigate the nature of this release.

check the rules — they're safety tools

[redacted]

3147794

SAFETY GUIDE

NATIONAL LEAD COMPANY
OF OHIO

July 2, 1968

Major Injury #3 and #4

Date

June 28, 1968

Time

11:00 a.m.

Division

Technical

Location

PLT Operation - Pilot Plant

Equipment Involved

PLT Furnace

Injury

#3 - 1st, 2nd, and 3rd degree burns of back of head. 1st degree burns of both eyes.

#4 - 1st and 2nd degree burns of face, both eyes and both wrists.

Details

Two Technical Division employees, a Pilot Plant Chemical Operator (#3) and a Metallurgical Department co-op student (#4) were injured as the result of an explosion in the open furnace shell of the PLT furnace. The Pilot Plant employee was inside the open furnace removing the insulation pack and the co-op employee was standing on a ladder observing the operation when the explosion occured. Both employees were treated on site and later transferred to an off site hospital. It is expected that they will be released to return to work in a week or more.

A committee has been formed to investigate the cause(s) of the accident.

check the rules — they're safety tools

co-op student

2668355

[redacted] 3230792

NLO, Inc.

A SUBSIDIARY OF NL INDUSTRIES, INC.
CINCINNATI, OHIO 45239

November 6, 1984

2230563

SUBJECT HEALTH, SAFETY, AND ENVIRONMENTAL MATTERS AT THE PILOT PLANT

TO E. M. Nutter

FROM R. M. Spenceley

REFERENCE Letter, R. B. Weidner to E. M. Nutter, Same Subject, November 1, 1984

We are in receipt of the reference letter which describes serious health, safety, and environmental problems in the Pilot Plant. These problems have apparently occurred as a result of design and construction defects in the new UF_6 to UF_4 reactor. Operations under such conditions cannot be tolerated. By receipt of this letter, my verbal instructions to you earlier this morning to shut the plant down, are confirmed. You are also instructed to begin and to expedite cleanup of the facility and on completion to request monitoring by the Health and Safety Division to assure that the cleanup has been carried out in a completely satisfactory manner.

In the future, copies of letters describing situations of such importance are to be forwarded immediately to this office.

R. M. Spenceley

WJA:rb

cc: M. W. Boback - R. B. Weidner
N. R. Leist

NLO-28-LOTZ

CENTRAL FILES

NATIONAL LEAD COMPANY
OF OHIO

P. O. BOX 158
MT. HEALTHY STATION
CINCINNATI 31, OHIO

F2-1-1

August 25, 1953

2242911

SUBJECT
Control of Dust in the Sampling Plant

TO
D. J. Blythe

FROM
J. J. Costa

REFERENCE
Report: E. V. Barry to J. A. Quigley, "Industrial Hygiene and Radiation Preliminary Report on the Sampling Plant" dated 8/19/53

Dust levels reported in the above survey are due to failures and poor design on the part of the processing equipment. These failures have not only increased air borne dust far above permissable safe working levels, but have also caused completion of the evaluation program to fall far behind schedule.

It will be noted that much of the dust is caused by the failure of both the Q-11 and MgX deheaders. Attempts are being made by Richmond Machining Co. in Philadelphia to rectify this situation.

The area around the MgX Drumming Station is dusty because of poor design. A redesign study is presently being made by Engineering. Engineering, too, is studying a redesign of hoods and ventilating systems in the laboratories to decrease dust there.

It will be noted that the Honan-Crane conveyors on the Q-11 side have been large contributors to the existing dust conditions. Conveyor G2-70 which feeds Q-11 to the samplers has been non-functioning with frequent breakdowns and under constant repairs. G2-78 has broken down several times causing Q-11 to spill out of the tail end of the drier. The conveyors are under study by Mr. H. Weineke who is working with Honan-Crane in attempting to make these conveyors work. G2-70 conveyor should and can be eliminated completely by elevating the Williams Mill cyclone to a position where it can discharge to the first sampler by means of a vibratory conveyor. A "Request for Engineering Services" has been made to accomplish this change in anticipation of complete failure on the part of G2-70.

The magnetic separators and drum washers are now under study and will be corrected. A recommendation has been made to enclose and ventilate the discharge points of the Hoffman Collectors. The multiclone and gas cooler are presently being studied for more efficient collection and discharging.

Very truly yours,

ORIGINAL SIGNED BY
J. J. COSTA
J. J. Costa

JJC:jmm

cc: G. W. Wunder
J. A. Quigley, M.D.

[redacted]

m-20000-JV

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NATIONAL LEAD COMPANY
of Ohio
P. O. Box 158
Cincinnati 39, Ohio

NOV 11 1960

Mr. C. L. Karl, Area Manager
U. S. Atomic Energy Commission
P. O. Box 188
Cincinnati 39, Ohio

SUBJECT: IDEA LETTER - ORE HANDLING (PLANT 1 - PLANT 2)
REVISION 1

Dear Mr. Karl:

PROBLEM

Health and Safety Hazard

High levels of airborne contamination indicate that the existing ore handling ventilation systems in Plants 1 and 2 are inadequate from a Health and Safety standpoint.

The prime sources of radioactive dust are:

a. The ore sampling station in the Drum Reconditioning building.

b. The ore sampling station in Plant 1.

c. The ore dumping stations in Plant 2.

d. The ore conveying system in Plant 2 which includes both the bucket elevators and the horizontal screw conveyors.

Results of the 1959 Plant 1 and Plant 2 air-dust surveys show that the airborne contamination exceeds the Maximum Allowable Concentration in both plants.

Operation	Location	Reading
Pipe Sampling	Drum Recond. Bldg. (Plant 1)	20 MAC
Auger Sampling	Drum Recond. Bldg. (Plant 1)	11 MAC
Auger Sampling	Plant 1	5 MAC
Ore Dumping	Hot Side Plant 2	15 MAC
Ore Dumping	Cold Side Plant 2	11 MAC
Metal Dumping	Metal Dissolver Plant 2	4 MAC

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These high dust levels would result in Daily Weighted Exposures of 3.0 x MAC for sampling operators in Plant 1 and between 5.5 and 6.3 x MAC for ore handling operators in Plant 2, if respirators were not worn while performing the above operations.

Another serious source of airborne contamination is the Hoffman Vacuum drumming station in Plant 2. The dust collector is located on the fourth floor and the dust is emptied by opening a valve beneath the collector which allows the dust to drop to the first floor drumming station. This drumming station is of the old design which is inadequate because it allows copious quantities of dust to escape.

Modernization

Both Plant 1 and Plant 2 are currently handling ore with obsolescent equipment and attendant operating difficulties. The drummed ore is handled and rehandled many times before it is finally dumped and the empty drums must then be handled several times before rail shipment to the vendor.

Sampling and Weighing

The sampling and weighing of ore concentrates is presently accomplished in two separate areas of the Sampling Plant (Drum Reconditioning Building and Plant 1 Building). This requires a double sampling crew, extra material handling equipment and four scales.

A semi-automatic auger type sampler is used to handle the bulk of the ore concentrates; however, it is too light to handle all types of ore. Some ores require pipe sampling which is slower and more costly; others require the use of a ship's auger type sampler. The semi-automatic auger sampler mentioned above has been used extensively and is in need of replacement.

Although the drums of ore are gross weighed prior to sampling, the directive for payment cannot be made for any Canadian and some of the other shipments until a tare weight has been secured on the empty drums. Considerable bookkeeping and paper work are required since there is a decided time lag between receipt, weighing and sampling, dumping of the ore, and final tare weighing.

After the ore is dumped, the empty drums are transferred from Plant 2 to Plant 1 by tractor-trailers. They must be sorted by vendor and shipping lot and are then transferred to the tare weigh station at the southwest corner of Plant 1. This tare weigh station is remotely

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CINCINNATI 31, OHIO

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August 16, 1956

CENTRAL FILES

SUBJECT AIR HYGIENE AT PLANT 2 DUMPING STATIONS

TO A. J. Stefanec

FROM C. E. Schumann

REFERENCE

Attached are the results of air dust samples collected at the Plant 2 dumping stations from 8/8/56 to 8/15/56, inclusive.

As indicated by these high sample results, these stations have recently been presenting a serious dust exposure problem. Several attempts have been made to reduce the air contamination, but none proved satisfactory. Some of these were: 1) slower dumping, 2) more careful handling of drums, 3) leaving the door on the dumping station closed for several seconds after dumping, 4) use of a vacuum hose to clear drum of dust before removing it from the enclosure, and 5) elimination of the ore crushers located in the pits beneath the dumping enclosures. Although a considerable reduction of dust was noted after the crushers were eliminated, air contamination was still several times the MAC during the dumping operations. Obviously there still exist several sources of dust which cannot be controlled by changes in operating procedure.

Additional ventilation is needed on all the enclosures. If possible, a ventilated tunnel should be installed in front of each enclosure so that drum dusting can be controlled. Faulty and leaky equipment in the pits beneath the dumpers are not only contributing to air contamination but are also causing additional personnel exposure by the frequent cleanouts which are required. During these cleanout periods operating personnel are being exposed to radioactive dust concentrations over 1800 times the MAC. Immediate action should be taken toward modification and/or repair of this equipment.

It has been noted that some operating personnel in these areas are using MSA Comfo and Dust-foe respirators. Use of these mechanical filter respirators is not satisfactory and should be discontinued. Air line respirators should be used at all times until effective dust controls are provided.

C. E. Schumann /bg

C. E. Schumann

CES:bg

0046113

NLO-GEN-698-1 (12-14-55)

[redacted]

PE142

CENTRAL FILES

72-1-1-1

May 17, 1960

RE-EVALUATION OF JUICE HOPPER FILLING STATIONS, DENITRATION AREA, PLANT 3
J. F. King

E. E. Ross and R. D. Leininger

On April 26, 1960, an air hygiene re-evaluation was conducted at the juice hopper filling stations, Denitration Area, Plant 3. This evaluation was made in order to determine if the new corrugated, rubber enclosed chutes recently installed at the filling stations had lowered the concentration of airborne dust.

The results of this evaluation show that the concentration of airborne dust has been lowered; however, the results also show that the air dust level is still well above the MAC.

A summary of the air dust samples from the current survey as compared to those taken in a previous survey is shown below:

PREVIOUS SURVEY (December, 1959)

Type	Sample Description	Concentration-α d/m/M³ High	Low	Average	X MAC
BZ	Changing juice hoppers	2866	2435	2522	36
GA	First level in general vicinity of juice hoppers	131	22	83	1

CURRENT SURVEY (April, 1960)

Type	Sample Description	High	Low	Average	X MAC
BZ	Operator changing sample jar (removing filled jar and replacing with an empty one)	2701	1411	2056	29
BZ	Operator raising chute from full hopper, removing rubber gasket and vacuum line, and putting lid on hopper	3156	160	1450	21

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CENTRAL FILES

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December 30, 1960 72-1-1-1

AIR DUST EVALUATION OF HOFFMAN DRUMMING STATION - PLANT II

G. R. Harr

K. N. Ross

Ruhe to K. Ross 12/30/60 72-1-1-1

The attached air dust evaluation was made because samples taken during the Plant 2 Complete In-Plant Air Dust Survey showed the air dust levels while operating this station to be 45 X MAC. It is thought that this level is of sufficient magnitude to be brought to your immediate attention. The installation of the new dumping station under the Idea Letter "Ore Handling (Plant 1 & 2)" should alleviate this high air dust level. Until this installation is complete and a re-evaluation shows the air dust levels to be considerably lower a full-face air supplied respirator is recommended.

ORIGINAL SIGNED BY
K. N. Ross

Attach:

cc: R. H. Starkey
R. L. Ruhe
J. F. Wing

Central File

KNR:mmh

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2637810

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NATIONAL LEAD COMPANY
of Ohio
P. O. Box 39158
Cincinnati 39, Ohio

B2-40
C21-1

November 16, 1961

SUBJECT: IDEA LETTER - DUST COLLECTION FACILITY FOR UO_3 MILLING AND LOADING STATIONS - PLANT 3

CENTRAL FILES

TO: J. H. Noyes

FROM: P. G. DeFazio

PROBLEM:

The UO_3 milling and loading stations are consistent sources of dust. The major contributors are the mills, rotary valves, filling chutes, and sample stations. Efforts to contain the dust from this equipment have not been successful. New gasketing, shaft seals, and other minor changes have reduced the amount of airborne contamination, but not to the degree required by the Health & Safety Division. To keep dust leakage at a minimum, continual maintenance is required.

These dust problems are intensified when the door on the east side of the Denitration Area is open as the resulting draft creates air movements which spread the dust to adjacent areas. To control the contamination and to improve the housekeeping, the Fume and Dust Control Committee has recommended ventilation and/or enclosure of the various dust sources.

SOLUTION:

Procure and install a dust collector (2,000 CFM) plus the necessary duct work, hooding, and enclosures to contain dust from the following sources:

1. Hammer mills
2. Rotary valves
3. Sample jar stations

The dust collector is to be located on the second deck, between columns 19 and 20. The orange oxide from the collector discharge is to be transferred by screw conveyor to surge hopper F3E-228.

To eliminate dusting from the hopper filling chutes it is proposed to install new control valves on the air lines activating the filling chutes and manual shut-off valves on the discharge ends of the chutes. At present, the chutes open and close very rapidly, creating a large amount of dust. Air control valves that will allow gradual lifting of the chutes and shut-off valves that will provide a positive seal on the chute dis[illegible] ld reduce the air-dust levels to acceptable limits.

0089624

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PE 146

JUSTIFICATION:

Reduction of the air-dust levels in the milling and loading areas is necessary to minimize exposure of the operating personnel. Listed are the results of two air-dust surveys conducted by the Health & Safety Division. The first survey was made just after the milling and loading equipment were put in the best possible operating condition by means of new gasketing and shaft seals. The second survey was conducted under normal operating conditions.

Results of Air-Dust Surveys

Type	Operation or Area	I X MAC	II X MAC
Breathing Zone	Changing sample jar	5.5	29.
Breathing Zone	Raising and lowering hopper filling chute	4.6 - 6.5	4.2 - 21.
General Air	Mill deck (second level)	2.8	-

Installation of the proposed dust collection system and filling chute revisions will improve the housekeeping in the hopper loading area in addition to reducing the airborne contamination to below the maximum allowable concentration.

STATUS OF PROPOSAL:

The cost of this project is estimated to be $17,300. Funds are available in Activity 02-01-99 FY 1962 Budget.

P. G. DeFazio, Chairman
Engineering Committee

LWK:mc:ljm

cc: S. F. Audia
C. R. Chapman
G. R. Harr
L. W. Kessler (P-22300-41)
H. Martin
W. J. Strattman
Central Files ✓

APPROVED:

Original Signed By
J. H. NOYES
Plant Manager
J. H. Noyes, Plant Manager

DATE: NOV 20 1961

089625

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NATIONAL LEAD COMPANY
OF OHIO

November 28, 1972 2215886

2.280

SUBJECT: AIR DUST RESULTS OF DUMPING ORE CONCENTRATES

TO: W. J. Adams

FROM: R. C. Heatherton

REFERENCE:
1. Letter, R. C. Heatherton to W. J. Adams, dated 10/2/72, (2.280) "Air Dust Sampling in the Refinery"
2. Letter, S. F. Audia to P. G. DeFazio, dated 11/3/72, "Dusting/2.280 Problems in the Ore Refinery and Capacity Requirements"

On 11/21/72 measurements were made of the airborne radioactivity resulting from the dumping of concentrates at the Refinery's north dumping station. Results which are summarized below nullify those previously reported to you in reference 1 and indicate a definite need for improved dust control for these operations. It is my opinion that Mr. Firsich, the chemical operator assigned to the dumping on 11/21, was doing the best he could with the existing equipment and the material he was dumping. In addition, he faithfully wore his respirator while doing this job.

In the time that I watched and sampled the operation I did not observe airborne dust outside the dumping enclosure nor did I see any drums in which the material appeared to be wet. However, the material was apparently sufficiently damp to prevent it from ~~flowing from the overturned drums.~~ Usually the drum had to be struck several times on the sides with a hammer in order to start the material flow. The hammering had to be done with the door to the enclosure open. When flow started the door was closed and the drum was jogged to complete the dumping. At that point the enclosure would be filled with a dust cloud.

The sample results from in front of the enclosure indicate there is probably adequate dust control with the door to the enclosure lowered, but leaving a small opening while dumping. The results of process samples collected at the small opening, while higher than the NOG of 100 $d/m/m^3$, were still lower than other results. Most likely residual dust from other operations caused these results to be high.

With regard to items relating to the concentrate dumping in reference 2, I have these comments:

1. I agree the present operation is unsafe and improvements are needed to eliminate the need to climb over conveyors and manhandle the drums. Also a means of cleaning the empty drums before removal from the enclosure would be desirable.

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[redacted]

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April 19, 1972

REFINERY URANIUM EXPOSURES

S. F. Audia

J. A. Quigley, M.D.

During January, Refinery personnel were scheduled to submit a quarterly urine sample for uranium analysis. When the first samples were analyzed it became clear that there had been prolonged exposures to high concentrations of airborne uranium. In the attached summary, conclusions are given regarding the sources. Recommendations are made to avoid the recurrence of such unacceptable exposures.

The exposure conditions have continued despite abatement efforts made so far. During the week of April 10, fresh layers of dust were noted around the north side screw conveyor and one drum dumper operator was observed without a respirator. In view of anticipated Refinery operations, these exposures and possible corrective measures are matters of major concern.

Original signed by
J. A. QUIGLEY, M.D./RCH
Dir. of Health & Safety

J. A. Quigley, M.D.

MWB
MWB/vvs

attach.

cc: W. J. Adams
J. E. Beckelheimer
P. G. DeFazio - w/o printout
A. F. Pennak - w/o printout

Routed to Bell Hall 5/4/72
Returned by [illegible] 5/5/72

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