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FERNALD LIVING HISTORY PROJECT
Transcript

Name: Jerome "Jerry" Freitag
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Tape FLHP 000108

15:01:05
Q:
Okay. First of all, we just need to get your name and your spelling of your name (laughs).

A:
Oh. Jerome Freitag. F-R-E-I-T-A-G.

Q:
Great and uh, we usually start with a little bit of background; um, where you were born, a little bit about your family.

15:01:23
A:
Oh, well, I was born in Amie, Wisconsin. And my parents farmed, and I worked on the farm until I went to college. Then after I got my first job after college, I did not farm any more. I didn't much care for farming; I liked chemistry a lot better.

Q:
And where did you get your education?

15:01:46
A:
Uh, let's see, Bachelor's Degree at the uh, University of Wisconsin in Chemistry; a Master's Degree at the University of Cincinnati in Chemistry, plus additional graduate work. The graduate work consisted of uh, doing the course work for my uh, Ph.D., but I did not complete the thesis.

(Off camera: can, we stop for just one more time.)

Q:
All right. Great. Uh, when and how did you get your job at Fernald?

A:
Oh, I thought we were gonna start at the beginning again.

Q:
Oh no, we don't need to do that (laughs).

15:02:22
A:
Oh, well I was job-hunting, that summer. I worked for Dow-Corning in Michigan for 2 years, and they had a huge layoff. So a thousand of us chemists were dumped on the market all at once. And I

was job-hunting that summer of '58. And I saw the ad in the paper and came down and interviewed and uh, eventually got hired.

15:02:44
A:
I had to wait 6 months, about 6 months for the uh, security clearance. No, it musta been 3 months. Three months for the security clearance.

(Speaking at the same time)

Q:
So you had the Q clearance.

A:
And uh, Ray Sisson was the one that interviewed me, and essentially hired me. And I was there for 12 years.

15:03:04
Q:
And tell us a little bit about getting the Q clearance.

A:
Well, the uh, the FBI sent peop-, a person to my hometown. To ask friends and relatives and acquaintances whether I was a Communist or not. And uh later, I guess next year when I was at home again for a visit, one of these people came to me and said, "There was an FBI guy here asking about you."

15:03:33
A:
(Chuckles) And they were, I asked them, "What did they, what questions did they wanna know?" And he said, "Well, mostly if you were a Communist or not." But uh, the whole town was about uh, 1500 people. Everybody, you know, the women, children and kids and. So everybody pretty well there, knows everyone.

15:03:53
A:
My mother's probably related to half the people in town. So I guess they gave 'em a, they gave the FBI fellow a good ah, good answer, so anyway, I got hired.

15:04:07
Q:
That's great. So did it create crite-, quite a stir in your hometown?

A:
(Laughing) Ah, it probably did because I was probably the only one that happened uh, to. And the uh, it doesn't take much to make news in a small town.

15:04:27
Q:
Speaking of making news in a small town, um, what was the surrounding area of Fernald like when you first got there?

A:
Oh, it was pretty much like it is today. The buildings are all completed, and Knollman's cows are grazing in the yard. Uh, outside the fence that surr-, that surrounded the uh, plant, but inside the uh, the main great big fence that went along the highway.

15:05:01
A:
The trees were not planted. All those pine trees were, were not there. Mostly open area, beside the plant. It was all surrounded by farm.

15:05:19
Q:
And uh, what were the early years like? What were your responsibilities when you first got there?

A:
Well, I was in analytical development. And the uh, the procedures were pretty well settled by the time I got there. The um, they had hired a lot of people they had hired in the early day-, real early days, and they had more than they needed, so these people were gone.

15:05:43
A:
Uh, a lot of 'em, after they got rid of them, the production was better, or the work was better (chuckling) because some of these people did not take their job seriously. And hindered other people doing their work. So anyway, these people are all gone, so, and then I came after that group.

15:06:05
A:
So uh, my responsibilities were to uh, develop analytical methods, and one of the first ones, methods was to work on the uh, analyses of small amounts of magnesium in the uh, ores that we received. And this turned out all right. As I remember, I wrote a paper on it. And they used the procedure for uh, several years. They replaced a much longer procedure that they were using before.

15:06:37
A:
And this was a, a general uh, scope of my work over the years, doing analytical development like this. And then also uh, special projects for Chem Development. So very interesting work, and satisfying.

15:06:55
Q:
What was a typical day like?

A:
Well, I didn't live very far away, so I try to get there before the whistle blew. And uh, well, I just go in and uh, finish whatever project I was working on. Uh, keep a note-, laboratory notebook up to date. And talk with the other fellows in the lab, and discuss their progress and mine. We were encouraged to use the library, so I would spend some time there. Uh, keeping up with the literature.

15:07:30
A:
And uh, sometimes talk with the people in Chemical Development, and. So it was, it was good working conditions. We would eat lunch at 11:30, uh, and I'd eat with my boss who was Ernie Brown. So usually, I and Albert and Ernie Brown would eat lunch together and visit. And usually not talk about business; we'd talk about everything else.

15:08:00
A:
And then back to the lab and keep on working. Some things worked well and some things didn't. We'd keep trying until it, we either succeeded in the project or abandoned it because there was no answer at the time.

15:08:19
Q:
Did you ever work in the Moving Bed Project?

A:
Not directly, no. I knew about it, but I wasn't involved in it.

Q:
Can you tell us what you knew about that?

A:
Well, can you describe it more to me? Was this, was this uh, the one where the uh, fluid bed, gas supported reaction?

15:08:50
Q:
It could be. It was something Ray Sisson mentioned to me. And I just, I didn't think to ask him.

A:
There was a fluid bed, but a moving bed? Ray Sisson worked on the moving bed where the uh, because I remember where the screw impeller pushed the material through. Is this the one?

Q:
It could be, yeah.

15:09:11
A:
Okay, yeah. He would talk about that because he did a very good job on that. And as I remember, he built his reputation on the problems he solved doing that. The uh, I asked one time why they were putting the gas in co-current instead of counter-current. And the answer was, because it worked better that way, so that was enough for me. But, that project was pretty well over bef-, when I came there.

15:09:41
A:
And then let's see, I think, Eric Noise was plant manager, and he and Ray Sisson were friends. And the uh, Eric Noise wanted someone in the uh, laboratory to uh, take care of things there, so he sent Ray over to analytical so he was there and for the rest of my career there. And like I said, he was the one that hired me.

15:10:09
Q:
What were some of the interesting challenges you had to meet while you were at Fernald?

A:
Well goodness uh, well we, we had various ones. Well, we (chuckles) well you were called on for your expertise, and uh, well do you want the whole story (laughs)?

Q:
Sure. Yeah, that's a good one (laughs).

15:10:36
A:
Okay, this is uh, one of the things we did, I had one day I came in and there was a piece of hose laying on my bench saying, it was all dried up, and saying, Why did this hose break? Well, I didn't know why it broke. It was just laying there. It was obviously broken, it was, it was ruptured.

15:10:56
A:
So uh, I found out where it came from, it came from the Pilot Plant. So I went out to the Pilot Plant to uh, look at the operation and see where the hose was. And I saw it, and what was going on. Then I went and found the operator and, and talked to him about it, and asked him what the hose was made out of.

15:11:18
A:
And he went and found the catalogue, and showed it to me, this was the hose we were using, this was the hose we were supposed to use. And the other hoses don't work as well. This was the proper kind. So I went back and uh, looked at the operation again. There was a holding tank for the solvent. There was two layers in it, and one layer was solvent, was for perchloroethylene, the other layer was water.

15:11:42
A:
And the reason they were doing it this way was to prevent an excursion in the huge kettle that was used to evaporate the zinc out of the thorium. They would put the uh, thorium ingots in and the uh, zinc under vacuum and then heat it, and the zinc would collect on the cold lid. Well the uh, heat exchanger had broken that cooled the perchloroethylene, but they didn't know it.

15:12:07
A:
So they had cleaned out all the perchloroethylene, put in new, put on new hoses, but the water was still leaking in. And that's when I saw the two layers. Then I also saw a thin thread of the dissolving hose, and I knew that the hose was going to fail again, very soon. So I uh, I found the uh, the uh, operator and I said, "This hose is going to break again." Well, they didn't know that, or believe it.

15:12:37
A:
And so I went back to the lab, and the next day I get a call, and the fellow asked me, "Did you tell me this hose was gonna break again?" and uh, I said, "Yeah, I know it's gonna break, but I don't know exactly when." He said, "Well the hose broke last night and sprayed the operator." And uh, I said, "Yeah, I know it was gonna happen."

15:12:58
A:
So then the uh, fellow said, "Will you come out here and explain this to Beckelheimer?" And I said, "Oh, sure." So I had a piece o' the hose in a glass o' water, in a beaker of water on my uh, on my lab bench. The outside rubber part I had taken away, and the inside had all dissolved. The only thing left was the reinforcing, which looked something like a snakeskin.

15:13:26
A:
And so I took this out and we found Beckelheimer, and I told him uh, "This is what happened to your hose because uh, your heat exchanger is broken and water is getting in there." And he said, "What kind of hose would dissolve in water?" and I said, "Polyvinyl alcohol. Which is very good for perchloroethylene, but it is useless for water."

15:13:50
A:
And I said, "You've got two choices. You can take either take the heat exchanger out and fix the hole, so the water doesn't get in, or just replace everything with water. And uh, use the proper hose, something like garden hose, for uh, sending the water through there and you'll be all right." And anyway, that's the choice they took was to replace everything with water and they proceeded on just fine after that.

15:14:18
Q:
That's quite a challenge. (Laughs) How about um, tell us a little bit about sampling at the Tank Farm.

A:
Well, one of my jobs was to sample the tank cars of ammonia. This was anhydrous compressed ammonia. And um, I'd taken my flasks, I had 3 flasks, they held about I think about 2 liters, 4 liters. Uh, and I'd go out there and Mr. Koon was the operator, and he was a very cooperative fellow, and we'd, I'd find him and we'd climb up on top o' the tank car. And we'd see if the breeze was blowing.

15:15:01
A:
If the air was dead still, I'd just go back to the lab and that was the end of it for the day. Then come out the next day. If there was a little breeze blowing, we would uh, get down, get upwind from the breeze.

15:15:15
A:
And uh, I'd hook up the sampling line and uh, and put the, the flask underneath it and then Mr. Koon would turn the valve and a huge cloud of ammonia would come out and engulf us. And we'd shut our eyes and hold our breath, and pretty soon the cloud would dissipate and the ammonia was coming out into the flasks.

15:15:36
A:
Then when all the flasks were full, then we'd shut the valve off and leave two of the flasks out there. And uh, find a water hose and let the water run on 'em so the ammonia would all evaporate. And leave the residue of oil in the bottom which is what they were interested in. Because the specifications called for a certain amount of oil they could not exceed.

15:16:01
A:
And then the other lab I'd take, the other flask I'd take back to the lab and complete the analyses on that. Well, this was uh, kinda routine. It was kinda fun actually, to walk out, in the nice weather and uh, get outside.

Q:
And what were you looking for in the.

A:
Oh, oil, in the analyses, and I forget the other. I think I also did an essay on it, which is kind of interesting. I had to neutralize the ammonia, and so that generates a lot of heat, so I'd get like a small washtub and fill it full of ice water. And I had a burette sticking in the uh, tub full of water.

15:16:48
A:
And then I left the ammonia to bubble into the ice water and it would go bong, bong, bong, when it reacted and uh, any residual gas would collect at the top of the burette. And by the time I was done the ice was all melted (pause) so a lot of innovations like that.

Q:
Wow (pause) that's interesting. And uh, tell us a little about the uh, the pits, how much did you know about the pits? What was going in the pits and also you did some sampling there.

15:17:21
A:
Yea, I was involved in the samp-, not in the actual sampling, I was involved in the analyses, the uh, pits were mostly magnesium fluoride because this was the slag produced in the uranium production, and also uh, made a little copper and other metals out there too. The reason they were sampled that one year was because, they uh, over the years they had built of a uranium deficiency, in other words they could not account for all of it.

15:17:55
A:
And they thought it might be out in the pits, and uh, as I remember, Chem Development did some of the sampling out there. And the way to sample it was to go out in a rowboat with an auger and take samples at various levels. Well the uh, I did not see this but apparently the boat didn't proceed quite well enough, so they hooked a rope to it, to the tail end of the boat and pulled it with a car, a uh, pulled the end of the boat out (laughter).

15:18:26
A:
So they're out there with a boat with no transom. But, they collected many jars, gallons jars, of the uh, of the pit and had various bands of colors, red for the copper and blue for something, and gray. And, we had, oh half a room full all stacked up and uh, in order to record, it they went and got the photographer and he took a picture of all the samples.

15:18:55
A:
One of the reasons I remember this is because uh, Albert Tieman, that I worked with, he and I worked during plant shutdown analyzing these samples. To see how much uranium was there. As I remember, there was very, very little. But uh, that was the object of that project.

15:19:18:
Q:
And, uh, tell me a little bit about security.

A:
Oh, that was interesting, if you forgot your badge you felt naked. You'd rather go into the plant wearing no pants, (laughter) or your blouse than forget your badge. You, if you uh, forgot your badge you had to go into the uh, security uh, building and explain to the guard why you forgot your badge.

15:19:45
A:
Then he would give you a temporary badge which everybody would recognize because it was different. And as you walked around the laboratory, about 20 people would come up and say "Oh, you forgot your badge today." (Laughter) And make you feel horribly embarrassed. Or, uh, uh, that - Let' s see

that was that aspect of it. Then later on they had fewer and fewer guards so they went to a television camera.

15:20:11
A:
So in order to get onto the Pilot Plant, I think I could walk out there but to get back into the lab you put your badge in the uh, on the little camera and then the guard in the guard house would look at your badge and look at you. And if they matched then he would buzz the gate and you could go back in again. Uh, the only story I remember is uh, that we had a black janitor who didn't show up well on the black and white television screen. All you saw was the eyeglasses and teeth.

15:20:48
A:
Uh, security, you had to lock your safe up every night. If you didn't, you got a reprimand. And too many reprimands or write-ups, uh, you could uh, got a dismissal. You could not leave anything classified on your desk or in desk drawers that you could not lock. We had a large filing cabinet with uh, oh I guess a triple lock combination they called it.

15:21:21
A:
And they came around every few months and changed the combination. So, and also, uh, if a visitor came in, he had to be escorted at all times. So uh, and you passed him on. If he came into your room, you would take him on to the next room and give him to somebody, and they would pass him on to the next person.

15:21:44
A:
So one time, a person did complain, you know, "Why is this guy here?" and the fellow who brought him in started where he left him off and traced him all the way through and proved that someone was responsible for him all the time. This was included going to the men's room. So you stayed in there, while he did his business then you both went back out again.

15:22:11
A:
So security was taken very seriously. See, well, unlike the recent China episode.

Q:
And what was the secret? Why, why were they guarding Fernald so closely?

A:
Because of the Cold War. To prevent the Russians uh, from getting an advantage. To – come our work without doing their own.

Q:
What was the typical American's view of the Cold War at the time?

15:22:42
A:
Uh, very concerned. It varied with the person. I didn't worry about it. But some people are maybe more sensitive. They were afraid missiles were coming very soon. And of course the epitome was when Kruschev sent missiles to Cuba. And fortunately backed down, because Castro could've launched his missiles.

15:23:11
A:
And at the time, there were enough missiles between the two of us to uh, destroy much of the world. Uh, every major city, essentially. And lots of rhetoric, and lots of Russia el-, claiming they had capabilities they did not that we found out afterwards. In the days of the hydrogen bomb, they were actually ahead of us for a while we debated whether it was moral or not to develop the bomb.

15:23:43
A:
And this climaxed when uh, I think Taylor and Openheimer had a falling out, and Openheimer left and Taylor then con-, continued with the hydrogen bomb development.

15:23:59
Q:
And how did Fernald contribute to the security of America?

A:
Well, the, we were a part of the Weapons Production Program. In a early stage, we received uh, uranium ore from Africa, South Africa, which was very, very concentrated, very good ore. And the rest of the ore mostly came from Colorado Plateau. Uh, Grant Junction was the sampling point. And we also got ore from Canada, also.

15:24:31
A:
And we refined that. Uh, the chemical plant part of it refined that, to pure uranium. Then uh, uranium solution, and that would boil down to uranium oxide, UO_3, orange oxide, and that was reduced in the reactors to uh, uh, brown oxide which is UO_2.

15:24:58
A:
Uh, they used the cracked ammonia to produce hydrogen, and that reduced the UO_3 to UO_2 and then continued in the reactors, when hydrous hydrofluoric acid was introduced and that reduced the, or converted the UO_2 to uh, uranium tetrafluoride.

15:25:20
A:
And then this was uh, reacted in uh, let's see, like a blast furnace, except it was contained in these, they called 'em bombs, they were steel containers. Probably about, (clears throat) about uh, oh, 5 feet high and maybe a foot in diameter.

15:25:40
A:
These were packed with magnesium metal and uranium tetrafluoride and heated until the reaction proceeded and uh, the uranium metal mass was collected in the bottom. The slag was uh, uranium uh magnesium fluoride. And this was further processed with hydrochloric acid to extract every bit of residue of uranium that did not collect in the ingot.

15:26:09
A:
And then after that was done, uh, the uranium the collected there was recycled. And what was left was called trailer cake and this went out into the pit. Uh, the uh, well let's see after that, the ingots, as I remember, four or five of 'em were put in the re-melt furnaces, up above in a hopper in a vacuum chamber, and melted in a large crucible.

15:26:39
A:
Then the uh, this was radio frequency induction heating, like a microwave, like a big microwave oven. Then uh, an arm knocked the plug out of the bottom of the crucible up on top, and the uranium flowed into the mold. And this made a large ingot, uh, may-, six or eight inches in diameter, and oh, four or five feet long. And this went into the rolling mill. Now the rolling mill was unique to Fernald.

15:27:11
A:
No one else had that. So this ingot was rolled into uh, rods, maybe, oh, three inches in diameter or so or less. And several feet long, maybe 20 feet long. And uh, (clears throat) these rods then were chopped into sections and went into the uh, large lathes. Uh, they called them _____ machines which were later replaced by the Cross machine.

15:27:48
A:
And then the uh, well, these were made into what we called slugs, maybe a foot long and maybe a inch or so in diameter with a hole drilled through the middle, to exacting tolerances. And the hole in through middle was for cooling, water. Uh, this was our final product. And this was packed in cases and shipped to Hanford, Washington.

15:28:11
A:
Uh, there, the slugs were encased with zirconium, which is transparent to neutrons. And then cooked in reactors out there to produce plutonium, and plutonium is used for making bombs. Then uh, after the cooking process, the uranium was taken out and reprocessed in somewhat similar to the extraction process at, at Fernald.

15:28:41
A:
Except more, much more elaborate, uh, highly radioactive material, which we did not have, Fernald produced, or processed highly radioactive stuff, which we did not have. Very little radiation at Fernald. Uh, then plutonium went to machine shops, and out there. And uh, eventually became weapons

15:29:08
A:
Uh, let's see, the Oak Ridge was involved, and Los Alamos. And also a laboratory at Mound. Mound made the detonators. Uh, that's kind of a brief overview of the process.

15:29:19
Q:
Great, we're gonna take a quick break. We only have 30 m-.

Tape FLHP000109

16:01:00
A:
That's kind of a basic uh.

Q:
That's Okay. I, 'cause that's somethin' I think maybe some people.

(Q: and A: discussing over the top of each other)

A:
Let's see, how shall we get into that?

Q:
I'll ask you how that.

A:
Ask me about the cool-, ask me about the coolant, and what I did, because I had the project there.

16:01:12
Q:
Okay, tell us a little bit about the coolant, and what it did.

A:
Okay, we're on, okay (laughs). Well the coolant was used in the Acme Gridley machines, to uh, keep the tools cool during the machining. Uranium was a tough metal to machine. And the uh, my project was the coolant, and working with the coolant, I got to uh, watch how the machines worked. So I described how these long rods were produced in the rolling mill.

16:01:41
A:
Then they're cut into segments and fed into the Acme Gridley machine. And the Acme Gridley machine was a large lathe, sort of like a Gattling gun, where the slug came in, and each station in the machine uh, did a different operation. This machine, the outside of the slug to very exact tolerances, and drilled a hole through the center.

16:02:09
A:
And uh, then put radii on the outside and inside of the slug, and it all had to be exactly the same size. Then after that, the slug went to uh, be heat-treated and into uh, into the uh, box that's to be shipped out by rail. And this is our final product was these slugs. But to back up, the heat treating part was important because the uranium had to have a certain grain structure.

16:02:42
A:
It was pro-, uh, the responsibility of the metallurgy department to make sure the grain structure was proper. Because if the uranium had the improper uh, crystal structure where there were two crystals, in the uranium, and when heated, they would, both expand, one crystal would expand more than the other crystal would.

16:03:03
A:
Then when they cooled, then the crystals would collapse again, but not as far because the one crystal would prevent the other one from collapsing as far. Then when they reheated, they would expand again, but then when they would cool, they would never collapse as far, so the uh, result was that these two crystals jacked, the uranium into a longer section than it had before.

16:03:35
A:
So it became thinner, and it didn't jack evenly, so uranium was crooked. So you had a wavy piece of uranium metal, all out of shape, which should be the proper size and shape. So, that was important to have the proper crystal structure in the uh, uranium metal. And the metallurgy department had some elaborate x-ray equipment and that's how they examined the crystal structure of it.

16:04:02
A:
Uh, the coolant project I was on was kind of a short one. The coolant had become contaminated with, I believe it was acid. And the coolant was an emulsion, of oil and water. Uh, normally used in machines. And the coolant was then processed to remove the traces of uranium that was in it, from the machining operation. And so any way, some acid contaminated the coolant and it collapsed.

16:04:37
A:
Separated into two layers and became unstable. And so my project was to find out why it collapsed and find ways of stabilizing the coolant. And uh, the main reason the coolant was unstable was because of the hard water that was used. So uh, I made coolant with distilled water and it was very stable. But was impractical to use distilled water in the plant, so they continued on.

16:05:08
A:
And then there was another project to use a water-soluble lubricant on the machines, which worked very well to recover uranium because all you had to do was filter it. But uh, the lubricating probably very insufficient for uh, for the Acme Gridley, so that project was abandoned.

16:05:29
Q:
Wow, I hadn't heard about that. Tell us a little bit about the um, acid tank beside the Pilot Plant.

A:
Uh, let's see, this was a small storage plant that con-, or tank that contained hydrochloric acid. And some workmen were working on it one day, grinding on a flange. And created uh, some sparks, and the tank puffed. It did not really explode, but puffed, and some of the acid spilled out and got on the operators.

16:06:03
A:
And the uh, and somebody called me up and said, "This tank exploded. " Well, it hadn't exploded but get out there (chuckling) and get a sample. So uh, I went out with my sampling bottle, and somewhere in my mind, "Is this going to explode again?" (Laughing) so while I'm climbing up on top of this thing.

16:06:24
A:
So I got my samples and went back to the lab with it. And somewhere along the line, management had found out about it too and came to get me to send me out there. Well I'd already been out there twice, so I didn't have to go again. But what it turned out was the rubber lining of the tank had peeled slightly. The acid had contacted the iron tank, and produced hydrogen.

16:06:47
A:
And in the process, also had dissolved some of the iron into the tank of the hydrofluoric acid. It was contaminating the process somewhere along the line with iron. So uh, after that, that was the explanation, so then I guess they fixed the tank.

Q:
So when it got, when iron got into the process, does that mean that the uranium was impure at the end of the line?

16:07:14
A:
No, it wasn't at the end of the line. It was somewhere in between. I don't know where it was.

Q:
And how did they know how pure the uranium was?

A:
Well, that was the job of the analytical lab to analyze it. It was done in done in two sides. The analytical lab was in two sections. The instrumental side which had the uh, emission spectrograph. Which did almost all the work. And then our side which did the uh, the uh, oh special analyses which didn't lend itself to emission spectroscopy.

16:07:50
A:
The uh, they had an auto-reader, uh, let's see, they could, they could do I think 80, 90 elements all at one time. Uh, let's see, a direct reader had a, it was emission spectrograph with a photo multiplier to, for every element.

16:08:13
A:
And, when the, well when the uranium was burned in the electrodes, the light went into the spectrometer, was defracted by the defraction grating and each emission line they were interested in hit the photo tube. Then the machine sampled each photo tube and see what information was in it, and this was related to the level of impurity.

16:08:38
A:
If the impurity exceeded the limit of the spectrograph, it was sent over to the wet, chemical side, my side, and uh, another value was obtained. But in between, the two had to agree. Otherwise, there was something wrong with one of 'em.

16:08:56
A:
Uh, the instrumental side was interesting. They had a film reader, uh and a plate, plate reader, and also the x-ray analyzer was in there, too. Probably plus some others I don't remember. The uh, let's see on our side, we analyzed the ore, we analyzed the metal, and the intermediate products, the orange oxide, the brown oxide, the green salt, we analyzed it all.

16:09:31
A:
Uh, one brief project was to work on the uh, let's see, they took the chips, washed them from the coolant and re-compressed them into bisques that looked sort of like hockey pucks. And then these were thrown in with the re-melt and recycled. And the object was to see, I guess, how much uranium was in 'em, and how clean they were. I didn't work on that part. It was another person in my lab.

16:10:07
A:
Oh, let's see, analyses, oh, there were special projects if something went wrong. Uh, let's see, I worked on some exotic metals one time, niobium, and, I did that with an ion exchange to separate the, the elements.

Q:
What was that all about? Was that a new something new they were looking into?

A:
I don't remember much. I don't know, I think it was an alloy they were working on.

16:10:42
Q:
What did Fernald use thorium for?

A:
Well, I guess that's de-classified (laughs). Uh, uranium is infissionable. You can use it in a power plant or bombs. Thorium is that way also. And, but it had some isotopic advantages, and that's as far as I'll go with. I don't know if it's ever been declassified.

Q:
Hmm. So they were gonna do the same process, but using thorium instead?

16:11:16
A:
Yeah. The advantage was it's a lot easier to separate chemicals than it is isotopes. And the object was to uh, develop an isotope that would, could be separated chemically. Ah, there were advantages to it. The uh, General Electric was involved with that then also. But ah, we produced quite a bit of thorium.

16:11:46
A:
That was an interesting project. No one else could precipitate thorium, but one of the fellows uh, Chem Development ah, figured out a way to do it. And we never told anyone either (laughing) how it worked. It was, was part serendipity.

Q:
Would that have shortened the process at all?

A:
Well, it made it possible. Yeah, we were the only ones who could precipitate thorium. I'm trying to think of the guy who invented that but I can't right now. A well respected engineering. Chem Development who ah, thought, thought like a chemist which most of the engineers didn't (chuckles).

16:12:34
Q:
That's interesting.

A:
I got interesting, oh I got somewhat interesting ah, with the thorium project. Two of 'em, yeah. The ah, they were extracting thorium in the Pilot Plant and they ah, they had this fuzzy looking stuff in the end of the column. And everybody wondered what it was, and they were hunting all over for impurities.

16:13:03
A:
And I collected enough of it, which took a lot and I also duplicated it in the lab with thorium. But what was happening, was the solvent was extracting the thorium and the acid also. Which is normal it always did that. Well the pH got too high and ah, the thorium started hydrolyzing so it was just

hydrolyzed thorium. So that was an interesting project that didn't take too long. But apparently it impressed other people.

16:13:32
A:
Ah the other small project was, they had this really black residue that occurred ah, with the thorium. The thorium was sawed into sections in the Pilot Plant with a great big hacksaw machine. And ah, anyway, this black impurity was, was ah, being produced. And they were analyzing for zinc and thorium and everything under the sun.

16:14:01
A:
And finally it came down to me to see if I could figure out what it was. And I looked at it and I took it over to the lab where the microscope was and I looked at it there and I really didn't see much. And I thought about it for a while and then I went out to the plant. Can I answer the phone, or

Q:
Oh that's ah.

A:
Can you get it or?

(Off camera: sure)

Q:
Is the answering machine on?

(Tape stops then begins again)

16:14:25
Q:
Okay, continue.

A:
Well anyway there' s black, finely divided black material was appearing and ah, and ah, they gave it to me to look at. And I looked at it under a microscope and really didn't see much of anything, which was, I thought important. So I walked out to the Pilot Plant and I found the fellow who was running the saw.

16:14:44
A:
And I watched him ah, run the saw back and forth and this black stuff was there, so ah, I asked the operator, "Can I have a saw blade." And he said yeah, there's some broken ones there, so I took a saw blade back to the lab and I had a small piece of thorium. You know, next pure thorium and I rubbed it on the saw blade and here's this black stuff comes. Well it's just finely divided thorium, producing by, produced by the friction of the saw blade.

16:15:14
A:
So ah, didn't take long. It was very trivial and by, it made a lot of people happy apparently. Oh well, while we're at it, lets see. I probably wasn't working very hard and my boss wanted to give me a job to do (laughing). The job was to fill these little vial, glass vials, everything comes in them ah, either you see 'em in a doctor' s office, they break the top off.

16:15:44
A:
And I was supposed to fill those with green salt. So they'd, to be a long continuing source of reference material. Well the way he had been doing it, or having his helper doing it, you pour it in, you'd put a funnel on top and pour it in and shake it, that takes forever. Well I looked at that and I thought well, there must be a better way.

16:16:04
A:
So ah, I figured out the reason the green salt wasn't going in very fast was because the air had to get out. So ah, I put a little vibrator underneath the vile and put funnel with a side arm up on top. Hooked the side arm up to some vacuum to get the air out and dumped the green salt in, so it sucked out the air, sucked in the green salt. And ah, I think in one day or less, I had all these vials filled (laughs) which would have been a week's project.

16:16:37
A:
And ah, other people seemed impressed by it and said I should send it in and publish it, but I never did.

Q:
And now you' re telling somebody (laughing).

A:
Well it just came to mind, otherwise I never think about these things.

Q:
Did you ever publish papers about the, what happened at Fernald?

16:16:57
A:
Ah, I published a paper about every other year. I didn't bring the list with. Ah, some projects I thought weren't all that great, got a lot of attention. First you get re-, they send us request cards for reprints just before ah, Xerox copying machines were very popular and you requested reprints from the author.

16:17:22
A:
So first you get reprints from people in the United States, then the article would hit the foreign countries and then you'd get reprints from ah, Europe, ah requests. Ah, England and Europe. So you knew where you paper had gone by the re-prints you got back. I think I did about five or six, about

one every other year. Uh, I did some other projects that should have been published, but uh, never did get published. One of the best ones was the last one I did and never got typed even.

16:17:52
A:
Because I was leaving to go to school and this fellow had published an article giving the reaction between nitric oxide and urea as an air pollution remedy. And his equation was wrong. In his published article, and I did the work and found the correct reaction. But, it never got published, so that would have been my best paper.

16:18:19
A:
But, uh, I think, uh, I was leaving in a week or two and uh, so it never got published. It's in my notebook though, in the library, uh, you know in the, well in the Fernald library, Lab library, it's still there.

16:18:36
Q:
That's kinda interesting. So, it's sort of a rebuttal (Laughter).

A:
Yeah (laughter) oh yeah. This is great if another scientist can find someone else making a mistake. Because the fellow never did the work, he just made the assumption.

16:18:54
Q:
Um, (pause) looking at all my notes here from when we were talking earlier. Uh, tell us a little bit about the re-melt furnace accident.

A:
Uh, well the re-melt, I wasn't involved directly at all. The re-melt is, uh, let's see, the uh, RF energy is put in with a copper tubing and water went through the copper tubing to uh, keep it cool, because the uranium was right next to it, very hot.

16:19:40
A:
And the uh, the uh, copper tubing broke and water sprayed on the hot uranium and turned instantly to steam; and exploded. And uh, as I remember one fellow died right away and another fellow maybe a little bit afterwards.

16:20:03
A:
I think this was the only death that occurred while I was there. I had been out there and had looked through those windows so I know, knew what they looked like. So, a bad accident, uh, probably uh, that's easy to uh, realize, or you know, hindsight is much better. But, something that you really couldn't predict ahead of time. As far as health and safety, they took very, very good care of us. We had a uh, very good physical every year with chest x-ray.

16:20:48
A:
So, (laughter) if we didn't get enough radiation in the lab we got some more. Uh, actually, I never worried about the radiation because there wasn't enough there to be a health hazard at all. Yeah, two doctors, several nurses and a good health department which went out into the plant to uh, take care of things. If people were doing something wrong or endangering themselves they would uh, tell them, and educate them. So - very good health department, they took very good care of us. No complaints there, whatsoever.

16:21:30
Q:
A lot of people do worry about the radiation at Fernald. Can you explain why it's so low-level?

A:
Uh, uranium is not much more radioactive than dirt to begin with. The uh, after, let's see uranium has been in the earth all these years since, since uh, well to put it eloquently - since it was struck from the hands of the creator, see I like that.

16:21:55
And, these by-products built up over many, many years, especially the radium and radon, but after the uranium was processed this was no longer there, it's gone. And the uh, in order for all the radiation to build up again would take many, many, many years. Millions of years to build up again.

16:22:20
A:
So that was gone. And the uh, anyway, in the preliminary processing of the ore from either Canada or Grand Junction, so we were receiving very clean material. Very little radiation. Uh, the only exception was the uranium from Africa. And that's what's in the silos out there that they worry so much about now.

16:22:46
Q:
So the K-65 silos, what type of waste is in there? I mean and how did they get it there?

A:
Uh, well we bought the ore from Africa. And the deal at the time was the uh, Africans would get the uh, slag back that uh, had other precious metals in it, including radium which is ex-, valuable in itself. And also, I think gold and probably copper and maybe some platinum metals in it. So the agreement was they would get it back again after we took the uranium out, because that's what we had bought.

16:23:27
A:
Uh, however in the mean time, there was a change of government, probably violently. And the new government did not want the slag back again, even though it was worth money. And so it just, stayed there. And it's still there. Uh, some recent interest in recovering the uranium, for use in, you know, medical purposes, because somebody developed something new and they could use it.

16:23:56
A:
But uh, so anyway, my recommendation, or opinion would be to uh, reprocess it, and get the uranium out of it, and whatever other precious metals. Which would cost quite a bit, but so, I don't know what they'll do. They, the way it's going to be now, they're going to vitrify it and store it away.

16:24:19
Q:
Oh, that's a, K-65 isn't very interesting to most people because they don't quite understand what's in there. And a lot of what's in there came from other places. Is that true?

A:
All of it did. It came from Africa.

Q:
And then also, the waste from, is there Manhattan waste in there? Have you, did you ever hear anything about that?

A:
As far as I know, it's all stored at the Ridge. Uh, as far as I know, we did not receive waste, radioactive waste from other places. Uh, it could've happened. I don't know about it. But there was nothing put in those silos, while I was there. Uh, only thing, a slight amount of radon coming out, which the wind blew away.

16:25:11
A:
Uh, let's see, as far as I know, they only have a few cases of radon damage to a person's lungs, and they were minors. And the top o' that, they were smokers, too, and worked in the dusty mines. So how much the radon contributed to that, I don't know. Uh, to the best of my knowledge, no one's ever, no nonsmoker has ever died from radon poisoning, or uh, gotten lung cancer.

16:25:43
Q:
Let's get into that just a little bit. Um, in the mid-80s, you were gone from there.

A:
Yes. I left in um, I believe 1970.

Q:
Um-hmm. Did, were you aware of the media attention about the dust collector releases in Plant 9?

A:
Uh, I knew about the dust collectors. At one time, the budget was so tight, that the collector bags weren't long enough to reach the floor. They were using shorter bags than they were supposed to. Uh, this might've contributed to some o' the problem. Then the uh, they, they did uh, as well as they could. As I remember, what, some of the dust leaked out that they couldn't account for or something?

16:26:40
A:
That could've happened. But they're, generally they were very, very careful the, who uh, recover every scrap of uranium because see, as they explained it, it was ab-, worth about the same amount of silver. Because of all the uh, difficulty in processing it. And then we also had to account for all the uranium that came in and went out.

16:27:03
A:
All, everything that came in was sampled and analyzed and, so they knew the uranium content, and we knew the weight of the product that we sent out. So whatever left over was loss, which was, which you didn't like. But over the years, uh, yeah. They coulda had dust accumulated there, and one o' the reasons there mighta been the short bags. But uh, never involved directly.

16:27:32
Q:
In your opinion, uh, how dangerous is Fernald, and how dangerous was Fernald?

A:
I don't uh, well as far as radiation, I don't think it was dangerous at all. Uranium is like a heavy metal, like lead or any other heavy metal, and you can get poisoning from that. The chemical uh, aspects that were dangerous far outweighed any danger from the uranium itself. You handled solvents and corrosive acids. And you could have accidents from like the furnace exploding.

16:28:14
A:
Or from accidents like something falling on your head (laughs) construction type accidents. But all these were more dangerous than the uranium itself. Uh, there is a town in Texas, let's say Aluba, Texas, which naturally has more uranium in the water than uh, than the uranium concentration that's here. And those people get along just fine, and have for a very long time.

16:28:45
A:
So the uranium itself as far as ration, radiation goes, uh, not dangerous, but as a chemical, dangerous as any other heavy metal.

16:28:58
Q:
Great. Uh, ready to change tapes? Okay. Let's change tapes.

Tape FLHP000110

17:00:01
A:
You made me remember of a lot of things I'd forgotten.

17:01:03
Q:
(Laughing) Yeah, that's great.

A:
Well, when ya don't think of all these things over the years, you know, they go away (chuckling).

Q:
Right, well, I'll jog your memory some more. Um, talk to us a little bit about uh, you had mentioned that uranium catches fire quite easily.

17:01:19
A:
Uh, yes, Uranium is pyrophoric. It's uh, similar to the uh, lighter flint in your uh, in your cigarette lighter. It catches fire easily, especially if it's finely divided. And the uh, outside of Plant 8, uh, right out, opposite our windows, our, our, our laboratory room uh, windows faced Plant 8, and there was a storage drum pad there.

17:01:46
A:
And we could see the bubbles coming up from the uranium stored in the drums. And there was very likely hydrogen coming up. And every once in a while, a drum would catch on fire, and these, (chuckles) and these flames would uh, would go up several feet in the air. Sometimes go way, way up in the air.

17:02:05
A:
And we'd say, "Boy, that's a good fire now." If it was really good, we would go and tell the other people down the hall, you know, "Come, they got a really good fire going outta here, you know, come and watch it." And uh, eventually, uh, it would either burn out or someone would come and uh, and you know, put some more water on it and put it out.

17:02:25
A:
But uh, that was not uncommon. It didn't happen all that often, but occasionally, and we'd watch the flames going up and. The other time I saw a small fire was in the uh, chip washing station. They had these baskets oh, about this big around (demonstrates with hands) that're perforated. And the chips would come from the Acme Gridley machines.

17:02:48
A:
They'd be washed, and dried, and put in these containers. And I was out there watching the operation one time, and one of the baskets caught on fire. So it was like a big charcoal grill inside, just glowing coals, except it was uranium chips burning. And the operator was working uh, you know, putting these baskets in and out of the uh chip washer, and he saw the one was burning and he, he hollered, "Fire!"

17:03:16
A:
And then just went back to whatever he was doing, and nobody was paying any attention. And he looked around and he hollered, "Fire!" again. And he went back to what he was doing, you know, not paying any attention to the basket. And uh, a couple minutes later, here comes a fork lift operator and he grabs hold o' the basket, and uh, takes it out past the doorway outside and sets it down.

17:03:38
A:
And it burns away, and the uh, uranium metal just converts to black oxide, and it's put back and recycled again. But nobody got excited, nobody panicked, nobody went to get the fire hose, because water woulda made it worse. And on top o' that, it woulda washed away the black oxide. They could not recover it.

17:04:00
A:
It was very straight forward. Because uh, like I said, uranium was pyrophoric, they were used to it, they knew what to do, and nobody paid a whole lot o' attention. So it was interesting uh, to see how they handled that.

17:04:17
Q:
That' s great. Um.

A:
Let's see, I investigated the pyrophoric in the lab briefly one time, if you want that story.

Q:
Sure. Yeah.

A:
Uh, they wanted to know when the uranium would catch on fire. And so uh, I just set up a small glass tube inside of a furnace, and put the uranium in there, in a little boat. The boat was maybe two inches long, maybe quarter inch wide and I just put a few grams in. Then I'd also put a thermocouple lead in, and hook the thermocouple to the chart recorder.

17:04:59
A:
And then gradually turn the furnace on and gradually brought the temperature up. And when the uh, uranium ignited, or glowed, it would, uh, temperature would go up, and the pen would go up on the recorder, and I knew exactly at what temperature that uranium ignited. Then I did that for some other compounds too.

17:05:20
A:
Uh, one was uranium nitride, I don't know why they was interested in that for, but it was a interesting small project, and I suppose I invented the whole thing, but other people seemed impressed, but I wasn't particularly. But it got the job done, and I wrote the report and that was the end of it.

17:05:42
Q:
What kinds of chemicals are, were, or were actually, used in the process?

A:
Lots of nitric acid. (Clears throat) Uh, to dissolve the ore, and uh, reprocess uranium metal. Uh, they had huge kettles, huge stainless steel tanks, that the, that the ore was put in with a stirrer. Then the acid went in. One time, uh, this is a second-hand story, an operator uh, couldn't get his ore to start dissolving. And he said he put acid in, put acid in, and nothing happened.

17:06:23
A:
Well the trouble was he forgot to turn on the stirrer. (Chuckles) So eventually, he remembered, but he had too much acid in. So when he turned the stirrer on, the uh, it boiled over. Just like your, your coffee cup boiling over. So any way, this is uranium, and uh, actually the acid that boiled over.

17:06:42
A:
One time I got into the room above these kettles, for one reason or another and the air was brown with nitric oxide, which is a deadly chemical. So uh, no one else was up there, and I left (chuckles).

17:07:00
Q:
Let's see, when you talk about uh, safety on site, what types of uh, personal protective gear did NLO use?

A:
Uh, well see if I wanted, in the laboratory, use our, our regulatory, our regular laboratory lab jacket. Uh, face shields were available, safety glasses were available we wore them when appropriate. Sitting at our desk writing, we didn't need them. Self-contained breathing apparatus was available which I used once.

17:07:32
A:
The uh, I was distilling tributyl phosphate, and uh, I left it unattended for a few sections, a few, well less than a minute or, to get some equipment wh-, which I needed. And the uh, line between the vacuum pump and the flask clogged up and popped the cork on the uh, stopper on the flask. The room filled up with fumes.

17:07:58
A:
And I coulda held my breath and gone in, but they had trained us very thoroughly on how .to use the uh, the breathing tank. So I put this on and went in and turned the heat off. And eventually, the uh, air cleared out and uh, there was no problem. However, because I used the breathing apparatus, I had to fill out a report, (laughs) and go through the paperwork.

17:08:22
A:
Uh, see anyway, getting back to the chemicals, do you want some more of that yet? The, uh, let's see, nitric acid, uh, which came in, in tank farm, that came in tank cars, um, railroad, trucks. Trucks brought that in. Maybe both, but trucks I know about.

17:08:42
A:
Uh, ammonia came in tank cars, and uh, anhydrous hydrofluoric acid came in the tank cars. I sampled that once, that is nasty stuff. That, that is, that's dangerous, you don't wanna fool with that. Uh, the other chemical was magnesium metal, used in the reduction process which we talked about. So uh, those were the main, uh, bulk chemicals that were used uh, kerosene for the uh, extraction process.

17:09:21
A:
Uh, tributyl phosphate uh, which extracted the uranium. Uh, hydrochloric acid for recovering uranium. Uh, let's see, I think there was phosphate in there, too. They find that, but I don't remember that, what that was used for right now. Uh, let's see, I guess alum for the water treatment plant. I suppose a lot of that. And coal for the power plant. Uh, let's see water in the water towers. That's about all the bulk chemicals I remember.

17:10:09
Q:
That's great. I don't think a lot of people know, you know, what's out there. (Chuckles) Um, let's see, let me see if I've. You mentioned in your pre-interview that you thought that the whole place was unusual and kind of unique. Can you tell us why you feel that way about Fernald?

A:
Well, no other place did what we did. Uh, we uh, were working with uranium metal, lets see, during the cold war to ensure our freedom. And uh, this gave uh, incentive to the people who were working there. And a sense of patriotism and the metal we were working with was unique. The only other place that did it were in the other uh, Atomic Energy Offices.

17:11:01
A:
A lot of good people worked there, interesting people, very intelligent, dedicated. The uh, let' s see, the only very unique place was the rolling mill, no one else had one. So, that was the uh, if you ever worried about the plant closing completely, they said well that will never happen because we have the only rolling mill. Well, of course, they could have shipped the rolling mill someplace else. One of the

reasons we stayed was because uh, we, there was another place that made uranium metal, and this was Monsanto, uh, I think St. Louis, and uh, I remember there was not enough business for both of us.

17:11:48
A:
So, they, the uh, Energy Department had sort of a contest where both given ore to refine, and it was bad ore, it was dirty ore. And uh, the people who worked at our, uh, National Lab did a good job, they knew how to refine bad ore, and the uh, people at Monsanto uh, the words I heard, they failed miserable. (Laughter) So, the uh, plant at Monsanto shut down and we continued.

17:12:23
Q:
Was that Mallinckrodt?

A:
Yeah, what'd I say, Monsanto?

Q:
Yeah, yeah, that's okay.

A:
Oh, well the memory isn't what it used to be?

Q:
M-word

A:
So. So, when you edit it you will have to.

Q:
Right, right!)

17:12:35
Q:
That's interesting though. I really like, like that story. Um, oh, how did Fernald's, they were in business for some 30 some years, how did what they were doing at Fernald help further America's goals?

A:
Well, it kept us free, I guess that was a good goal. The, proof that it worked is that we never got into a war with Russia. Although we came close during the missile crisis and Kruschev knew we had lots of atomic bombs in the Strategic Air Command and lots of missiles, and lot of missiles in submarines and Russia would be annihilated if he started a war.

17:13:29
A:
The other aspect is just part of atomic energy, which is a very good energy, we're producing power, very non-polluting. But uh, people in this country uh, generally do not take it seriously, or did not take it seriously, they over-emphasized the safety part of it. That is safe, well it can be safe, but you have to be carefully, and you have to take it seriously. Now the people at 3-mile island, if the operators there had done nothing whatsoever, the plant would have taken care of itself and the automatic controls. And it would have been safe.

17:14:11
A:
But another good example I can think of is at uh, Dow chemical, they were going to put a reactor in there to produce power. And so, Dow was going to buy power from it so, they got involved. And they found out some 30 percent of the bolts, were bad bolts they were supposed to be a lot stronger than they were.

17:14:35
A:
Some contractor bought bolts from Japan, had the Japanese stamp high strength steel on the bolts and shipped them to Midland to use in the reactor. Well, this is not taking it seriously. The same thing happened with the atomic submarine. A manufacturer bought some surplus bolts and sold them as good ones. And that fellow, that fellow went to jail. So, in this country uh, that's why I say, were-, we don't have the right attitude, or care for atomic energy.

17:15:16
A:
Eventually, fossil fuels will run out, oil and coal will be gone and we will have to rely on nuclear power for electricity. Now France generates almost all of its power from nuclear energy, they've had no problems, they take it seriously. The accident at Chernobyl, when that happened, I told the people at the office, I know what' s happening, well they didn't.

17:15:45
A:
I knew the graphite was on fire. (Laughter) So, I said that's why it's burning, the graphite is burning. Well, they caused their own accident there. They were uh, trying to experimenting with some far-out scenario of if something bad happened and the next thing bad happened and they just went over-board a little bit. And uh, the result was Chernobyl.

17:16:09
A:
All that radioactivity was released. If they had done nothing, if they had left the plant alone, n-, not experimented with it, it would have been all right. But these operators and managers get bored and they try to think up something to do, and end up with the inevitable result.

17:16:28
A:
Uh, this also happened in Canada. A fellow was experimenting with his reactor, pushing it to the limit. And he had an operator standing there. You know, when it got too high, you were supposed to push the button. Well, the fellow said, "Shut it down instantly." Well apparently the operator didn't know, quite know what instantly meant.

17:16:49
A:
And by then it was too late, you know, they had an excursion. So, useful, but has to be taken seriously and we're not doing that in this country. The other problem of course is what to do with the waste material, in this country. The other problem of course is what to do with the waste material. In this country we are terrified of loose uranium or plutonium getting out and terrorists getting a hold of it.

17:17:12
A:
Well, France doesn't seem to have that problem. But uh, it has to be taken seriously. So if that (chuckles) adds to the question.

Q:
That's great, yeah. 'Cause that's one of the things that, I mean we were sending our material to reactors. You know, it's part of what Fernald was doing.

17:17:34
A:
Well the uh, well our uh, some of our material went to wh-, to what was called a dual purpose reactor, which ran uranium and uh, plutonium both. But the conditions are not the same. What's efficient for nuclear power production is not the same conditions that would produce good plutonium for our weapons.

17:17:58
A:
So this was a compromise reactor. It's probably not being used any more, I think they're all shut down.

17:18:07
Q:
How much did you know about the DOE complex in it's entirety while you were working at Fernald?

A:
Well, in generalities, we knew, uh, the uh, I visited the Ridge, and I saw the calutrons that were still being used to separate isotopes, not uranium isotopes any more. And there was a few of 'em operating yet. But that was a, Manhattan Project was a fantastic project. The calutrons were the giant mass spectrometers that were one about story high. Huge magnets, huge diffusion pumps.

17:18:49
A:
And uh, the uranium isotopes were separated in the magnetic field, and collected in graphite, uh, they call 'em buckets, they were uh, graphite collection cup. (demonstrates about a six inch oval with his cupped hands) Oh, about that long and would, the 238 went here (shows with his right hand underneath the other hand) and the 235 went here (shows with his left hand over the other hand).

17:19:09
A:
And they hired many, many women to scrub out the liners of these calutrons, and recycle everything. Uh, and the first atomic bomb that was dropped on Japan, I think was largely made from, from that uranium that was separated in the calutrons. Then the uh, diffusion plant came on line which was a fantastic project. As far as I know, the barrier is still classified as to how it's made. It's made of nickel metal.

17:19:44
A:
And the ah, it depends on fixed law of diffusion, which says a lighter atom will go through faster than a heavier one. Well, between 235 and 238, there's not much difference, so it takes many, many stages of separation. And uh, as I re-, as far as I know, the, let's see, well that was used for weapons then. And then the plutonium production came on line, which we were a part of.

17:20:16
A:
So the second bomb uh, I'm not sure the plutonium bomb or a 235 bomb from the diffusion plant. But anyway, they were both used. The, as I remember, the 235 uranium was used in power plants, and plutonium was used for bombs. But they could be used either way. Us, so that was the Ridge, and then they did weapons development there, which nobody got near, unless you were directly involved.

17:20:53
A:
Then the other plant was at Paducah, which was a gaseous diffusion plant. Ah, let's see there was Pudach and Portsmouth, I think they were about the same. I visited there once ah, to discuss some legal procedures. But never got to visit, visit inside the ah, diffusion plant itself. These plants were huge, they were ah, they would go ah maybe quarter mile one way, turn the corner and come a quarter mile back or something like that.

17:21:25
A:
Or maybe a half-mile this way, turn a corner and go back. So uranium was pumped in one end, and the separated uranium came out the other end. Ah, we received ah, some U-235 from ah, I think ah, Portsmouth to ah, add to ah, our uranium to enrich it slightly, not a whole lot but, but slightly.

17:21:51
A:
Ah, the other plants, ah, see Hansford in Washington, we discussed where they extracted the ah, plutonium out of the uranium after they cooked it in the reactors. (Coughs) They also produced ah,

neptunium and some other, ah americium they produced. Ah, I think some of that was used in ah, in the ah smoke detectors for a while.

17:22:21
A:
So many useful products – ah let's see, Los Alamos of course was weapons development – and ah, that's where they developed the hydrogen bomb also. Ah, did a lot of theoretical work on it and probably build it there. The ah, let's see, there was a clean up plant – let's see, two clean up plants. One near Niagara Falls, I don't remember the name of it anymore.

17:23:00
A:
Which has been abandoned a long time ago, I don't know if it's been cleaned up or if it's just sitting there. Another ah, recovery plant in ah, let's see I believe in New Jersey on east coast and they did have an excursion there. Ah, another place was at, well the reason they had the excursion at New Jersey, carelessness again, the ah, didn't take it seriously.

17:23:27
A:
The operator was processing ah, low-enriched uranium, well somebody put a high-enriched uranium bottle in with all the rest. He labeled it correctly, but the operator takes them all and dumps them in the same tank. Well it was concentrated enough in water so an excursion occurred, (begins gesturing with hands) which meant that water boiled and ah, it boiled over. When it boiled it turned to steam and the mass was not there anymore.

17:23:59
A:
So the steam condensed, it went back and it formed the ah, puddle again in the bottom of the tank. The mass increased enough so then it went (gestures with hands in a back and forth motion) back an forth like that. Ah, the operator I don't know if he died or not, he may have. Ah, another place I was involved directly with was Idaho Falls.

17:24:23
A:
This was the ah, National Reactor Testing Station. They were sampling the Colorado Plateau ah, which involved collecting a lot of dust and ore samples. Part of it was to make sure the miners were safe, they were using their respirators. So, lots and lots of samples. And ah, the Health and Safety department did not have enough people to do all this work, so they collected people from various sites including ours.

17:24:58
A:
And rotated them to the lab to do the work. So ah, I think three of us all together from National Lead went there. We went three weeks at a time, so I was the first one and ah, did my three weeks as a, and worked and then when I was done I came back. As a side interesting event, that was the year the earthquake occurred at Yellowstone (laughing).

17:25:27
A:
This caused a lot of panic among the operator, reactor operators. Then that free weekend, we went out to Yellowstone to look at the damage. And the, we couldn't get very far into the park because the park was full of rocks and boulders. And all the geysers were very, very active.

17:25:45
A:
Geysers that have been inactive for years, were spewing huge volumes of water all over the sidewalk, you had to walk around, Old Faithful was very irregular. Uh, so interesting side trip. (Pauses) Another interesting side event, that I remember uh, they were expanding the Health & Safety Laboratory.

17:26:12
A:
They built the extension over the railroad tracks. They just took off the railroad track and just left it there and just, b-, bui-, uh, made the building over where the tracks were. A boxcar was sitting out on the tracks farther up. One day the wind was blowing, and the railroad boxcar started moving, because the brakes weren't set, heading for the new addition (laughs).

17:26:35
A:
But the workmen out there saw it, and threw some boards and stuff underneath the wheels and stopped it, uh, maybe two or three feet before it woulda plowed into the new building.

Q:
That woulda been a disaster (laughing).

17:26:49
A:
So interesting incident I just happened to remember. The uh, fellow who ran the lab was an interesting person. When he wanted his people, he just stuck his head out the door and hollered, and they all came running, (laughing) to see what he wanted. So, interesting lab.

17:27:12
Q:
Musta been, it musta been good to be able to go to some of the other locations.

A:
Uh, see, I was involved directly there. Did not get out into the reactors or the plant.

Q:
So now that they're, they're cleaning up the Fernald, how do you feel about the work that's going on now?

17:27:32
A:
Well, they seem to very over-concerned about the radiation, and they, like I, I never wanted to go back, because it would destroy the memory I have of the place the way it was when I worked there. So if I went back to tour or look, then that memory would be gone and a new one would come.

17:27:56
A:
And the uh, way one fellow described it, who did go back on a tour, he said they went out into the plant and these health and safety people uh, scattered everywhere with their g-, Geiger counters like uh, cockroaches scattering when you turn the light on. And he thought the whole thing was utterly ridiculous. Because he used to work there, you know, for several years, and never worried about it then.

17:28:20
A:
And so they overly concerned with radiation to appease the media. Um, the chemical hazards they should take seriously, because the danger is real, but radiation, no. And, the reason is because of what we discussed. The uranium is clean when we processed it. The age is build up of radioactive material, and uh, other hazards is isotopes, they were, they are gone. So, fairly clean.

17:28:51
A:
But chemical aspects, uh, you should respect those. The other aspects of it, they're cleaning up and taking it apart and putting the land back the way it was. Which is about uh, you know, what they should do. The alternative would be just to leave it there and let it fall down, which, not a good idea either. But uh, overdoing it I think, but that's what we're doing.

17:29:23
A:
The, problem is nobody can distinguish between the huge amount of radiation and a tiny amount. Newspaper reporters cannot. Their favorite phrases are uh, "deadly radiation" and "hazardous toxic waste." (Laughs) And uh, seem unable to get outside those boundaries.

17:29:44
Q:
Great. Is there anything we didn't cover that you wanted to cover? We're at the end of our 3rd tape here. Um.

A:
No, I just like to say it was a good place to work, they paid me very well, and I had a lot of fond memories. And lot of good people I worked with. And here we can close with dog (laughs).

17:30:03
Q:
Great. Well, thanks for spending time with us, just gonna run the tape out here. If we could just have quiet on the set, for a few seconds. This is nat sound.

A:
Gonna have to wait 'til the dog gets done.