Joe Dykstra

National Educational Technology Solutions LLC

K-25 Oral History Interview

Date: 3/07/05

Interviewee: Joe Dykstra

Interviewer: Connie Callan

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Name/Org: Gary W. Snyder 721567 Date: June 4, 2005
Guidance (if applicable): CG-SS-4 September, 2000

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[1:00:45]

Callan, C.: Okay. We are ready to start. This is Connie Callan. I'm doing the interviews, and today's date is 3/7/05. And this is Joe Dykstra. Now Joe, the first question is the easiest. I want you to first state your name and spell your name. We need to know how to pronounce your name if it's going to be on camera. So go ahead.

Dykstra, J.: My name is Joe Dykstra, and it's spelled D-Y-K-S-T-R-A.

Callan, C.: Now I'm going to ask a question. You don't have to answer it, but if you could answer your date of birth and also what your title was at the plant.

Dykstra, J.: I was born 6/6/21. I'm almost 84 years old. I started out in the plant as a supervisor in operations on the start up, and I held many different positions in chemical operations and later in engineering in the design of the upgraded plants in the later years.

Callan, C.: Okay. What I'm going to do is cue you now. When you talk into a camera, you need to look at me just like I'm your best friend.

Dykstra, J.: Okay. And not look --

Callan, C.: I hope I am after this interview.

Dykstra, J.: Okay.

Callan, C.: But when you're talking to people on camera, you want to look into my eyes, and you want to talk as if you were talking just in casual conversation. So first we're going to start, and you can take as long or as short as you want on this interview. We have a lot of questions though, so we're hoping this interview will take around an hour. It could go longer than that. The question first is in the categories of place of origin. Where were you born, and please expand if you wish.

Dykstra, J.: I was born in Iowa and spent my life in rural Iowa and Minnesota. And when I went to school, my dad was on the railroad, so I never went to school more than one year at a time in the same school. I started high school in Minnesota and then moved back to Iowa and went to Grinnell College and got a degree in chemistry in 1943.

[1:03:38]

Callan, C.: Where were you living prior to coming to work at K-25 in Oak Ridge? It sounds like you answered all that. So do you want us to skip that question?

Dykstra, J.: Well, when I finished college in '43, I accepted a job in the defense

industry in Niagara Falls, New York. And that was in May of 1943. As it turned out, the defense industry was the Manhattan Project. And so I worked there and lived there until 1945. And then we completed the work that Hooker was assigned to do for the Manhattan Project. And then I was hired by Carbide and moved to Oak Ridge, Tennessee.

Callan, C.: What kind of work did you do prior to working at K-25?

Dykstra, J.: Well, uh, I was a young chemist right out of school, 20 years of age, and I went to Niagara Falls and worked for Hooker. Of course, I knew nothing about the chemical industry, but uh -- And I didn't really know what I was going to be doing other than it was the defense project. And as it turned out, Hooker had the assignment to produce chemicals and fluorine production facilities that was later to be used at the K-25 plant. And of course it was classified. And I didn't know at the time that that's what I was going to be doing.

[1:05:26]

But the UF_6 diffusion plant required a lot of fluorine and fluorinated compounds. There was no fluorocarbon or fluorine industry any place in the world, so this had to be developed. And of course, they had already decided that the plant was going to be built. And even these chemicals and processes hadn't been developed. But that was what part of the assignment was at Hooker.

And so they developed the first production fluorine cells. Harshaw Chemical also developed fluorine cells, and Dupont worked on fluorine cells. It turned out the cell that was developed by Hooker was the one that was eventually used at K-25. And Hooker personnel actually built a plant at K-25 and operated it as the plant started up. Later on, that operation was turned over to Union Carbide to operate.

[1:06:36]

But also, they had to have fluorocarbon coolants and fluorocarbon lubricants. And these compounds were developed by research chemists at Purdue and Cornell and Columbia. But then after these were developed, Hooker was assigned the problem of producing these chemicals. So they built a plant at Niagara Falls. And I was there to help start up those plants. And we produced enough of the fluorocarbon coolants and lubricants to satisfy the needs for the diffusion plant.

And these were new and unique chemicals. And when these quantities were produced, the plant at Niagara Falls was shut down. And the

fluorine work was transferred to Oak Ridge and all the chemicals that we produced were transferred to Oak Ridge. And then since I had already had a clearance for working on the Manhattan Project, Carbide interviewed me and I was transferred to Oak Ridge.

Callan, C.: Okay. Let me just stop for a minute.

[1:07:58]

[crew talk]

Callan, C.: Thank you. That was a real good background. You've already talked a little bit about your educational background, but where did you attend high school? And what year did you graduate?

Dykstra, J.: Well, as I said, my dad worked on the railroad and so we moved almost every year after I was in fourth grade. And most of this was in rural communities in Iowa and Minnesota. I started high school in Albert Lea, Minnesota and finished high school in a school that had four seniors in the graduating class at Fernald, Iowa. The school doesn't even exist now, but I went to four different high schools. One in Minnesota and three in Iowa. And then I went to --

Of course, I was an athlete and basketball player, and so I could have gone -- I was recruited to play basketball at some of the schools. But my interest was in studying chemistry. And so rather than take an athletic scholarship at some of the universities, I went to Grinnell College, which had a good chemistry department. And I worked my way through school and had a degree in chemistry in 1943 in May.

[1:09:40]

The next week after I graduated, I started working in Niagara Falls at Hooker on the Manhattan Project. I was six foot nine at the time, and so I was 4-F. And most of it, there were only four of us that graduated from high -- or men that graduated from college, because most of the people were entered into the service. And I just happened to be the one that wasn't accepted. So I was permitted to finish and get my degree in chemistry.

Callan, C.: Now did you say which university you got your degree from in chemistry?

Dykstra, J.: At Grinnell College.

Callan, C.: Okay. I'm sorry. Well, that's an interesting story. My daughter is in

basketball, too.

Dykstra, J.: When I went to -- I don't want this on the tape, but when I went to some of the schools and they asked me if I wanted to see the campus, well I said, "Yeah. I'd like to see the chemistry department." "Well, if you're going to play basketball, you can't go to chemistry because you have labs in the afternoon when you have to be practicing." And so I just told them that I wasn't interested. And finally I went and got accepted at Grinnell College, which had a -- You know, you could study chemistry. You didn't have to play basketball in the afternoon.

[1:11:09]

Callan, C.: That's exactly what she said. She wanted to be a student not an athlete. It turned out she had to make the choice.

Dykstra, J.: My dad was very disappointed. He said, "You know, I haven't got money to send you to college. And you could have gone at no cost, and you accepted a school that was the highest tuition of any in the state of Iowa." But they had a good chemistry department.

Callan, C.: Well, I think the world is lucky that you made that choice today. Let's talk about family now. Do you want to talk about anything about your family life?

Dykstra, J.: Well, I met a red-headed gal when I was working in Niagara Falls. And a few years later, after the war, I talked her into coming to Tennessee. And we were married, and I have a son and a daughter who grew up in Oak Ridge and went to the University of Tennessee. And I lived -- My wife passed away three years ago, so I live by myself now in the house. I've lived in the same house for over 50 years. But I've spent most of my lifetime in Oak Ridge.

Callan, C.: Now we're getting onto the actual questions about working at K-25. And I know you've answered some as we've started, but we have several questions in this general category. So we're going to start with why did you come to work at K-25? What attracted you to come and how did you hear about it? And I think you've alluded to it in some of the other answers.

Dykstra, J.: Well, of course, I didn't know at the time -- Working in Niagara Falls, I didn't know about the Manhattan Project and didn't know that the materials we were working on were going to be used in Oak Ridge, but I was asked by Carbide to come to work at a plant that was going to be built and started up in Oak Ridge, Tennessee.

[1:13:32]

It was several years before I found out what the connection was between the work I was doing in Niagara Falls and what was being done at Oak Ridge. But I arrived at Oak Ridge in March, and that was the month that the plant started in production. And so with a short amount of training, I was assigned as a supervisor in charge of starting up part of the plant.

And with very little knowledge about gaseous diffusion, because what we knew we weren't supposed to talk about. And the people I was supervising weren't told, but we did manage to start it up. And there were, you know, some three thousand stages, and the building at K-25 was over a mile long. As soon as construction assembled one of the cells or one of the units, it was turned over to operations. And Carbide was responsible for leak testing the equipment that had been put in by the contractor, assembling some of the components, and then energizing the electrical system and starting it up.

[1:15:08]

Callan, C.: What are your first recollections when you arrived at K-25? Think back at the first day you came to the plant.

Dykstra, J.: Well, of course, I was told to report to an office in Knoxville. And I came to Oak Ridge by train and got to that office. And they loaded me up on a bus, and I went out to the, what they call Wheat School, which was the employment office adjacent to the K-25 plant. The K-25 plant was still under construction at the time. But some of the equipment was ready to start operating.

When we came in, they assigned us all -- Of course, most of us were single. They assigned us a dormitory room, and they had a number of cafeterias scattered through the plant. And I think at the time there was about 70 thousand people in the population of Oak Ridge. Of course, the Y-12 electromagnetic plant and the national laboratory, which operated a nuclear reactor to produce plutonium, they had started up a couple years earlier. And so there were many people in Oak Ridge working at those plants. There were a lot of construction people, because construction was still going on at Y-12.

[1:17:03]

And at Oak Ridge there were work buses that delivered people from almost the Kentucky border almost down to Chattanooga. And they provided free transportation for all these people to come to work and

deliver them home, because there wasn't enough housing in Oak Ridge for all the employees.

There was a construction village of temporary housing out near K-25. And it was -- The work went on 24 hours per day. So most everyone worked some kind of shift. And construction and operating people and the people were trained on shift. Of course, there were some security guards protecting all three of the plants.

And so it was an unusual community to live in. Most of the people did not have automobiles because of the rationing. And of course, I never had an automobile because I had never lived where I could own one. New automobiles weren't available during the war. So most everyone used the public transportation. If you wanted to go to Knoxville anytime to go shopping, you could get on a bus. And they operated 24 hours per day because there were people working in construction and operating people that had to be delivered to and from most of the communities.

[1:18:51]

I always liked to fish. I didn't have an automobile, but all I had to do was get on a work bus and could stop off at one of the lakes. And then when I got done fishing, I could get out by the road and get a free work bus back into town. But most of the people didn't have automobiles, and if they did, they had gas rationing so they couldn't do much driving for pleasure anyway. So the buses took us every place we wanted to go.

Callan, C.: What years did you work? I think you talked about what years you worked at K-25, but give the years now and then also did you ever transfer to Y-12 or X-10 and when?

Dykstra, J.: Let's see. I started in March of '45. And I worked in the cascade in operations until we got the plant started up. Many of the supervisors were technical people during start up and -- because of the uncertainties and complexities that had to be solved.

[1:20:14]

As soon as the plant got started, I was transferred to what we call chemical operations. And we had to develop processes for cleaning and processing and recycling the uranium that came off of the equipment that failed. And then we had to clean it so it could go into the shop to be repaired.

And so I worked at that kind of operation from like '47 until the '60's. And we -- And I don't mean to say that I did it. But part of the thing that

we had to do was work with engineering and the development to develop chemical processes for cleaning the process equipment and recovering uranium from the chemical trap material. And so for several years, that was my assignment.

And then as the plant -- When the plant started up, the UF-6 was all provided from uranium ore that came from Belgium Congo in Africa. And it was shipped to Cleveland and Niagara Falls. And it was processed to UF_6 gas, which is needed for the diffusion plant. This was produced at the time by Harshaw Chemical in Cleveland. It was shipped to Oak Ridge in 400-pound cylinders. And then we vaporized that and fed it to the cascade.

[1:22:27]

As demand for uranium increased, ore was made available from -- in Canada. But the process that Harshaw had was not capable of meeting all the demands. So I was worked with -- We worked to develop at continuous process to produce UF_6 at K-25. And that started in 1950. And we produced UF_6 at the rate of, oh, 16, 18 tons a day. And instead of having it in 400-pound cylinders, we were transporting and storing the material in two and a half and ten ton cylinders. The need was that much greater to keep the plants operating.

In fact, there was such a shortage that a lot of the depleted material that was taken out of the cascade was re-fed to strip to a lower level until we got larger UF_6 productions settled in the operation at K-25.

[1:23:56]

Callan, C.: That was a really, really interesting answer. I was talking about -- I think the question was about the transferring around. I think the next one -- And if you want to pass on a question, just let me know, too. But if people --

Dykstra, J.: One of the things I want to be reassured that I'm not saying I did this and this here. It was -- I'm talking about a number of people that worked on these projects. And I was one of them. But in most cases, I was in charge of the operating after it was developed. But I didn't develop these things. You know. It was a great number of people.

Callan, C.: You're talking collectively.

Dykstra, J.: And I don't want this to sound like I did this. Okay.

Callan, C.: That sounds okay. It doesn't. If you could put in a succinct way. If

people would inquire what work was done here at K-25, how would you describe it as briefly as possible or as detailed?

[1:25:18]

Dykstra, J.: Well, of course, most of the people that worked on the project didn't know what the end process was. And we weren't supposed to talk about it. Of course, a number of us had to learn, or in our knowledge, we did have some sense of what was going on. But, you know, we had people in Detroit. Chrysler was building converters. Cadillac designed this plant when there wasn't even any barrier that had been developed yet. But they did provide a design for the converters that contained the barrier.

It had to be nickel plated because of the corrosive nature of uranium hexafluoride. There's only one compound of uranium that's a gas at normal temperatures. And so it had to be fluorinated. UF_6 is the only compound that is a gas. And of course with gases diffusion, you had to have it as a gaseous form.

If moisture was introduced to it, it converted it to a solid and no longer any gas. And it would plug up the barrier. So the system had to be -- It all operated at a vacuum below atmospheric pressure so the toxic UF_6 would not leak out. But at the same time, operating a negative pressure, if there was a leak, the wet air would go into the system and convert the gas to a solid. So the system had to be resistant to the fluorine compounds. And so it had to be a material like nickel or Monel or copper. It couldn't be iron.

[1:27:15]

And it also had to be absolutely leak tight so that the wet air wouldn't get in there. So it was all a welded system. And there were thousands of welds. And all these had to be probed with helium to see that there wasn't a leak. And the helium if it leaked in then they would mark that so they could re-weld it so it would be leak tight.

This took days and days. And so the construction of this plant, there were miles of tubing and piping throughout this one mile long building. And all this equipment that was welded had to be leak tested. And there were dozens of people, and most of these were women, because they had to crawl up over the pipe and probe every inch of welds before we could ever start up.

[1:28:18]

This was after the contractor installed it and had it all welded. Carbide people did all the leak testing. Let's see. I guess I lost my train of thought here.

[crew talk]

[End of Tape 1, Begin Tape 2]
[2:00:06]

Callan, C.: Well, that's good. So we now have thirty minutes of you on tape.

[laughter]

[crew talk]

Dykstra, J.: I don't know whether this is appropriate. I would like to talk a little bit about the mix of the people here.

Callan, C.: Yes. And that's in here.

Dykstra, J.: Go ahead with your questioning, and I'll respond to those.

Callan, C.: Well, I'll remind you at the end if you think you didn't cover it, but I bet you will.

Dykstra, J.: Okay.

[2:00:53]

Callan, C.: I don't know if you're noticing, but we tried to group the questions in categories. My question next is going to be -- There are two questions, so you can put it together. What did you like most about working at the plant? And what did you dislike about working at the plant? So do you want to start with what did you like most about working at K-25?

Dykstra, J.: Well, I think I just liked most of the people that worked here. It was a very challenging job. And of course, it was a wartime. And most of the people, we worked six days a week. And most of the time we worked more than eight hours a day. But the job -- I worked at the plant almost 40 years, and I never had a day when I had to force myself to come to work. The jobs were challenging technically and not necessarily financially rewarding.

Many of the people worked for 80 cents an hour. And many of the supervisors worked -- My grandchildren just can't believe it, but most of

us worked for 250 dollars a month. We had housing furnished to us for --

[2:02:29]

When I first married, I had a two-bedroom house. When I first married, I lived in an apartment because I didn't have any children. But we had a furnished apartment that cost 20 dollars a month. We had free transportation to and from work. I remember when my first -- If you were going to have a child, you could get a house. The government furnished the house. And this was a two-bedroom house, and we had to buy furniture, because it wasn't furnished.

Of course, we knew it was a wartime job, and that was quite an experience to have to go out and buy furniture to furnish a house, because we didn't expect to be working here very long. And then a couple of years later, I had a second child. And since it was a daughter and I had a son, my first child was a son. If you had two children of opposite sexes you got a three bedroom house.

And so I got a three bedroom house that I think cost about 40 dollars a month rent, including all the utilities. And later on, these homes were put up for sale. And I'm still living in the same house. Of course, I've made additions to it and so forth, but it's on a three-quarter acre lot. And I don't know what it would cost to build a house like that now. But these houses sold for three or four thousand dollars in 1950, the late '50's I think.

[2:04:28]

But Oak Ridge -- Of course I worked on a number of different projects and finally ended up working in engineering and worked on -- Helped to start up the plant at Paducah and Portsmouth, Ohio and worked on expanding the plant here. And so during my almost 40 years of work, there was a challenge in assignment every day. I fell in love with east Tennessee like most of the people did. And many of us are still here.

Callan, C.: You've got to remember to look at me, because your eyes keep going. I think you're looking at him and also the lens. So if we want this to be used by documentarians, you've got to be looking at me. So, let's talk about what you disliked about working at K-25.

[2:05:35]

Dykstra, J.: I can't honestly say there was [not] anything that I disliked. I had various assignments with DOE and with nuclear regulatory. And I visited the fuel fabrication plants and assisted them in some of the problems that they

overcame or that they faced with the work that we did at K-25.

And also I traveled to most of the DOE facilities and enjoyed every bit of the work because it was all challenging. And I had no desire to leave Tennessee and work anyplace else.

Callan, C.: Okay, working conditions, work environment. Since everything was secret, talk about how people communicated to fellow workers.

Dykstra, J.: Uh, you know, we -- I had friends. In fact, I had a roommate in college that worked at the electromagnetic facility. He later went to University of Chicago and got a doctorate degree under Fermi, who was one of the leaders in the nuclear industry.

But we did not talk in detail about what he was doing over there. And he later went to Cal Tech, and I visited him on trips that I made to California. But we didn't really talk about the classified parts or efforts that were going on. He didn't ever work at the diffusion plant and had no need for the knowledge of the classified parts of the diffusion plant. I had no need for the parts about the electromagnetic process that he worked on.

[2:07:53]

And this was the way with friends that I fished with and worked with. We played Bridge together and visited. But we didn't really discuss the classified parts of the job. And of course, we were advised not to. We knew there were people that were criticized, and I don't know how severely, for discussing classified information on the job. And of course, we do know that there were some of the secrets of the diffusion plant that did go to the Russians. But we didn't know that at the time.

But most of us were well indoctrinated with not talking about classified information, because we knew it was a wartime classified secret. And most of the people were really surprised and shocked when the announcement came out about the nuclear weapon being used in Hiroshima. Most people did not know that that was the effort that we were working on.

Callan, C.: Well, talk about that. How did people react the day it happened? Was it an instant reaction of knowing?

Dykstra, J.: Oh, yeah. I think there was an instant reaction, and there was also the real strong feeling that the war was nearly over. And almost everyone that worked here had family members. There were a lot of women here that their husbands were in service. And as soon as the information about the nuclear weapon being used at Hiroshima, everyone thought the war would

be over very soon.

And a lot of people were ready to leave Oak Ridge because they knew it was a wartime job. And they had interest at home. And that was the other thing. Almost all of the people that were here came from other places, you know; a lot of people from big cities -- New York and Chicago; and a lot of them from rural Alabama and Mississippi.

[2:10:15]

And when the war was over, most of them were very willing to go back to their home country and home state. And their family members were going to be released from the war very soon. And of course, the war in Europe was already over. So some of the people were being discharged -- but as soon as the nuclear weapon, they knew that the war wouldn't last very long.

So that August date when they announced it, and I was working on the twelve to eight shift in the cascade. And we were operating -- We had just completed the start up of the plant. And it was unbelievable when they announced it on the public address system during the night shift that the nuclear weapon had been used in Japan. And it was a real joyous period for all the people in Oak Ridge.

But I would say that most of them did not know that that was the project they were working on.

Callan, C.: Let's talk about how it felt to be always working in a secret facility as far as talking to your family and friends at home. Being able to share what happened on the job. Was that difficult for you?

[2:11:46]

Dykstra, J.: No. My parents visited. You could get passes, and they could come into the area. And it was no problem, because they knew it was a defense project, although they didn't -- And you know, they were examined when they came on the area. And they had to have a visitors pass. It was no real problem I don't think, because many of the people that were here had already worked on defense projects.

The TNT plants for instance. They had all shut down, and many of the people that worked here transferred here from the defense plant when those plants were shut down. We also had a number of GIs that were in uniform. And these were technical people, engineers and chemists that were permitted to finish college before they went in the service. And

when they got in the service, rather than going for basic training and going into the Army, since they had technical background, they were put in a uniform and send to Oak Ridge. They called them special engineer detachments.

[2:13:13]

And they had -- There were several hundred of them in barracks living here. And some of them were married, but they did not provide any housing. They had to go in the surrounding community and provide housing. But all of these service, special engineer people, when the announcement was made that the bomb, they knew they were going to be released from the Army, and they could go on with their regular life.

A lot of them did hire in with Carbide and continued to work at X-10 and Y-12 and K-25. But the news about the bomb permitted almost everyone to look forward to a different type of lifestyle than they had when they were in Oak Ridge, and they were very glad to move again.

Callan, C.: Well, talk a bit about the rules at the plant. And did everyone pull their weight? Your co-workers, what were they like?

Dykstra, J.: Well, you know, most of the people, regardless of their assignment, this was probably the best job they had ever had. Even though the pay-rate for some of these people were 80-cents an hour, and very few people made as much as 500 dollars a month. And that's just hard to believe in today's -- That people with technical education would be working for two or three hundred dollars a month. But at the time, that was -- We lived well, and there was rationing. Wherever you were, there was rationing of meat, and there were limits of what -- But there was also price control, so 200 dollars a month went a long ways.

[2:15:29]

I think most of the people felt that their job here was as good, or better, than they'd ever had before.

Callan, C.: Okay, we're going to go onto the general category on health conditions. And just talking about the health facilities and the emphasis the company had on health and safety and if you were every hurt or radiological, chemical monitoring, results of that presently. Do you want to talk a bit about health at the plant as well as your health today? Is that too large a question?

Dykstra, J.: No. You know, we were working with very corrosive and toxic and

radioactive materials. The containment was very good, because the material was scarce and had to be controlled. Most of us had never worked with corrosive material like this.

When I worked at Niagara Falls, we used anhydrous HF at two thousand pounds pressure. All the operators in that plant were chemistry engineers because they assume that some of the problems required technical knowledge to even operate it. So I was involved in the start up of that plant. I was involved in the start up of the plant here. And there was also the potential of a nuclear criticality if you had too much of the enriched material in one place at one time.

And so we had very rigid controls of nuclear criticality. And we had nuclear criticality specialists that patrolled our operating area all the time and advised us so that the supervisors or the operators or the mechanics would not violate the safe spacing and -- You know, we had chemical releases. And I was involved in some of them. I never had any real health problems.

[2:18:08]

We had very frequent, depending on the type of operation you were in, you had medical exams, long x-rays, blood samples at regular intervals. These intervals depended on what part of the plant you were in. In my case, since I was involved in most all of them, I had monthly visits to the dispensary.

We had urinalysis and blood samples and x-rays taken on monthly or quarterly basis. We wore radiation meters all the time, and these were analyzed. And if you had a residual radiation of a certain level, you were removed from that type of operation for a period of time until the radiation level was reduced. There was a very strong safety program in the plant. I have never had any health problems that I know of.

Callan, C.: Okay, let's go onto the Manhattan Project. And I know you've answered many of these questions, but let me see if there is any more you want to talk to in this area. Talking about the idea during the war, did you have any idea what the enriched uranium 235 you were separating would be used for? I think you answered a bit on that. How would you link what you were doing with what was going on with the war effort with current events and dropping of the atomic bomb? You answered that. What was your reaction to the August 6th news? The Manhattan Project. You talked to all of those. Is there anything you want to talk to in this period we call the Manhattan Project? Talking about key stories in the newspapers and your reaction to the news.

[2:20:23]

Dykstra, J.: No. I don't -- I think everyone that worked in Oak Ridge or worked on other parts of the project were patriotic, and they felt that the work that they were doing was well worthwhile. And since almost everyone had family members that were involved in the war effort, and they had friends and family members that had been lost during the war effort in Europe and in the Pacific, I think there was an extreme dedication and loyalty to complete the job.

And as long as the defense project was -- And of course, the word Manhattan Project was never used. It was -- I think the Clinton Engineer Works, and they knew it was a defense project. And most of the people did not know that the material that we were producing would be used in a weapon.

[2:21:51]

And a lot of people did know what we were working with was uranium. And we knew what uranium could do. But we were not aware of what was being done when the material was shipped from Oak Ridge to the weapon producers. And I'm sure there were some people. But we had 75 thousand people here, and I would say there were only a few hundred people in Oak Ridge that had any knowledge of the weapon. There was a real dedicated effort by the Manhattan Project and General Groves to segregate the various components and the various amounts of work that were being done at various sites.

For instance, the chemicals that were used here had a security code when they were made at Dupont in Wilmington or when they were made at Hooker in Niagara Falls. When they came to Oak Ridge, they had a different code.

For instance, we didn't talk about fluorine. It was C2-16. We talked about coolant. It was CH-16. When we worked at Hooker, those compounds were called P-45 or monochloro or something. But when the material went from one site to another, it had a different code name. And they never talked about the specific chemical compound. They all had --

[2:23:33]

And for instance, even like liquid nitrogen was called L-28 at K-25. And when it was used in Dupont, it was called a different code. Because part of the Dupont plant was in a Manhattan district segregated area; and the same thing with Hooker. Only a few people in the Hooker plant were

cleared to work in the Manhattan Project contract. And as operators, the chemists and engineers operated and maintained all their own equipment. And they were all Q-cleared. And this would be the same way in Dupont or Harshaw or National Lead or any of the other Manhattan Projects.

All the service people were Q-cleared. But they were limited to the knowledge that they needed to conduct their daily operations.

[2:24:42]

Callan, C.: Okay. Now let's talk about the next period of years, '45 to '48, which is what we're calling the post-Manhattan Project transition. How do you think history will view the Manhattan Project? And could you please explain the expansion program and when did that begin? Either one, you can answer either or both of those questions.

Dykstra, J.: Okay. Well, I have known associates and people that worked on the project that feel that the nuclear effort was unnecessary. And I think the younger generation now, because they don't really know how close we came to losing the World War II. Some of them feel that we would have been better off if the nuclear weapon had never been developed.

There was a tremendous amount of funds. In fact, I think one of the real issues. There was more money spent in Oak Ridge on enriching uranium and producing enriched uranium than there was any other part of the Manhattan Project. A lot of the attention has been given to the weapons development at Las Alamos in Albuquerque and so forth.

[2:26:24]

But in looking at the total cost of the project, Oak Ridge consumed most of the money or the larger share of the money until the end of World War II. Then when we got into the Cold War, it is unbelievable what we did.

We expanded the plants in Oak Ridge. I mean greatly expanded them. We had -- For instance, in the diffusion plant at K-25, we had motors, gas compressors that had five and maybe 200 horsepower motors. When we started the Cold War in the rush to compete with Russia on the thermonuclear weapons, we built equipment that used three thousand horsepower motors to circulate the UF_6 through the barrier.

And then we built this big plant in Oak Ridge. TVA built the largest electrical, coal fired electrical generation system that had ever been built; and built that in Kingston. And the total output for that plant came to Oak Ridge. And then we built a plant at Paducah that exceeded the capacity of

the plant at Oak Ridge; and that was done for the Cold War effort.

And then in addition to that, we built a plant at Portsmouth, Ohio that equaled the capacity of the Paducah plant. And so we had about twenty times the capacity of the weapons production plant at the end of World War II. And there were many people that thought -- because at the same time, the Russians were building thermonuclear weapons at the same rate we were building them. And we knew that they had tested these weapons.

And there were thousands of these. And every one of them would have almost -- They would have destroyed the whole island of Japan, some of these thermonuclear weapons. In fact, some of the tests of the weapons that were done in the Pacific actually destroyed a whole island. They never even found the island after it. And there were many people, and these weren't just pacifists. There were many people that were knowledgeable that thought this was the wrong way to go; because we had thousands of these nuclear weapons. The Russians had thousands of them.

We had aircraft in the air 24 hours a day, 365 days a year circulating over the U.S. that had thermonuclear weapons. Because the fear was that if the Russians delivered a nuclear weapon here, we wouldn't even have time to get our aircraft off of the air -- off of the ground.

[2:30:20]

And so we had these B-52s circulating, flying around the country continuously; and they had thermonuclear weapons on that could have been dispatched to the Russians if they were necessary. And there were many people that were aware of this and felt that that was absolutely the wrong approach, because at almost any time, these weapons could have been delivered, and it would have been essentially the end of our present style of life.

But this showdown and this Cold War race really caused the Russians to disarm --

[End of Tape 2, Begin Tape 3]
[3:00:28]

Callan, C.: -- is all in the category of the Cold War era. We're talking about the years '48 to '64. And I don't know if you can talk a bit about what kind of work was done at the K-25 during the Cold War. Talk about your work, how it changed, and some of the stories and your thoughts about K-25, which revolutionized the world during the Cold War era specifically.

[crew talk]

Callan, C.: Was that too large a grouping of questions? I'm kind of putting questions together so we can help go through this interview.

Dykstra, J.: No. In 1964, I guess, or sometime about that time and maybe '63, I was transferred back to the K-25 cascade. And we at that time, we were still producing weapons grade uranium. The Portsmouth plant was operating, and they could also produce weapons grade uranium. And part of this was used for the nuclear submarine fuel; part of it was made, still being stockpiled to develop thermonuclear weapons.

At that time in early '64, I was assigned in charge of the whole K-25 building to shut the building down. We evacuated all the inventory and put it in standby, because the thought was it may be needed later. But it was not needed at that time to produce more weapons grade material, because the material was still being produced at Portsmouth and also the fuel for the nuclear submarines.

[3:02:38]

So in a matter of weeks, we removed all the inventory, put it in safe standby, and terminated all the people that were working there. We still were operating the large part of the plant that had been built in the '60's. But that produced low enriched uranium, which could be used to fuel reactors, or it could be shipped to Portsmouth, and then they could further enrich it if it was necessary.

But that -- We shut the plant down and put it in total standby. And it stayed there until the current time. And now it is starting to be dismantled now. But the equipment is still there. And that's part of the cleanup project that will be done in the next two or three years. All this process equipment and all the residual contamination and toxic material will be removed, and the building will be dismantled.

[3:03:55]

I think it will be done in the next three or four years. You know, we hated to see it go down. And of course the people that worked there that lost their jobs hated to see it go down. But there really was no need for it. Although it was still productive, the new plant, the plant that had been built in Portsmouth was probably in the middle '50's, was in better condition than the plant at K-25.

But we continued to produce large amounts of material for the cold war.

But the work at the enriched part of K-25 was not needed. The plant continued to operate until '85, and then it was decided to shut all the enrichment facilities at Oak Ridge, to shut down. And so it was put in standby.

About three years ago, they started removing all that equipment. And those buildings are still standing, but the process equipment has all been removed. The area has been cleaned from its radioactive material. And there are plans that that will be leased to a private industry sometime in the future.

[3:05:42]

The K-25 plant will be totally torn down. And any contamination in the soil or the surrounding area will be removed. And I think that's scheduled to be done in the next four, five years I think. It's a long, costly project to dismantle and remove all that equipment.

Callan, C.: Let me ask you in this job category area. You've talked a lot about the different jobs you did, if you want to skip over that or if you want to go into more detail. But do you want to tell me what you feel is your most significant accomplishment as an individual and as a group?

Dykstra, J.: Well, there was so many contributions by so many different people. And these weren't inventive type things, but they were solutions to complicated problems. And I think everyone that was involved and most everyone that will be interviewed in this period have a feeling of real satisfaction and contributions, although their names aren't on the wall as being an inventor or a scientist. But so many of the contributions were done by the mechanics and the welders and the electricians and the research chemists and the analytical chemists, that it's just hard to comprehend what each individual contributed. But it was a working group of engineering and development and operating and maintenance crafts that I think most people are -- feel a great deal of satisfaction that the job did succeed.

[3:08:13]

Callan, C.: Since you were in the technical engineering area, do you want to talk a bit about the technology then and the technology today? Or not?

Dykstra, J.: Well, yeah. I could talk a little bit about it. For instance, in the 1960's, 1969 for instance, we started enriching private uranium. And I was in charge of what we called the toll enrichment program. And the government quit buying uranium to be enriched. But the civilian nuclear reactor people in this country and in Japan and France and Sweden and

Germany were all permitted to buy uranium, get it fluorinated to meet our specifications, and ship it to Oak Ridge. And we would enrich it and charge them for the cost of operating the plant.

[3:09:35]

And so from 1969, the cost of operating the diffusion plant here and at Paducah and Portsmouth has all been supported by the civilian, privately owned nuclear reactor people. And it isn't just -- We furnished all the enriched uranium for the nuclear reactors in Japan and at one time in Sweden and in Germany, plus all the domestic reactors. There's over 100 domestic reactors in this country.

And these utility companies bought the uranium and got it converted to UF_6, shipped it to Oak Ridge. We weighed it and sampled it to be sure it met our -- And we fed it into the diffusion plant here and in Paducah and Portsmouth. Took the product out and shipped it to their fuel fabricators. And so they own the material, and they made the fuel elements that generate all the nuclear power. And for many years, all the nuclear power in the world was produced by the diffusion plants in Oak Ridge, Paducah, and Portsmouth. And the total cost of operating these plants were born by those private utility companies.

[3:11:12]

I can remember when we, from my position down at the plant, we had shipped eight billion dollars worth of material. That was the enriching cost that we shipped to Japan and Sweden and the U.S. reactors. And at that time since we were -- We fabricated the containers. Some of these were 2½- , some were 10-, and some were 14-ton cylinders. And I visited all the fuel fabrication plants and worked with those people handling this material in the same manner that we handle it here. Because there were -- We had some experience with explosive reactions with hydrocarbon oil and so forth. So we helped those fabricators avoid the same kind of problems that we had here.

But the plants at Paducah and Portsmouth now are no longer operated by the government. They are operated by a private contractor. They're still owned by the government, but all the nuclear fuel for all the reactors in the U.S. are produced at these diffusion plants. But the uranium is all purchased and paid for by the private utility companies.

And all the cost of operating those plants are now born by these utility companies, and that is priced in the -- And we call it toll enrichment because they bought the uranium. They ship it to us, and we ship the

product to them. Just like the old mill and the people bought grain and shipped to the flour producer, and then he got the flour and paid a fee for the mill. And that was the program.

And this is many millions of dollars a year that these utility companies pay for getting their uranium enriched. And this is not enriched to weapons grade. This would be three or four percent, 235 instead of the 93 percent that's required for weapons. So there's no one now in the United States that is producing weapons grade material, but we're still enriching normal assay uranium owned by the utility companies and producing it as UF_6 which they can fabricate fuel elements out of.

Callan, C.: Well, I think you talked about living at Oak Ridge. So we're going to go to final questions. We've got to make sure that the crew gets some lunch before the next interviews. We've got about four questions that I want to go over, and these are key. But I want you to try to make them short and succinct, because they might actually be used for documentaries. If you can try to make it really a tight answer. And so these are like quick impression questions. Let's start with this one. Describe what you feel future generations should remember about K-25. What is the key thing that should be remembered about this plan?

[3:15:00]

Dykstra, J.: Well, I think that there needs to be an understanding of what the complex problems were that had to be solved to operate the plant. And most people don't even know who did the design, but the Kellogg engineering, which is called Kellex, they designed this plant before the barrier was even developed. And they developed the plant that -- and furnished drawings that are still available that we used to develop the operating procedures. And almost everything worked. And it's unbelievable that that kind of a thing could be done.

And they required containers and piping and valves and so forth that procurement people for the Manhattan Project had to go to everyone -- You know, the compressors were built by Allis Chalmers, which made farm equipment. Chrysler, who had made automobiles, made these diffusers that they put the barrier in. We had Valley Iron Pump Company in Wisconsin that built system compressors to operate in the cascade. We had valve manufacturers. We had General Electric and Westinghouse building special motors from all the way from five horsepower to 33 hundred horsepower to circulate the UF_6 gas. And these were all special designed compressors.

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And all of these were complex problems that had never been faced before. And I think Kellex people normally don't even associate Kellex with the K-25 plant, but they did the design work for this whole plant before we even had the barrier or had the fluorocarbon or had the chemistry technology available. But it was all required to make the plant work. And it was a fantastic achievement by that design -- And none of those people are around now, you know. Because they were senior engineers at the time they designed it, and you know, most of the people you're going to interview today were in their 20's at that time, but the managers and the designers and so forth were in their 40's. And that was 60 years ago; so very few of them are around.

Callan, C.: Well, thank you for speaking for the people that we can't interview today. If you were writing a story about K-25, just quickly talk about what are some of the key topics that would need to be covered in a story about K-25? Let's say you were thinking about an outline approach to a story. Can you answer that? Or do you want to pass on it?

Dykstra, J.: Yeah. I don't think I can say anything more.

Callan, C.: Okay. Did you tell us who else you think we definitely ought to interview?

Dykstra, J.: Well, of course Bill Wilcox. He's writing the history of the plant. And I've spent a lot of time with Bill. But most of these people that -- Jay Foster is very knowledgeable. I've worked with him. But I think most of the people you're going to interview are probably the ones that were involved in the -- Bechtel Jacobs in DOE had luncheons last summer. And most of these people came and talked about their feelings and relationships and so forth. And I think those are the ones you're going to interview. Some of them are mechanics and engineers. Some of them are women that worked in the plant in the lab and so forth.

[3:19:52]

But all of them have special recollections and contributions that they made. And the thing would have never worked without the contributions of so many people; because there wasn't any I did it or this thing. Because I think it was an effort by a great number of different, talented people.

Callan, C.: Okay. Here's your last question. And your last question is just basically is there anything else that you want to say or a last statement that you want to emphasize?

Dykstra, J.: No. Not really. I think it will be appreciated to have a compilation of

these type of interviews because there is a contribution by so many people. And a lot of them have been forgotten. And it's unfortunate that some of the managers that really led the projects aren't around so they could be -- so their contributions could be documented.

Callan, C.: Well, thank you very much. That was very interesting.

Dykstra, J.: Long winded, huh?

Callan, C.: Oh, no. I really --

[End of Interview]