SUPERIOR COURT OF NEW JERSEY
CHANCERY DIVISION-MORRIS COUNTY
DOCKET NO. C-3939-84

DIAMOND SHAMROCK CHEMICALS COMPANY,

Plaintiff,

vs.

THE AETNA CASUALTY AND SURETY COMPANY, et al,

Defendants.

DEPOSITION OF:
JOHN BURTON

Wednesday, March 18, 1987,
Morristown, New Jersey

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I N D E X

E X H I B I T S

(Before Gary M. Talpins, a Certified Shorthand Reporter and Notary Public of the State of New Jersey, held at the offices of Messrs. Pitney, Hardin, Kipp & Szuch, 163 Madison Avenue, Morristown, New Jersey, on Wednesday, March 18, 1987, commencing at 10:05 a.m.)

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J O H N B U R T O N, 208 Bowerstown Road, Washington, New Jersey, Sworn.

DIRECT EXAMINATION BY MS. COOKE:

Q. Mr. Burton, my name is Kim Cooke. I represent the Aetna Casualty and Surety Company in this litigation. I'm going to ask you questions today about your employment and about Diamond Shamrock and Diamond Alkali. If any of my questions are not clear, if I ask you two questions at once, please stop me and I will reword the question and if you want to take a break at any time, you are certainly welcome to, for lunch, coffee, for any other reason, just let us know and we will stop. The only other

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requirement we have is you give verbal answers to the questions so the court reporter can get them on the record.

Is that all clear?

A. Right.

Q. Could I ask you to state your full name and current home address again for the record?

A. John Burton, 208 Bowerstown Road, Washington, New Jersey, 07882.

Q. And are you currently employed, Mr. Burton?

A. No.

Q. When were you last employed?

A. I worked as a consulting engineer from 1961 to -- I sort of gradually wound down about 1980 but I didn't stop at any specific time.

Q. Were you a consulting engineer for any one company in particular?

A. No.

Q. For a number of companies?

A. Yes.

Q. Was that on an independent contracting sort of basis?

A. Yes. Actually, during that period, at two different times, I worked as an employee for one period of maybe eight months, I was a plant manager for Bzura Chemical; another period of perhaps eight months, I was plant manager for Montrose Chemical. In those two cases, I was working as a regular employee, as distinct from being independent.

Q. Do you recall approximately when those periods were?

A. At Bzura Chemical, it was --

MR. SHEFT: Excuse me. Could you --

Q. Could you spell that?

A. B-z-u-r-a. It was in 1961-62; at Montrose, I'm not certain, but I think it was about 19 -- the period of 1966 or thereabouts but I'm not certain of the year.

Q. Could you describe for us your education following high school?

A. Yes. A bachelor degree in chemical engineering from what was then Rhode Island State College, now Rhode Island, University of Rhode Island.

Q. And what year did you receive your

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degree?

A. 1936.

Q. Did you pursue any courses after receiving your college degree?

A. Not in particular, no, nothing worthwhile. I think I took a course once in business management at Stevens, an evening course, but it's the only thing I can remember.

Q. Were you employed immediately upon graduation from college?

A. I graduated in June 1936 and I started employment in August of the same year.

Q. Where was it that you started in August in '36?

A. The U.S. Rubber Company, Naugatuck, Connecticut.

Q. And what was your position at U.S. Rubber?

A. I had several, two or three positions. They were on the basis of not really professional work, more as a technician. I was sort of being held in these jobs until a professional position opened up.

Q. What were your responsibilities

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initially at U.S. Rubber?

A. Doing testing work on fabrics that they used as liners for their footwear.

Q. Would this have been chemical testing?

A. No, physical testing.

Q. Did you then move on to a professional position within U.S. Rubber?

A. The next position was testing the mixtures they made in their rubber compounding machines. This was, as I remember, mostly physical testing. Again, this wasn't really a professional job.

Q. Do you recall approximately how long you were in these technician type positions which involved testing materials?

A. Yes. I left in November of the same year to take a position with Charles Pfizer Company in Brooklyn.

Q. When you say the same year, is that still in 1936?

A. Right.

Q. What position did you take at Charles Pfizer?

A. The first job was in the analytical

laboratory analyzing their products.

Q. Do you recall what particular products Charles Pfizer was manufacturing at that time?

A. The principal product was citric acid but there were several other pharmaceutical products and actually, I don't remember specifically what they were at this time.

Q. Were they manufacturing any products other than pharmaceuticals at your location?

A. No -- wait a minute, I'm sorry, they manufactured oxalic acid because that was a by-product of the citric acid operation. Oxalic acid, as far as I know, is not a pharmaceutical.

Q. How long were you in this position at Charles Pfizer?

A. Until January 2, 1938.

Q. What position did you assume at that time?

A. You mean the next position?

Q. Yes.

A. I started work in February for Heyden Chemical Company in Passaic, New Jersey.

Q. Do you recall your position at Heyden Chemical?

A. Again, it went through a number of positions. The first was working in the research laboratory.

Q. Were you researching any particular product or material in the laboratory?

A. The only work I remember specifically had to do with formaldehyde and chemicals derived from formaldehyde.

Q. Do you recall what products Heyden was producing in Passaic other than the formaldehyde and formaldehyde derivatives?

A. At this plant, Heyden produced salicylic acid -- do you want the whole list?

Q. Whatever you recall.

A. Salicylic acid, beta-oxynapthoic acid, formaldehyde, methyl salicylate. That's all I can recollect they were producing at that time.

Q. For what uses or to what industries was Heyden selling these products?

A. Some for the dye industry, some to pharmaceutical and plastics.

Q. Was Heyden manufacturing any product that would have been a pesticide or herbicide, to your knowledge?

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A. No.

Q. Do you recall how long you were in this research laboratory position at Heyden?

A. Not precisely. It was a matter of perhaps six months.

Q. What was your next position?

A. A production supervisor in one department of the plant.

Q. And did you have actual responsibility for a production line or for the department itself?

A. A chemical plant is broken into departments. Each department produces certain chemicals. It's not like a production line in an automobile factory. In my department, we produced beta-oxynapthoic acid and parahydroxybenzoic acid and a crude form of salicylic acid.

Q. What was your next position after being a production supervisor?

A. There were some other related jobs that I did in connection with formaldehyde and another product that they were going into production on, pentaerythritol and also set up and operated a pilot plant for the production of

citric acid. There was one period where I branched out into other operations besides the one department.

My next job with Heyden was production manager and chief chemical engineer for a plant that was built in Pennsylvania by the Ordinance Department during World War II.

Q. Do you recall when you went to the Pennsylvania plant?

A. No, I don't. I would guess it would have been around 1941 plus or minus a year.

Q. And what was Heyden producing at the Pennsylvania plant?

A. Hexamethylenetetramine.

Q. What was the use for that particular chemical?

A. That was shipped to another plant who reacted it to form RDX, which was a high explosive.

Q. And do you know what this RDX explosive was used for?

A. Yes, it was the ingredient, what they called blockbusters. It was an explosive with considerably more explosive power than TNT.

Q. Do you recall how long you were in the position of production manager in Pennsylvania?

A. No, but it would be on the order of two to three years.

Q. What was your next position following the Pennsylvania employment?

A. I was plant manager -- or assistant plant manager of a Heyden Chemical plant in Princeton -- rather, I'm sorry, not Princeton, Penns Neck, New Jersey.

Q. What was Heyden manufacturing in Penns Neck, New Jersey?

A. Penicillin.

Q. Was that the only product manufactured there?

A. Right.

Q. And how long were you at the Penns Neck plant?

A. I would guess about six months.

Q. Where did you go from the Penns Neck plant?

A. I worked for a short interval at the Heyden plant in Garfield -- I'm sorry, the original one I said was in Passaic. It was really

in Garfield, New Jersey, not Passaic.

Q. So in other words, you returned to that same plant for a second period of time?

A. Yes.

Q. In what capacity were you at the -- did you return?

A. The post war planning.

Q. Can you describe what that involved?

A. Studying the future of the formaldehyde business. The specific project I remember was how Heyden would best be competitive in formaldehyde.

Q. What did you do following your interval when you had returned to Garfield?

A. I left Heyden and went to work for Rohm & Haas in Bristol, Pennsylvania.

Q. Do you recall the approximate year that you went to Rohm & Haas? Do you recall what position you had with Rohm & Haas?

A. I don't remember what title I had, but I was assistant in charge of one of the production units.

Q. What were they producing in the production unit where you were assisting?

A. They had quite a variety of complex chemicals and I have a difficulty remembering specifically what. They were based on -- some were based on sulfur dioxide, which we made by burning sulfur; some I know we started with zinc oxide as a raw material. These were basically chemicals that had to do with the textile industry and no connection with the pesticide or herbicide industry, that's for sure.

Q. How long were you at Rohm & Haas, if you recall?

A. Approximately three months.

Q. Do you remember what position you assumed next?

A. Yes. I went to work for J.T. Baker Chemical Company.

Q. And in what capacity?

A. I was chief engineer of the organics. Baker had started a new division to produce organic chemicals and I was chief engineer of the organic chemicals division.

Q. Where was that located?

A. In Phillipsburg, New Jersey.

Q. Do you recall any particular organic

chemicals they were producing?

A. At the plant I went to, they were not producing any. The function of this new division was to develop some and go into production. We got sidetracked because at that time, Baker was also making DDT and having trouble with the process and I was assigned to supervise the DDT process, which was a sideline from a regular position. So I supervised DDT production and then we went into production of 2,4-D, benzene hexachloride, a pharmaceutical R-u-t-i-n, Rutin; and some other complex chemicals in the pharmaceutical industry on very small scale and at this point, I don't remember their name.

Q. Were you involved at all in the development process for the production of 2,4-D or the benzene hexachloride?

A. Yes.

Q. What was your role in the development?

A. Basically, the way it worked, the laboratory would develop a process and I would further refine the process. I had a small laboratory with a chemist. I would adapt what the laboratory found to make it adaptable to plant

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production. I would make cost estimates on what the product would cost so in turn, it could be seen whether it was economically worthwhile to enter and design and start up and operate the production unit.

Q. And how long were you with J.T. Baker Chemical?

A. I would estimate about three years. I think I can work back and think that I left there in either '47 or '48.

Q. Do you recall what portion of that time J.T. Baker was actually producing 2,4-D or the benzene hexachloride?

A. It would be probably the last year or year and a half. DDT was being produced all the time I was there.

Q. The DDT, I take it, was already in production when you arrived?

A. Right.

Q. Where did you go from J.T. Baker?

A. Crown Chemical in Ridgefield, New Jersey.

Q. What was your position at Crown Chemical?

A. Plant manager.

Q. What was Crown producing in the plant where you were located?

A. Producing dyes and dye intermediates.

Q. For any particular industry, particular use?

A. For the dye industry.

Q. That makes sense.

A. Dye and textile industry. Intermediates would be sold to the dyestuff producers and dyes to textile producers.

Q. How long were you at Crown Chemical?

A. Somewhere -- three or four months, I would guess.

Q. Do you recall where you went following Crown Chemical?

A. Wilson Organic Chemicals in Sayreville, New Jersey.

MR. COX: Wilson?

THE WITNESS: Organic Chemicals.

MR. COX: Thank you.

Q. And what was your position there?

A. Production manager.

Q. And what were they producing in that

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location?

A. Dye intermediates. These are chemicals that are further refined to make the dyestuffs themselves.

Q. Do you recall approximately how long you were at Wilson?

A. I think eight to 12 months, something less than a year.

Q. And where did you go next?

A. To Kolker Chemical Works.

Q. Was that in Newark, New Jersey?

A. Right.

Q. What was your position at Kolker?

A. There I remember specifically it was September 1949 I started.

Q. And what position were you in at Kolker?

A. I went there as chief engineer but at some point, it was sort of -- I took over production responsibilities. It wasn't a clear-cut -- in effect, I became plant manager shortly after going there, but I don't remember the specifics of it.

Q. Do you recall what Kolker was

producing when you arrived?

A. They were producing DDT, 2,4-D and products from 2,4-D. I believe they were also producing hexachlorobenzene.

Q. And when you say products from 2,4-D, are you including acids and --

A. 2,4-D is usually thought of as 2,4-D acid, the basic chemical. From that -- but that is not used as a herbicide itself. It is converted either to any one of various amine salt solutions or converted to various esters which in turn are formulated to make emulsifiable concentrates. At the time when I went there, they were producing dry 2,4-D acid for sale plus these other products derived from it.

Q. Do you recall how many production buildings Kolker had at the Newark facility when you arrived?

A. Yes, there were two.

Q. Can you describe what operations were in each of the two buildings?

A. In the main building, that had DDT and hexachlorobenzene. I'm not certain, as I say, if hexachlorobenzene was produced at that time.

Later, I put in a unit to produce it but I think they were already producing it on a small scale when I went there. I'm not certain. Also in that same building were the offices and laboratories and maintenance shop and general facilities.

Q. I take it the 2,4-D acid production and the --

A. Yes. The other building was devoted solely to 2,4-D and its derivatives.

Q. Was Kolker producing any 2,4,5-T at the time you arrived?

A. No. At the time I arrived, a chemist was doing laboratory work on the production of trichlorophenol.

Q. Do you recall in what building they were performing this laboratory work?

A. Yes, it was in the laboratory on the first floor and I will be doggone if I could show you specifically where it was.

Q. The first floor of the main building?

A. Yes.

Q. And I take it the work the chemists were doing was to develop a production process for trichlorophenol?

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A. Right.

Q. Do you recall whether Kolker then subsequently did go into trichlorophenol production?

A. Yes, because that was one of my personal jobs, to handle this trichlorophenol operation, the laboratory work and the design and start-up of a production unit.

Q. Do you recall when you started up the trichlorophenol production unit?

A. In 1950.

Q. And where was that production unit located?

A. That was also located in the main building. I have forgotten my direction as far as east, one corner of the main building.

Q. Did the trichlorophenol production involve installing new equipment in the main building?

A. Yes.

Q. Were you involved in the selection of the equipment for that process?

A. Yes.

Q. Can you describe as well as you recall

what equipment had to be purchased for the trichlorophenol process?

A. The principal piece of equipment was the autoclave, where the pressure reaction was carried out to produce the trichlorophenol itself. At that time, we couldn't purchase one of the raw materials, tetrachlorobenzene, so we also had to make tetrachlorobenzene for use in making trichlorophenol. That, in turn, involved an agitated jacketed tank and a centrifuge. The trichlorophenol unit, besides the autoclave that I mentioned, needed a condenser and a couple of mixing tanks and a filter.

Q. And was the entire trichlorophenol unit in the corner of the building you described?

A. Right.

Q. Was the tetrachlorobenzene also in that same area?

A. Yes, it was adjacent to it.

Q. How were the autoclave and the other pieces of equipment in the trichlorophenol process connected to one another, if they were?

A. By pipes.

Q. When this trichlorophenol unit was

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originally installed, how did you -- first of all, what raw materials were used in the trichlorophenol process?

A. Methanol, 1,2,4 tetrachlorobenzene and caustic soda and I'm not sure, we needed an acid at that time, either hydrochloric or sulfuric. I'm not sure which we used.

Q. Other than the fact that Diamond had to produce the tetrachlorobenzene, did it purchase the other raw materials from outside sources?

A. If we used hydrochloric acid, that was a product that was produced at Diamond as a by-product of other operations, so we would have used our own. Sulfuric would have been purchased from the outside.

Q. And as the unit was initially set up, how did you introduce these raw materials into the autoclave?

A. The methanol was pumped up to a measuring tank and then dropped by gravity from the measuring tank into the autoclave through a pipe. The caustic soda was a solid material and on a platform a floor above the autoclave that was emptied through a hopper into the autoclave and

the tetrachlorobenzene, I don't remember specifically, but obviously, it would have been handled the same way, brought up to the second floor. Tetrachlorobenzene, being a solid material, would have been dumped in through that same hopper.

Q. Did the caustic come in drums?

A. I'm sorry?

Q. What sort of packaging did the caustic material come in?

A. It came in metal drums.

Q. And would --

A. I would like to correct this because I'm not -- I'm quite sure we used the solid form of caustic soda but at some stage, it's possible we might have used the 50 percent liquid, which is a common way of handling caustic soda. It's immaterial for anything that I know of, but just to be very specific, I'm not positive at all times we used the solid form.

Q. And you stated that tetrachlorobenzene would also have had to have been taken up to the second floor. How would it have been packaged or handled?

A. It would be put in probably fiberboard containers, fiberboard drums.

Q. Did employees have to physically handle either the tetrachlorobenzene or the caustic material at any point in this process?

A. Yes.

Q. Can you describe what contact they would have had with these materials?

A. The tetrachlorobenzene, we had a very poor piece of equipment for it. It was a centrifuge in which the solid tetrachlorobenzene was separated from the liquid and then that had to be manually dug out of the centrifuge with a scoop.

Q. I take it, then, the employee would have to scoop out the centrifuge to put the tetrachlorobenzene in the fiberboard drums you described?

A. Right. I have to think a minute. In the process we used for trichlorophenol at that time, I believe we handled the trichlorophenol -- if you excuse me one minute, I have to think a minute.

Yes, I'm quite sure of this, although

I don't remember specifically, but I know we had a filtration step and I believe the trichlorophenol itself was acidified and filtered and was removed from the filter manually, like with shovels.

Q. So I take it did this filtration step involve an open process?

A. Right.

Q. Can you describe that for us in any further detail?

A. The filter we used at that time, as I remember, would be like this end of this table, a filter medium of cloth or other materials on the bottom and you pump in the mixture of solid and liquid onto it and the liquid drains through the filter and the solid stays on top. At the end of the batch, then the solid is shoveled off manually.

Q. And what would the employees do with the material they had shoveled off?

A. If this is the way I remember it, as I say, I don't remember the specs of it, that would then be transferred into a tank and heat applied to melt it.

MR. SHEFT: Could you read that answer

back, please.

(Whereupon the record was read.)

Q. Do you recall any other steps in the trichlorophenol production process which involved an open process or an open tank other than the filtration you described?

A. The next step in the -- the trichlorophenol was used to produce 2,4,5-T acid and the reaction of the trichlorophenol with monochloroacetic acid and caustic soda was done in a closed tank but a tank that had an open manhole which would be about 12 to 18 inches diameter and the operator would be making tests at this open manhole. So in effect, he would be exposed to fumes from the trichlorophenol.

Q. The operator would then be making these tests during the reaction process?

A. Right. The tank was vented to a scrubber system but on the other hand, the reaction was run at the boiling temperature, so there always were some degree of fumes at this open manhole.

Q. Do you recall any other steps in either the trichlorophenol production or further

down the line 2,4,5-T acid production which involved open vessels or tanks or open filtration processes?

A. The 2,4,5-T acid, after this reaction step, is then in the form of the sodium salt of 2,4,5-T and this was filtered first in open filters of the type that I mentioned before that were used for filtering the trichlorophenol itself and later filtered on a rotary filter, which again is totally exposed to the atmosphere. Then the final 2,4,5-T acid itself is separated from a liquid in the centrifuge except in this case, we had a better designed centrifuge so that there was a mechanical device for removing the 2,4,5-T acid from the centrifuge, rather than scooping it out. But there would be all through this some exposure to the operators of vapors from the 2,4,5-T acid or from any trichlorophenol that had not been completely removed from it.

Basically, in this filtration step, subsequent to the 2,4,5-T reaction, any unreacted trichlorophenol was removed but that removal was never 100 percent.

Q. Where you had the second centrifuge

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step or the centrifuge in the 2,4,5-T area and the mechanical device for separating the material, did the employees have to come into any contact with material at that separation step?

A. No direct contact except perhaps occasionally, when the centrifuge had to be cleaned out.

Q. Do you recall how the centrifuge was cleaned out?

A. It was a matter of taking a spatula blade and reaching in and scraping any residual 2,4,5-T on the cloth and washing it out and then applying a coat of filter aid for use in subsequent batches.

Q. You stated that in the 2,4,5-T filtration step, I believe you stated that excess trichlorophenol would be separated out. Was that your testimony?

A. After the reaction to make 2,4,5-T, both the 2,4,5-T that is produced and the trichlorophenol are in the form of their sodium salts. So in this subsequent filtration step, the sodium salt of trichlorophenol is water soluble and is separated from the sodium salt of the

2,4,5-T which is insoluble.

Q. At the time that Kolker initially started the 2,4,5-T production in 1950, do you recall what was done with the sodium salt of TCP that was separated out?

A. Yes, that was recycled and used over again.

Q. How was it used over again? In other words, in what --

A. The same as the original, it was equivalent to the material we produced originally. So it would be used exactly the same way, or charged into subsequent 2,4,5-T batches.

Q. In what step of the process would you introduce the recycled material?

A. Into the 2,4,5-T acid reactor.

Q. You stated earlier that there would be points, I believe your words were "all along" where employees would be exposed to fumes in the TCP process and the 2,4,5-T acid process, as well. Can you recall any specific locations other than a manhole and the filtration steps you have already described where employees would be exposed to fumes?

A. Those are the principal points. The single biggest point would be in the filtration of the trichlorophenol and the trichlorophenol production. The next point of greatest contact would be in the 2,4,5-T reaction because of the high temperature. There would be a large exposure in the filtration except from a chemical point of view, at that time, both the trichlorophenol and the 2,4,5-T acid in the form of the sodium salts, which renders them relatively nonvolatile, in other words, it's totally different, from a chemical point of view, of handling those when they were in their acid state, and then in the centrifuge step itself would be another point, that if there was any trichlorophenol left, again, the centrifuge was connected to a vent system where we had the tanks in that building connected to an exhaust blower and a vapor scrubber located on the roof.

But for practical purposes, in those days, the centrifuge itself acts as a tremendous air pump and it would be impossible to keep all the fumes from it -- I wouldn't say it was impossible, but all the fumes from it were not --

some of them escaped into the air, particularly around where the operator was doing the centrifuging, was exposed. So if there were trichlorophenol left in the product at that time, and certainly there was some very small amounts, there would be heavy exposure to the operator operating the centrifuge.

Q. If we could back up a step, I would like to ask whether you recall any vents or valves or openings on the initial trichlorophenol autoclave?

A. Will you repeat that, please?

Q. I'm trying to determine whether there were any vents or valves or openings, such as the manhole that you described. Were any of those types of openings on the trichlorophenol autoclave?

A. The manhole had to be open to charge the materials in. After that, the manhole was closed and this was a pressure operation of three or 400 pounds per square inch pressure, so obviously, everything was very tight thereafter.

Q. Other than the vents which you described that connected into the scrubber system,

do you recall any vents that were connected to the process equipment or piping and opened into the plant building, as opposed to going through the roof, for example?

A. Yes. For example, the solid material from the filter was put into what we call the slurry tank, which was simply to take that solid and mix it with water to make a mixture that we could pump. That tank was a completely open tank, no effort made to connect it to a vent system, because there was no perceptible fumes from it. Again, this is now in the form of the sodium salt, which is nonvolatile.

Q. Do you remember any other vents or any vents that opened into the building where fumes may have been emitted?

A. No.

Q. You stated that Kolker began this 2,4,5-T, started out with trichlorophenol production, that is, in 1950. Did they begin 2,4,5-T acid production at the same time?

A. Yes.

Q. And do you know how long Kolker continued to produce trichlorophenol and 2,4,5-T

acid?

A. They were producing it all the time I was there until I left in 1960. The tetrachlorobenzene part of it, we stopped that after perhaps a year. When we were able to buy the material, we bought it rather than produced our own.

Q. And at some point, did another company acquire Kolker?

A. Diamond Alkali bought Kolker, I'm quite sure it was 1951.

Q. Were there any changes in your responsibilities at the time that Diamond acquired Kolker?

A. Not officially, although unofficially, when Kolker was there, Charles Kolker and Lee Kolker both -- it was a loose organization, although I was nominally plant manager, they were directing a lot of things, whereas when Diamond bought it, there was a more clear-cut line of responsibilities, since Diamond headquarters were located in Cleveland.

Q. So, then, I take it you worked as the plant manager at the time that Diamond purchased

Kolker?

A. Yes.

Q. Were your primary responsibilities at that time supervising the operation of the trichlorophenol and 2,4,5-T or were you responsible for all products?

A. To be specific, at the time when Diamond bought Kolker, I was responsible for all production operations and for all laboratory -- all technical operations, laboratory and research work. I had no responsibilities for the office personnel or for sales.

Q. Did the different product lines or different process areas have managers who reported to you?

A. At this time, yes, there was one foreman in charge of the DDT operation and another foreman in charge of the 2,4-D and 2,4,5-T operation. I don't recollect exactly the trichlorophenol operation, whether I might have looked after that myself or whether it fell under one of these foremen, I don't remember, but there was at least one person normally between me and the operators themselves in terms of supervision.

Q. Did you continue as plant manager throughout the time of your employment at the Newark location?

A. Right -- well, no, not precisely. In 19 -- February 20, 1960, when the plant blew up, that ended my plant manager status. I didn't officially leave the company until I think it was about July 1st of that same year.

Q. Up until the date you just referred to, when you said the plant blew up, do you recall any significant changes in the trichlorophenol process or 2,4,5-T process?

A. In 19 -- let me -- I want to refer to an old table I have of different activities to be sure I get the right dates.

Yes, in the latter part of 1954, we made a major change in the trichlorophenol production process.

Q. Can you describe that change for us?

A. Yes. In this case, we took the product that came from the reaction vessel, which we commonly call the autoclave, distilled off the methanol, which we had also done previously, so that was no change, but then instead of acidifying

the material and separating out the trichlorophenol at that point, we took the batch after removal of the methanol and put it in what we call the steam stripper, where we blew steam through it and stripped out the impurities which were left at that point or stripped out most of them, the main impurity being what we call anisole, which is a trichloroanisole chemical.

And this was a major change in the process that resulted in less raw material cost and less labor cost. It reduced our manufacturing cost and also reduced the direct exposure of the workers to the product because there was no longer any necessity of this filtration step, which I described before.

Q. How did the steam stripping process result in lower raw material costs?

A. Because prior to that, we had taken the material from the autoclave, after we removed the methanol, and then acidified it with hydrochloric or sulfuric acid; then in turn, the trichlorophenol, which was now in the acid form, had to have an amount of caustic soda to convert it back again to the sodium salt. So we saved, in

terms of chemical terms, one equivalent weight of acid and one equivalent weight of caustic soda.

Q. You stated that both before and after the addition of this steam stripping process, you distilled off the methanol.

A. Right.

Q. Following the TCP reaction. What was done with the distilled methanol?

A. Recycled to another batch.

Q. Did the steam stripping process itself involve the release of any fumes either through process vessels or vents?

A. There would be a vent from the condenser to the vapors from the steam stripper, went through a condenser where the vapors were condensed. In turn, that condenser had to have a vent. As I recollect, we simply vented that outside the building.

Q. Do you recall what was done with the trichloroanisole or any other impurities that were removed in the steam stripping process?

A. The trichloroanisole was recycled to subsequent batches.

Q. Where in the production process would

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the recycled trichloroanisole be introduced?

A. Into the autoclave. It would be -- as far as we were -- the equivalent of tetrachlorobenzene would be charged.

Q. And how was it introduced into the autoclave?

A. I have no direct memory of it but since it would be a liquid material, we would normally collect it in a tank and transfer it in by a pump, although there is a possibility, since the condenser for it was -- I think the receiving tank for it was located on the second floor. We might have drained it into the autoclave by gravity. I don't remember.

Q. Do you recall any other specific impurities stripped off in the steam stripping process?

A. We didn't know at this point much about the nature of any impurities. We recognized that the material we got off from the steam stripper was an anisole product, which is a combination of trichlorophenol and methyl alcohol, commonly called anisole, but other than that, we didn't recognize the nature of any impurities.

Q. So, then, was all the material stripped off by the steam stripper recycled as trichloroanisole?

A. Right. Well, it would be a little bit not quite true because in the steam stripping process, both steam and anisole would be in the distillate and would be condensed. So in our tank, we then ended up with a layer of water and a layer of anisole. The anisole would be insoluble in water and that water was discarded. So presumably, when we discarded that water layer, we discarded some impurities. But I don't know that for sure and don't know what they would be.

Q. How was this water discarded?

A. Opening a valve and letting it run out to the river.

Q. Was the trichloroanisole completely water insoluble?

A. Nothing is ever completely insoluble. It had a low enough degree of solubility that we didn't consider trying to recover any from the water layer.

Q. Other than the addition of the steam stripping process, do you recall any other major

changes in the TCP process or 2,4,5-T process up until February 1960?

A. We added a second autoclave, but this did not change the process. We increased -- at some point, I don't remember -- maybe I do. Yes, in 1953, in March of 1953, we put a second autoclave into operation to increase the capacity but this did not change the process.

Q. Was the second autoclave the same size as the first, if you recall?

A. As I recollect, it was twice as big. I think the first was 500 gallons and as I recollect, the second was a thousand gallons.

Q. Were these two autoclaves operated simultaneously?

A. Yes, they were operated at the same time, but we wouldn't charge them both at the same moment, if that's what you mean by "simultaneous."

Q. Did you have one charging system to service both autoclaves?

A. No. Since the materials that had to be charged as solids, each autoclave, they were located in the building maybe ten or 12 feet

apart, each one would have its own charging hopper.

Q. If each had to have its own charging mechanisms, why was it that they were not charged at the same time?

A. Just the nature of the operation. An operator is busy charging one, he wants to get it charged and operating smoothly so he doesn't have to pay attention to it before he has the time to charge the second one.

Q. So did you have just one operator in the area with the two autoclaves?

A. Basically, we had one operator, although it seems to me that in some fashion, he had part-time help for the charging operation. I'm not sure how we arranged that. But I'm quite sure that he had normally someone to help him during the charging operation. I'm not completely sure on that.

Q. Did the addition of a second autoclave require duplication of any other equipment in the trichlorophenol process?

A. Not that I remember. One other change we made in 19 -- these weren't process changes,

but in 1955, I believe about the middle of the year, we began to have trouble with chloracne in the workers and from then, I don't remember the specific thing, but generally from then until 1960, they were doing things to improve housekeeping, ventilation and so forth, nothing to do with the process itself, but just trying to take the normal steps to reduce the exposure of the workers to the chemicals.

Q. Can you recall the date or nature of any of the housekeeping changes you referred to?

A. Not the dates. At one point, we put in a -- we had a system for the workers in general of getting, I think, one change or possibly more but at least one change of clothes a week. The company provided work clothes. I think it was one set a week but the workers in the trichlorophenol unit I think would -- I'm not sure, but I think they were given clothes, a change of clothes every day. But there was special provision for clothes changes by workers in the trichlorophenol unit.

Q. Was this only for workers in the trichlorophenol unit?

A. Yes.

Q. And what was the particular reason that this provision was only made --

A. Because we recognized that this chloracne trouble was centered in the trichlorophenol unit.

Q. Was there any particular location in the trichlorophenol unit where you seemed to have more chloracne problems than others?

A. As far as the workers were concerned, I don't remember specifics, but the man or men who operated the trichlorophenol unit were the first ones to get chloracne.

Q. Was 1955 the earliest time that you recall chloracne problems?

A. We had chloracne trouble in the early days but we ascribed that to when we were making our own tetrachlorobenzene because we had some impure materials, it was difficult to buy the raw materials for making tetrachlorobenzene and we had some materials of doubtful purity we used as raw material and we had a heavy exposure of the workers in the tetrachlorobenzene operation. So we had some chloracne troubles at that point and it appeared it cleared up. This is hard to tell

for certain because this chloracne tends to persist. But to the best of our knowledge, our chloracne trouble that we had earlier was solely due to the manufacture of our own tetrachlorobenzene.

Q. So that would have been, I gather, in the 1950 or 1951 time period?

A. Right.

Q. In that earlier time period, did trichlorophenol and tetrachlorobenzene workers or operators both have chloracne?

A. As I remember the two operations, they were physically adjacent and I think in terms of operators, it may have been the same operators involved. We couldn't distinguish one from the other.

Q. In that earlier time period, did any workers further down the line in the 2,4,5-T area have chloracne?

A. No.

Q. Do you recall any time period when there was complete absence of chloracne subsequent to 1950 and 1951?

A. As far as I know, from prior to 1955,

we certainly had no concern -- I know I had no concern about chloracne. As far as I was concerned, there was no problem. I think we had one man who still had some chloracne, a laboratory worker who had got it and who had worked in the tetrachlorobenzene unit but his chloracne persisted.

But as far as danger from it, I know I had no concern about it because there was no evidence that we had any problem.

Q. Do you recall the approximate number of employees who had chloracne problems in the 1950-1951 time frame?

A. There was one man, Joe Boba, B-o-b-a, who was -- he had some degree of technical knowledge, although he was actually working in the plant at that time. I'm not sure quite -- he had chloracne and as I remember, it stayed with him for at least several years. Another engineer who worked in the unit, Seymour Schlossberg, I think he had chloracne but it went away. It might have been someone else, but those are the only two cases I can specifically think of.

Q. In the 1950 to 1951 time period, were

there any particular efforts that you recall to detect the cause of chloracne?

A. No.

Q. Were there any particular efforts to limit exposure either to tetrachlorobenzene or trichlorophenol in that earlier time period?

A. I don't remember doing anything about it. I think we looked at this as something that well, the Kolkers themselves were pretty much running things at that time. I was nominally in charge, but they were sort of looking over my shoulder.

I don't remember -- thinking back, I don't remember what we thought or did about it. I would sort of guess, though, that we probably thought this was temporary, that we were going to be able to buy tetrachlorobenzene in the near future and probably just live through it meanwhile.

Q. Do you recall the approximate number of plant employees in the 1950 or 1951 time period?

A. I would guess it might be on the order of 50.

Q. Going back to the 1955 time period, when you were discussing the chloracne problem developed then, do you recall the approximate number of employees involved in 1955 involved in the chloracne problem?

A. No, I don't, and there were varying degrees. Some were serious cases, really serious worries; others were minor that we hoped and in some cases, did go away. I think there were probably three to five cases that we would call serious cases and maybe half a dozen of relatively minor cases. Maybe that half a dozen is exaggerated. Let's say there might be three or four serious cases and three or four minor or temporary cases.

Q. Do you recall whether that approximate number significantly increased or decreased at any point between 1955 and 1960?

A. My recollection is that it decreased and certainly, I'm quite sure that to some degree, we seemed to have the problem under control in the sense of not developing new cases. See, this chloracne is persistent even after, from the best information I could get, even after a worker no

longer is exposed to it, to the chemical. Chloracne may persist for five, ten, 20 years. But I did have the feeling that we were doing fairly well in terms of new cases developing.

Q. Do you remember when you concluded that you were doing fairly well in terms of controlling or preventing new cases?

A. Probably not until about the last year. I don't remember specific on this, but I know there was sort of a decreasing concern.

Q. By the last year, you are referring to the last year you were at the plant?

A. '59.

Q. Other than the change of clothes for TCP unit workers which you referred to, do you remember any changes, housekeeping changes --

A. I remember we went in once and repaired the floors in the TCP unit so they would be properly pitched for good drainage so it would be easy to wash down the floors cleanly.

Q. Can you describe the construction or condition of the floors prior to those repairs?

A. They were concrete floors but this building was not designed originally for chemical

production, so the floors were irregular, not pitched and not necessarily very smooth. In other words, they were -- so what we did is to, in effect, lay a new floor on top properly pitched with a drainage channel so it could be washed down cleanly and I remember doing work in connection with the ventilation system, although I don't remember the specifics of it, but I remember puzzling over how to have a good ventilation system at the point where the operators charged the autoclave, that is, this manual charging step on the second floor above.

Q. Why were you concerned about the irregularity of the floors prior to making the floor repairs? What was happening?

A. This is always standard in any chemical plant, when you have anything toxic, you want to be able to wash down cleanly. It didn't have anything to do with any particular spills or anything we had, but just standard operating procedure.

Q. And how often did you wash down the plant floors in the TCP area?

A. I have no idea, probably in relation

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to when there might have been some sort of spill, but it wasn't any specific procedure, but just a matter of general safety, you want to be able to wash down a unit cleanly for when you do get a spill or any form of leak.

Q. Do you recall --

A. This I do in all chemical plants where I have the chance to do it. It was nothing particular to TCP.

Q. Do you recall any set schedule for washing down plant floors at times when there was not a spill?

A. No.

Q. Could you describe the drainage channels you referred to?

A. I can't remember that particular one in that unit, but as a general practice, we did the same thing over in the 2,4-D building, not necessarily connected with trichlorophenol, but one time -- in 1952, during the vacation period there, we went in and poured new floors through all the 2,4-D building, where we made the 2,4-D acid and 2,4,5-T acid, for the same purpose, to be able to hose down the floors and have them drain

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clean.

Q. You stated the 2,4,5-T acid unit was in the same building?

A. The 2,4-D and the 2,4,5-T acid units were in the same building.

Q. Do you recall the location or description of these drainage channels in either of these buildings?

A. I remember the one in the 2,4-D building, it was a channel that ran down the center of the building starting from the river side and going in the opposite direction. I don't remember the location of the channel in the TCP unit.

Q. Where did these drainage channels discharge?

A. At the river. The plant was adjacent to the Passaic River.

Q. Did the channels run all the way to the river from the building?

A. I don't remember. There was about ten feet between the -- no, they couldn't have, just thinking back on the nature of the layout, it had to be an underground pipe.

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Q. Inside the building, was the channel an open channel, a trench?

A. Yes.

Q. Do you have any recollection of the width of the channel or depth?

A. About 12 inches by 12 inches.

Q. Was it an open channel at any point outside the building or did it go immediately to an enclosed pipe?

A. I'm not certain, but there was another electrical room between the building, between the 2,4-D part of the building and the outside of the building and then there was about ten or 12 feet of clear open area before you got to the river and I have no recollection of any drainage channels running through there, so I assume it had to be an underground pipe at that point. You wouldn't want these fumes running through the electrical room, in any event.

Q. You now described the installation of new floors and some work in the ventilation system. Do you recall any other housekeeping measures to limit exposure to either vapors or materials in the process in the Newark plant?

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A. I know we experimented with protective creams. We had some indication, at one point I talked to Dow Chemical and Hooker Chemical about the possible utility of protective creams. I know we supplied protective creams to workers in the trichlorophenol unit or to maintenance workers who were going to do work in there, although this was a voluntary matter and we weren't certain whether they were helpful or not.

Q. You stated before that there may have been three or four serious cases, three or four mild cases of chloracne in the 1955 time period. Were all of those cases limited to workers within the trichlorophenol unit?

A. No. We had two cases I can remember specifically and I think there was a third one in the maintenance crew. At one point, there was a man who operated in the ester unit, that is, where the 2,4-D acid and 2,4,5-T acid are converted to esters. We had one man in there who had, say, a mild case of chloracne and another man who had a bad case and he was doing office work, but he had been doing something in the plant before and I don't remember what work he was doing in the plant

before.

Q. Were maintenance workers assigned to any particular area of the plant or could they work all over the plant?

A. No, normally the trichlorophenol operators, for example, would be working in that unit, only. Maintenance men, they would work anywhere.

Q. Do you remember the approximate number of employees in the trichlorophenol unit in the 1955 to 1960 time period?

A. Normally we ran it three shifts a day, which means we had to have three workers or if we were running seven days a week, sometimes we would have to have four. In other words, we would have to have a minimum of three or four skilled workers.

Q. Is that on each shift?

A. No, one man on each shift. As I said before, they had some help, unskilled help in charging the autoclaves.

Q. Do you recall the approximate number of employees in the 2,4,5-T area in the 1955 to 1960 time period?

A. It varied considerably depending on our production requirements, production schedule, but on any given shift, it would normally range from two to five men per shift. At times, we ran on a five day week, so there were only three shifts; at times, we ran on a seven day week, in which case there were four shifts. So in other words, they could range from ten to 28 people.

Then in the ester unit, which we considered separately from the 2,4-D unit, because physically, there was a wall between, it would be one or two men per shift in there and in the formulation unit, where the esters or amines were blended with solvents, emulsifiers and packaged, that was pretty much a seasonal operation. So that some times of the year there might be no one there and other times, there might be 12 or 15, perhaps, people employed there.

Q. Do you recall any chloracne cases among workers in the formulation unit?

A. No.

Q. If the formulation process was seasonal, where did the employees work when they were not in the formulation unit?

A. We hired some extra help and used some moonlighting help in the formulation unit at times and we had some degree of flexibility in the various operations of the plant and we had no rules as to what man could work anywhere, so if we could slow down one unit, we would put extra help in there and also we had overtime. So by flexibility and the general work schedule in the plant plus hiring some temporary outsiders, we managed. But it was a problem.

Q. Do you recall any periods when you were required to bring people in from other areas to work in the trichlorophenol unit?

A. No. Normally this would be a skilled job and normally we would never bring one in unless he was working -- after we had the chloracne trouble, it was also voluntary. No one worked there except on a voluntary basis. As I say, it was a skilled job, so it wouldn't be a random putting somebody in there temporarily.

Q. Were any housekeeping procedures instituted to limit exposure to the ester workers or to the maintenance workers you described?

A. Nothing specific except for the

general feeling that we have a problem, we have to be extra careful. If a maintenance man goes into the trichlorophenol unit, the foreman of the unit has to check the job and verify that everything is in order so he can do the work with a minimum of exposure. In other words, it's just like driving cautiously on an icy day.

(Whereupon a discussion took place off the record and a recess was taken.)

MR. SHEFT: Back on the record for a second. Before we get going with the questioning, I would like to have Mr. Burton's personal notes marked as Burton number one.

(Whereupon the document was received and marked Burton 1 for identification.)

MR. SHEFT: Is there another letter there?

THE WITNESS: This is just correspondence with the Cahill firm setting the date for coming in.

Are we on? One small point I might correct. You asked about this drainage sewer in the 2,4-D building and I talked about its connection to the river. At a later point, we put

in a sewer line from the 2,4-D building out to the sewer line on Lister Avenue. At that point, we connected this drainage line into it. That was in 1956, to be specific.

BY MS. COOKE:

Q. Thank you, Mr. Burton. I will be coming back to that point.

At the moment, I would like to ask you you were referring to some notes this morning and we have just had them marked as an exhibit. I want to ask when you had compiled those notes, if you recall?

A. I have no idea. I don't know why I did it or when I did it, but it's sort of a tabulation from 1949 to 1960 of different things relating to the plant operation there. I think maybe I did it myself sometime when I was at Diamond to keep myself oriented as to when we did what.

Q. And these notes, then, I take it, you wrote yourself?

A. Yes. And they have to do with different things, like when we started a given

operation; it also has to do with when new employees came and employees left.

Q. This morning, you have told us that by referring to your notes, that there were a few changes made in the TCP process that you recall, TCP and 2,4,5-T process. One you identified as the addition of a second autoclave.

A. There weren't changes in the process. The only change in the process was this going to the steam stripping process. I'm sorry, let me correct that again, though. In connection with the study of what was causing the chloracne, we didn't change the basic process, but varied things such as temperature of reaction and so on. Those were continually studied, which had to do with the process itself.

Q. Let's separate out and talk about equipment first. Other than the addition of a second autoclave and the equipment involved in the steam stripping process, do you remember any additions to or changes in TCP equipment or 2,4,5-T equipment from 1951 up through 1960?

A. I don't remember any changes in the TCP equipment except for this switch to the steam

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stripping process. In the 2,4,5-T, we changed the equipment at one stage in order to be able to increase the production rate.

Q. Do you remember what equipment changed?

A. We added a -- the first 2,4,5-T batches we made in the 2,4-D equipment, the same equipment exactly. Later, we added -- I don't know when, but at some point, we put in equipment so we could process 2,4,5-T separate from 2,4-D and have the two operations going on at the same time. Then I have a note when we first made that switch, we used what we call Nuch, N-u-c-h, filters for the sodium salt of 2,4,5-D and I see I have a note that in 1955, we replaced that with a rotary filter.

Q. When you say that you initially made the 2,4,5-T in the same equipment that you used for the 2,4-D, are you saying that you alternated batches?

A. Right.

Q. So that you could run a batch of 2,4,5-T and then maybe later the same day or next day, you would make 2,4-D in the same process

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equipment?

A. Right.

Q. Do you recall whether separate 2,4,5-T equipment was put into place prior to 1955?

A. I don't, but I have a note that in 1953, we put in the second autoclave in the TCP unit. That would have about tripled our production rate, so I would guess probably at the same time, we added equipment to the 2,4,5-T unit.

Q. Do you recall any cases of chloracne at all associated with this combination 2,4,5-T and 2,4-D equipment? This would have been prior to --

A. I believe that one centrifuge operator had chloracne.

Q. Referring to --

A. I think that this man was operating the 2,4-D centrifuge. I think that also handled -- I have to think back a minute on this equipment. When we put in the separate unit for 2,4,5-T acid, I don't remember having -- I'm pretty sure we didn't put in a centrifuge for it. The last step in the acid manufacture is centrifuging and I'm quite sure we only had one

centrifuge and I can't remember, thinking back, how we handled that last stage in the 2,4,5-T, which we might have done by filters or we might have used this one centrifuge to handle both products. But anyway, the one case that I remember of chloracne in that building was the man who operated -- one of the men who operated the centrifuge.

Q. And do you recall whether that was before or after installation of the other separate 2,4,5-T equipment?

A. It would have been later.

Q. You mentioned two different types of filters. You stated in 1955, you switched to a rotary filter. Can you describe each filter to us and what its function was?

A. A Nuch filter is sort of like the filter in a coffee pot. The liquid drains down through it and it has a fine screen and then a cloth on top of the screen to separate the solids from the liquids and it can be in various shapes. I have seen them as big as this whole table or I have seen them about this big around. That's a Nuch filter, very simple, old-fashioned version.

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Q. Is the Nuch filter the open filter you described to us earlier this morning?

A. Right.

Q. Do you recall the approximate size of the Nuch filter used in the Diamond operation?

A. As I said, the trichlorophenol filter, as I recollect, was something like four feet by six feet. In the 2,4,5-T, when we were filtering that, it seems to me we had several kind of odd collections of different sizes.

Q. So there was more than one Nuch filter in the 2,4,5-T?

A. In the 2,4,5-T, yes.

Q. Do you recall the approximate number?

A. I would guess about three.

Q. Were these three filters in the 2,4,5-T area at different process stages or were they all at one stage?

A. All the same, doing the same job. Using these filters was a temporary affair and I think we just got ahold of whatever we -- (no further response).

Q. And could you explain to us how the rotary filter operated and how many of those you

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had?

A. A rotary filter set horizontally like so.

Q. You will have to describe it verbally as much as possible so the reporter can --

A. They come in various sizes. Those we had were apt to be maybe six feet in diameter and maybe ten feet long. So it's a rotating horizontal cylinder. The interior of the cylinder is hollow and is connected to a vacuum and also has drain lines that lead liquid to tanks. The outside of the filter is covered with a screen and on top of the screen, there is a cloth called a filter cloth. The material to be fed, which is a mixture of solid and a liquid, is fed lengthways across the top of the filter -- no, I'm sorry, I take that back, that's wrong.

MR. CALOGERO: Could I just indicate for the record that as the witness is testifying about this rotary filter, he is holding in his left hand a pencil container and he is describing the filter using an ordinary pencil container.

MR. SHEFT: Which is cylindrical in shape and approximately four inches long.

A. I was wrong when I said the feed material was fed on top. You corrected that? This cylinder is set in the stationary, what we call a pan, which extends perhaps 20 percent or let's say about 20 percent, perhaps, of the rotating cylinder is immersed in this liquid in the pan. The liquid in the pan is this mixture of solids and liquids that we want to filter.

As the cylinder rotates, the vacuum inside of the filter sucks some of this liquid in the pan through the filter cloth so that as the cylinder goes around, it has a continuous layer of solids which can range from normally from a quarter of an inch to one inch in thickness.

Across, lengthways across the top of the filter are a series of drip pipes or sprays through which wash water is fed to wash the remaining impurities or to wash out the remaining liquid that is still held in this filter cake. When the -- before the surface of the filter reenters the liquid, by various devices, the solids on the filter medium are removed and discharged into another tank so that when the filter medium reenters the liquid stream, it is

clean and ready to receive more of the solids.

Q. What became of the wash water that was used in the filtering process?

A. At various times, it probably was changed. Savings can be made by recycling it, which I think we did sometimes and perhaps sometimes we simply discarded it.

Q. And how would the wash water have been discarded?

A. Just by gravity drainage to either the -- to this sewer line or into some pipeline that connected to the sewer line.

Q. I believe you stated that this rotary filter was installed in 1955. Is that correct?

A. The one for 2,4,5-T acid.

Q. Was any of Diamond's process equipment connected to the sewer system in 1955?

A. The sewer system was put in in 1956. At that time, we connected everything in the 2,4-D building into this new sewer system. The system actually normally drained out through the industrial sewer on Lister Avenue, although we also had a connection so we could drain it into the river.

Q. So that when this 2,4,5-T rotary filter was installed in 1955 --

A. At that point, it obviously would have been draining to the river.

Q. Was there just one rotary filter?

A. We had a rotary filter for the 2,4-D acid and later, we added a second one for the 2,4,5-T acid.

Q. So within the 2,4,5-T acid area, there would only be one rotary filter?

A. Right.

Q. And was there ever any type of rotary filter in the trichlorophenol process?

A. No.

Q. Did you continue to use a Nuch filter in the trichlorophenol process up through 1960?

A. No, that was stopped -- that was stopped when we went to the steam stripping process.

Q. Do you recall any additional equipment additions or changes in the trichlorophenol or 2,4,5-T lines between 1950 and 1960?

A. No, I don't recall any.

Q. Did the reactor in the 2,4,5-T area

remain the same, the reactor used in that area remain the same from 1950 through 1960?

A. The 2,4,5-T reactor, is that the one you mentioned?

Q. Yes.

A. We installed it at some later date, I said probably in 1953. That's the one you asked me when and I said I didn't know, but since we had added the second autoclave in 1953, that's probably when we installed the separate 2,4,5-T acid reactor.

Q. Okay. I understand. Then did you continue to use the same 2,4,5-T reactor from 1953 forward?

A. Right.

Q. And is that the reactor you described earlier this morning with the manhole?

A. The two are designed the same. The one I was talking about this morning was a 2,4-D reactor but the 2,4,5-T reactor was designed exactly the same.

Q. So it had the same manhole and the operator would have reached into the manhole at various points in the process?

A. Right.

Q. You stated when we came back from the break that Diamond also made some changes, I believe it was in temperature and pressure of reactions or experimented with changes, in any event. Do you recall when Diamond experimented with temperature and pressure changes?

A. From the time when we had the outbreak of chloracne, we, that is, both myself, the people at the plant and to some degree, at Diamond headquarters, were looking for the source of the trouble, what was causing the chloracne.

Q. Was this the 1955 outbreak you are referring to?

A. All the times from that time until I left the plant.

Q. Do you recall specifically what you at the plant or Diamond in Cleveland was doing to locate the source of the chloracne?

A. I remember my first reaction was to send a chemist over to the library to go through the literature to see what could be found in the literature in the way of chemicals that cause chloracne.

Q. Do you recall the results of that research?

A. He didn't find anything that seemed to -- he found descriptions of chloracne having occurred back at least starting in World War I related to chlorinated naphthalenes. He didn't find anything that seemed to be related to trichlorophenol production.

Q. Do you recall other specific efforts to locate the source of chloracne? I should use the word to detect the source in terms of what was causing chloracne.

A. I remember that it seemed specific, pretty clear that it had started after we changed the steam stripping process and that we considered going back to the dilution process.

Q. Did you ever reach any conclusion as to why there was a problem related to the steam stripping process?

A. Only because it clearly occurred at that one time when they made this major process change. I don't think we had any other evidence to back that up. And I'm not certain to what degree we were sure of that, although I went so

far once as to prepare an appropriation request for the equipment to go back to the dilution process and to estimate how much that would increase our manufacturing cost.

Q. You may have already explained this this morning, sorry for repeating myself, but can you tell us again whether there was any particular exposure to material in any form, liquid or vapor or solid, at the steam stripping step?

A. Theoretically, there shouldn't be any except for taking samples to be tested.

Q. When you say theoretically, do you recall any --

A. Theoretically, that meaning if the pipes never leaked and nobody ever made any mistakes.

Q. Do you recall any actual occasions when there were exposures due to either human error or pipes leaking?

A. No, not specifically, but this thing occurs from time to time and it's such common occurrence that you don't normally remember it. I think, yes, we did have to -- the steam stripping tank, I believe we had to a couple of times go in

and manually clean it out, which meant we would have washed it out to the best of our ability first before anyone went in and at one stage, we were storing the trichlorophenol product, which was sodium trichlor, in sodium salt form, and those tanks would accumulate some salt and again, I believe on a couple of occasions, we had to go in and have someone clean out the salt that had accumulated.

Q. Do you remember why it was you had to clean the steam stripping tank on the few occasions you mentioned?

A. I'm not even certain of that. There might have been, obviously, some residues accumulated but I'm not even certain that we did. It would probably be, again, this matter of salt accumulation.

Q. How did you accomplish the cleaning of the steam stripping tank?

A. Just going in and, as I remember, these tanks had a manhole located on the bottom section of the vertical sides and I don't remember specifically doing it, but obviously, what we would do would be flush it with water until we

thought we flushed out everything we could and then go in and shovel out the salt.

Q. And where would the water run out when you were flushing the tank?

A. In that building, it would go to the river.

Q. Would it run out of the tank into the channels you described earlier?

A. No, the channels I described was in the 2,4-D building. The trichlorophenol unit was in the main building.

Q. So how would this water reach the river, the water used to clean the tank?

A. There were some sewer lines in that building that we put in and I don't remember the exact layout of them, but it would go through those, through one of those.

Q. Did you clean the trichlorophenol storage tanks in the same manner as the steam stripping tank?

A. Yes. But as I say, I'm less certain that we cleaned the steam stripping tank. Something rings a bell that we once had to go in it but I remember we had to clean the sodium

Burton - direct

trichlorophenate storage tanks.

Q. Was there any occasion when you had to clean the trichlorophenol autoclave?

A. Probably because as a routine precaution, I'm quite sure we inspected it once a year.

Q. Do you recall how that cleaning would have been accomplished?

A. Flushing it with water. The materials, as far as we knew, were all water soluble.

Q. Would that water have also discharged to the river?

A. Right.

Q. Do you recall any occasions on which you cleaned the 2,4,5-T reactor vessel?

A. No. That would normally never be cleaned unless we had to do some repairs on it and I don't remember having to do any repairs on it.

Q. Do you recall whether you ever had to make any repairs on the autoclave between 1951 and February of 1960?

A. I'm quite certain we never made any repairs on either autoclave.

Q. You stated a few minutes ago that theoretically, there should not be exposure at the steam stripping step apart from sampling. What sampling was performed at the steam stripping step?

A. I don't remember specifically, but normally a sample would be taken when it was assumed the batch was completed to see if the steam stripping was completed. As I say, this is just thinking of what we would normally do. I don't have any specific recollection of it.

Q. Do you recall how the sampling was accomplished?

A. No, but normally just visualizing how the tank was set up, we would have a pipe connection on the tank to close off the valves so the operator could open the valve and drain out a sample, but I have no specific recollection.

Also there might have been some exposure when the operator, in connection with the anisole recovery, because there we had two layers of water, a water layer and anisole layer, and sometimes with that kind of mixture the operator has to make some physical checks to see where the

level is. Again, I don't remember specifically but it's a likely source of having some exposure. And the autoclave batches themselves at some point were sampled before steam stripping.

Q. Do you recall how that sampling was accomplished?

A. No.

Q. Would it have involved reaching in through the manhole on the autoclave?

A. No. It would be, again, opening a valve either in the pipeline or in the tank, draining out a sample.

During this period, at one stage we also were doing laboratory work on this, so there would have been exposure to laboratory men working on this trying to find the solution to the problem. I don't believe any of those had chloracne trouble, though. But again, that work we would normally do in a hood with good ventilation.

Q. What specifically were these laboratory workers working on?

A. First we had some work we were doing which was not directly related to the chloracne

problem. For example, we wanted to sell trichlorophenol as a material for use in pharmaceuticals. Specifically, we wanted to sell it to Givaudan, G-i-v-a-u-d-a-n Company, and this involved trying to purify our product enough to meet their specifications.

Q. Did you ever, in fact, sell trichlorophenol for use in pharmaceuticals?

A. We didn't sell it to Givaudan Company, no. We never found practical the work to be needed to make a product to meet their specs.

Q. Did you ever sell it to any other company for pharmaceutical purposes?

A. No.

Q. What other specific laboratory work was done at Newark?

A. At a later stage, I believe during the first years of this --

Q. When you say, "this" --

A. I'm sorry, I have to go back and think a minute.

When we first had the outbreak of chloracne, we had no way of evaluating the product as to whether it was chloracne causing or not. At

some stage, and I don't remember when, people from Diamond headquarters were in contact with firms in Germany who had been making trichlorophenol and where there had been an outbreak of chloracne and where they had done research to find the trouble.

Q. And do you remember whether these German companies, in fact, found the source of the chloracne problem?

A. Yes, they did, or at least one of them did. There were, I believe, two, but at least one of them did.

Q. Do you recall what that source was?

A. Yes, it was what is commonly known as Dioxin, 2,3,7,8 chlorobenzopara-Dioxin.

Q. Do you remember when you first heard that at least one German company had found Dioxin as a source of chloracne?

A. I, myself, learned it after I had left Diamond's employee.

Q. Do you recall how long after you left Diamond?

A. Yes, it was in August 1960.

Q. You are saying it was --

A. August 9, 1960, if you want to be

precise. I can't tell you what hour of the day, though.

Q. And that is the time when you first learned of Dioxin?

A. Right. I will say, though, we had suspicions of a compound of that type but not precisely that one.

Q. Why is it you have such a specific recollection of learning about Dioxin on August 9, 1960?

A. Because this morning, I looked at the old yellow sheet where I made notes when I learned about it.

Q. That's a good reason. Do you recall from whom you first heard about Dioxin on August 9th?

A. The name of the man was on the sheet but I have forgotten because there were two people I spoke to at Monsanto and I have forgotten which one I was talking to at that time.

Q. Are you saying you learned this from someone at Monsanto, as opposed to someone at Diamond?

A. Right.

Burton - direct

Q. Do you recall when Diamond first suspected or when, to your knowledge, Diamond first suspected that some similar compound was a cause of chloracne?

A. I only know secondhand. I'm quite sure it was 1965, talking to one of the men at Diamond, they said that -- they mentioned Dioxin, which I don't know they gave me the full chemical name. To me it was clear that this was a compound that I had been informed of by Monsanto and that Diamond was putting in a carbon filter to remove this from the product.

Q. I believe, maybe I misunderstood, but a few moments ago, when you stated you learned on August 9, 1960, that a German company had identified Dioxin, did you also say that Diamond had suspected some similar compound prior to 1960?

A. In these studies that we were doing between 1955 and 1960 at the Newark plant, at Diamond headquarters, some conversations that I had with other producers, some conversations Diamond had with German companies, this was a whole collection of efforts in different ways to pin down this problem. The research department at

Cleveland felt by the nature of the reaction, a compound, compounds of that general family but not this specific 2,3,7,8 product were likely to be formed and likely to be the cause of the trouble.

Q. Do you recall when in the 1955 to 1960 time frame that the research department came to that conclusion?

A. It wasn't a firm conclusion at any time. Let's say the trend of thinking was in that direction.

Q. Do you recall when that trend of thinking originated?

A. No.

Q. Can you describe in more detail any of the work that was being done between 1955 and 1960 by Diamond?

A. We did some work -- at some point, and I don't remember when this was, we sent samples out from the plant at a different stage of the process for having rabbit ear tests done. Are you familiar with the rabbit ear tests from someone else? I can repeat it, but I didn't want to repeat it if it wasn't necessary.

Q. Where was this rabbit ear testing

performed?

A. At the institutional laboratories equipped for that type of work. Apparently, they sent samples to one firm and then later, sent samples to a firm which was a subsidiary of Mellon Institute.

Q. Did Diamond employees physically take the samples that were sent on to these other firms?

A. Yes. I bring that up because at the point where we had some way of evaluating the chloracnegen properties, what we were dealing with, it became then a reason for having laboratory work done to try to find the conditions that were causing chloracnegens, which could be in the reaction itself in terms of the ingredients charged or the operating temperature or it could be in regard to some step in the process. In other words, there were a number of variables, of which all should be explored to find out which helps or hinders the production of chloracnegens.

Q. Do you remember who at Diamond was responsible for taking samples to send to these other firms?

A. It would be no specific individual. The operator might take the sample, someone in the laboratory might package it. There would be no one individual at any time or in general.

Q. What did Diamond do in terms of experimenting with the variables in the reaction process and other aspects of the TCP or 2,4,5-T process?

A. One of the variables was the temperature in the autoclave and we sent out samples at various times from autoclave batches run at different temperatures and then we were looking to see what stage in the process the chloracnegens might be formed or added. So for example, we might take a sample of a batch before it was steam stripped and after it was steam stripped.

In other words, the different stages of the process, we would take samples to see if this chloracnegen was present in more greater degree in each step or if it was removed in any step.

Q. Do you recall how long this rabbit ear testing continued once it began?

A. We were still doing it in December 1959.

Q. Did you reach any conclusion as to regarding at what stage in the reaction process the chloracnegens were created?

A. No. I might add, just to clarify this, that also Diamond picked up some information from a German company, Boehringer, with which Diamond had some commercial dealings at least at one time, and this information wasn't always consistent, but temperatures of 150, 160 to 170 at various times were apparently of mention and so the work we did at the plant was considerably -- a considerable amount of it was set on this matter of determining the safe operating temperature, or if that was a variable.

I believe a combination of what we learned indirectly from the German companies and what we learned -- I don't recollect with what degree of certainty, but thinking along the lines that 160 was a safe operating temperature but I don't recollect what degree we were certain about that.

Q. Do you recall whether Diamond made any

Burton - direct

or set any policy or made any process changes to assure that the temperature range of the reaction would be in this 160 degree range?

A. No. I believe in 1959, we were still running batches at the 160 to 170 range and taking samples to try to pin this down for sure.

Q. Do you recall whether you ever did reach a conclusion regarding the effect of temperature on chloracnegens?

A. You mean myself or Diamond?

Q. Whether Diamond ever reached a firm conclusion.

A. My recollection is that the first operating instructions for the new unit after the plant was to be rebuilt called for a 160 degree operating temperature. But again, I don't know whether that would be called a firm conclusion or not.

Q. Did you, yourself, ever reach any particular conclusion about the effect of temperature on chloracne?

A. Yes. We weren't 100 percent sure but became quite certain that 160 was the maximum safe temperature.

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Q. Did you undertake any efforts to recommend that reactions be maintained at 160 degrees or below?

A. In what connection?

Q. For instance, as plant manager, did you institute any procedures or make any recommendations --

A. You are talking at Diamond?

Q. Yes.

A. No. We were still trying to verify that point.

Q. But you did --

A. But as I recollect, in the new operating instructions for the new unit, that they were initially set up to be a 160 operating temperature.

Q. But I think you also stated that it was your personal conclusion that 160 degrees was the maximum safe operating temperature?

A. Yes, but this was after I left Diamond and had other contacts with the industry.

Q. Do you recall what other variables, either in the initial TCP reaction process or further down the line, were tested or experimented

with in an effort to control chloracnegens?

A. One point was to control the temperature in the methanol distillation and I believe the information I got on this was directly or -- it would have to be indirectly from the Germans that 110 degrees should be the maximum temperature during the methanol distillation and there was something else about the methanol distillation where when I was designing the process, I added water as the methanol was removed and I'm not quite sure at this point what the purpose of that was, but I remember I was specific about it, after a certain amount of the methanol had been removed, then water should be added in an equivalent amount to the further removal of methanol apparently to avoid the sodium trichlorophenate concentration from getting too great.

Also in the steam stripping operation, I had recommended the maximum temperature of 120 or preferably a temperature of 110, maximum. This is centigrade temperatures.

Q. You personally made these recommendations?

Burton - direct

A. Yes.

Q. Do you recall the approximate time or date when you made the recommendations with regard to the steam stripping temperature?

A. August 8, 1967. The reason why I say it, because some of these points I want to refresh my memory on, so it's better to refer to a specific piece of correspondence.

Q. Are you currently referring to a piece of correspondence you authored?

A. Yes.

Q. And was that correspondence you wrote in 1967 making these specific recommendations?

A. Yes. This is a letter from myself dated August 8, 1967.

Q. And to whom was that correspondence addressed?

A. This was to John Drew at Hoffman Laboratories.

Q. Did you --

MR. SHEFT: Excuse me. Can we have that marked as Burton number two, please.

(Whereupon the document was received and marked Burton 2 for identification.)

Burton - direct

MR. SHEFT: Could we take a break for a second and take a look at that.

THE WITNESS: There were things for different recommendations, but when I looked through my files, this seemed most specific.

MR. SHEFT: Excuse me. Mr. Burton, do you have any other personal files of documents concerning TCP?

THE WITNESS: I have a scattered collection here and there and all the files I did in consulting work are sort of jumbled and mixed up from one project to another. But I do have some -- you might say some others somewhere.

MR. SHEFT: Did you bring any other documents with you today to refresh your recollection?

THE WITNESS: No, I just brought this because some of these things, my mind got a little fuzzy and this was specific on some points, so I thought it was better to refer to something that was specific.

MR. SHEFT: Thank you.

THE WITNESS: What I wanted to use this for is refresh my memory on these particular

Burton - direct

points I thought was critical in the operation.

MR. SHEFT: Do you think we can get copies of these documents that we can look at while Mr. Burton is refreshing his recollection?

MR. COX: I'm sorry, I don't understand.

MR. SHEFT: I would just like to get a copy of the document, Mr. Cox. Do you think you could prevail upon Pitney, Hardin for a Xerox of it?

MR. COX: I guess I probably can.

MR. SHEFT: Okay.

MS. COOKE: Do you want to do it now?

MR. SHEFT: Sure, do it now.

MR. FAVETTA: If I may, while you are doing that, perhaps we can copy Burton number one because there may be some questions regarding that.

MS. COOKE: Do you want to take lunch?

MR. SHEFT: Mr. Burton, are you feeling up to going forward or would you like to take a break for lunch? It's your choice.

THE WITNESS: I'm in good shape.

Burton - direct

MR. SHEFT: Let's take a break, then, and get a Xerox of this.

MR. COX: Why can't we go ahead and use this?

MR. SHEFT: Because we would like a copy to look at.

MS. COOKE: I can question him on this and get them copied over lunch.

MR. SHEFT: Would it be a problem to get copies?

MR. COX: I don't know.

MR. SHEFT: Why don't we find out.

MR. FAVETTA: Maybe we should break for lunch. You can do them over the lunch hour and start in right after lunch, unless you want to continue.

MS. COOKE: That's okay.

MR. SHEFT: I think it's really up to the discretion of the witness. Do you have any time limitations on your availability to testify later today, Mr. Burton?

THE WITNESS: No.

MR. COX: We all have some time limitations. I don't think the witness has to be

Burton - direct

asked if he has any time limitations. Of course he does. I mean he is --

MR. SHEFT: I think he answered the question.

(Whereupon a discussion took place off the record and the luncheon recess was taken.)

BY MS. COOKE:

Q. Mr. Burton, let's clear up a few things as we start out this afternoon. You left Diamond's employed in 1960. Is that correct?

A. 1960.

Q. And are you represented by counsel here today?

A. No.

Q. This morning, you referred to some notes which we have marked as Exhibit 1 in this deposition, handwritten notes you prepared, and you stated that you did not recall precisely when you had written those notes.

A. Which is one?

MR. COX: That's the handwritten notes.

Q. Do you have any recollection of

whether it was within the past ten years that you prepared these notes?

A. I don't think so.

Q. And were all pages of the handwritten notes written at one time?

A. All I know is what I see. I have no recollection of this at all.

Q. Do you have any recollection of your purpose for writing these notes?

A. No. Well, just knowing myself, though, I think for some reason, I don't know why, to refresh my memory of various things that went on at different times, but I don't know what the occasion was that would make me want to do it.

Q. Were these notes something you just kept in a personal file at home?

A. Yes.

Q. I believe you also stated prior to the lunch break that you have additional documents in a file at home, on apparently a number of topics, from your work as a consultant. Do any documents other than those which you have shown us today refer to trichlorophenol, 2,4,5-T or chloracne problems?

Burton - direct

A. Yes.

Q. Would you be willing to provide one of us with copies of those documents from your files?

A. Yes.

Q. We can arrange that after the deposition.

A. May I ask a clarifying question on that?

Q. Certainly.

A. I have a whole lot of calculations involved in the design of various plants which have no relation to chloracne but simply material balances and this kind of thing, which is a burden that I don't think is relevant to anything in connection with this case.

Q. Let me ask you can you describe the approximate volume of materials that you have got in these files?

A. Maybe 100 or 200 sheets.

Q. If there are documents relating at all to trichlorophenol or 2,4,5-T manufacture, I believe we would still want copies.

MR. COX: Regardless of when they were prepared?

MR. SHEFT: Precisely.

MS. COOKE: Right.

MR. FAVETTA: Can we go off the record a second?

MR. COX: No, let's not go off the record. Let's stay on the record. We have been on the record for awhile.

MR. FAVETTA: All right.

THE WITNESS: I believe it's a problem for me to look through my files and get these out but I have no objection to doing it for the time involved.

MR. SHEFT: Thank you.

MS. COOKE: Thank you.

MR. SHEFT: Along those lines, Mr. Burton, I assume --

MR. COX: Could I object to two people asking questions at the same time.

MR. SHEFT: I'm not asking a question.

MR. COX: You certainly are asking a question. You are asking a question. I want one lawyer at a time to ask questions, not to have people firing --

Burton - direct

MR. SHEFT: Are you in control of the deposition, Mr. Cox?

MR. COX: I'm not in control of the deposition but I think it utterly improper for two people to ask questions of the witness at the same time.

MR. SHEFT: Are you representing the witness?

MR. COX: I'm representing a party to this case and I have --

MR. SHEFT: You have no standing to make an objection if you are not representing the witness.

MR. COX: You mean the conduct of this deposition is utterly beyond any kind of control here, anybody can start firing questions? I don't think so, sir.

MR. SHEFT: I didn't suggest that.

MR. COX: I object to it. I think one person at a time should ask questions.

MR. SHEFT: Your objection is noted.

Mr. Burton, I would assume you have no objection to our continuing your deposition subject to a review of these documents that you

are going to produce from your files?

THE WITNESS: No, but I would like to get clear on just precisely what is needed. You said documents related to the chloracnegen problem, for one thing?

MS. COOKE: Right, for one thing. Also any other documents you would have relating to trichlorophenol production or 2,4,5-T production.

THE WITNESS: Does this include calculations on the design of plants who manufacture trichlorophenol?

MS. COOKE: It would be, yes, because the manufacturing process is relevant to this case.

THE WITNESS: I have one question, and I wouldn't know, really, until I ran across them, but for example, one project I was involved with was the design of a plant to make Agent Orange for the government and this was done -- the firm that had the contract was Thompson-Stearns Rogers, which Thompson Chemical was part of it. Thompson Chemical manufactured trichlorophenol and to some degree, they had their own process data.

Burton - direct

From an ethical matter as a consulting engineer, I don't reveal other people's clients' processes. So I have some hesitation about that part of it.

MS. COOKE: We would not ask you to give away anything that you felt you had an ethical obligation to keep confidential.

THE WITNESS: Okay.

MR. FAVETTA: We would only ask, however, you make a note of those items that you would be removing from the file, from what you would be giving to us, so that we would know what was held back and what the basis of the confidentiality or trade secrets position would be without revealing any contents, of course.

THE WITNESS: Okay.

BY MS. COOKE:

Q. Mr. Burton, immediately prior to lunch, you were discussing what has been marked as Burton Exhibit 2, an August 8, 1967, letter, which you indicated you had written to Mr. John Drew of Hoffman Laboratories recommending a number of things, including maximum temperatures in a

reaction process and also in a distillation process, I believe, on page three, the top of page three.

You had stated before lunch that these were your personal recommendations for maximum temperature ranges in a distillation process. Do you recall when you reached the conclusion yourself that certain maximum safe temperatures should be maintained in the distillation process referred to on page three?

A. I'm sorry, you were referring to this paragraph on the top of page three?

Q. Right.

A. No, I don't recollect specifically, although I'm quite positive this is information that was relayed to me from German plants, presumably either Boehringer or Badische.

Q. Do you recall whether you received any of the information on the maximum safe temperatures for the distillation process while you were still in Diamond's employ?

A. It's possible because we had at least one experience on checking this temperature in the steam stripper, although we were actually checking

every step of the operation. So maybe we did that because we had some clue on it or maybe we just did it as a matter of normal checking everything step by step.

Q. But do you have any specific recollection whether Diamond received recommendations on distillation temperatures while you were still at the Newark plant?

A. No, except as I say, I remember making one experiment along that line, but I don't recollect we ever came to any conclusions on it.

Q. On page four of this letter, which has been marked as Burton Exhibit 2, the full paragraph, last paragraph of the letter, you stated that you had heard that Diamond had found tetrachlorodioxin in at least some of its product. Do you recall when you first heard that Diamond had found Dioxin in its product?

A. I'm not certain of the year except that at that time, I was doing a project at Montrose Chemical, which is a plant adjacent to Diamond or nearly adjacent to it, and I don't remember the specific circumstances, but there were several people that I talked to at Diamond

from time to time just as casual friends or whatever and some of them mentioned this to me. At this time, I don't remember. I may have remembered when I wrote this letter but I don't remember now.

Q. Do you remember which Diamond people you were still talking to as of 1967, when you wrote this letter?

A. Frank Kennedy, Bill Tobin, Milton Rosenfeld. Those are the only ones I can remember at this time who were at that plant. I spoke to some other people that were not at that plant.

Q. What was Mr. Tobin's position, if you recall?

A. When I was there, he was foreman of the unit making DDT and trichlorophenol.

Q. And was he still a foreman after you left Diamond and were conversing with him as friends?

A. I believe he was a foreman in charge of, at this time, of the chlorination unit, which made monochloroacetic acid and dichlorophenol. I'm not certain whether that included trichlorophenol or not. I have no knowledge of

that.

Q. The last sentence of your 1967 letter states from various rumors you heard about the sloppy Diamond operation, you were not surprised that they have it at present. The "it" I believe refers to the Dioxin you discussed earlier in that paragraph. Is that correct?

A. Right.

Q. What were the rumors you had heard about the sloppy Diamond operation? What did you mean in that sentence?

A. I have to explain that for nearly a year after I had left Diamond, I was working at a plant of Kolker, I think it was called Doremus Chemical Works. It was a plant owned by Kolker on Doremus Avenue in Newark. At that plant, there were several workers who had relatives or friends at the Diamond plant. So there was a lot of interchange of talk and gossip and so forth and I don't remember specifically who or the specific circumstances, but from conversation related to me via that route, I got a lot of complaints about how bad things were up at Diamond, which to some degree I took as a grain of salt, disgruntled

employees, but there does seem to be enough of it that I thought there was probably something, a basis for it.

Q. Do you have any recollection of what it was that you were being told was bad about Diamond?

A. I remember one mentioned an excessive amount of uncontrolled fumes but from where, I don't know.

Q. Do you remember any instances of uncontrolled fumes when you were employed at Diamond?

A. No, actually, I was just thinking a little further about this, this I believe was related to the anisole stripper because I had the impression in the back of my mind that the vapors from the anisole stripper either had a leak or were not being condensed properly, had some connection to that. Again, this is just the impression that I had at the time.

Q. I take it that that was at the time that you heard the complaint you are referring to?

A. Right.

Q. Do you recall any particular problems

with the anisole stripper while you were employed at Diamond's Newark plant?

A. No. This was a different unit. The unit did the same job, but the anisole stripper that Diamond used was a different unit and they are located in a different place.

Q. A different unit from what?

A. From the one we had when I was there.

Q. Which would have been prior to the 1960 explosion?

A. Right.

Q. Do you recall any other particular complaints you heard about Diamond after you had left the plant?

A. That there was a lot of chloracne among the workers, but -- (no further response).

Q. Do you have any knowledge of whether this chloracne was more severe after you left the plant than it had been while you were there?

A. Nothing specific at the time, although later, I was given the reports of the study made by New Jersey -- some New Jersey health department which I think showed something like 28 cases of chloracne of varying degrees among employees,

which would be a considerably bigger percentage than we had in the fifties.

Q. Do you recall the approximate date of that report?

A. I'm quite sure it was 1969.

Q. Do you remember hearing any other information about what you refer to as the sloppy Diamond operation, what would cause you to include that sentence in your 1967 letter?

A. No.

Q. To what, if anything, would you attribute an increase or at least in your impression, you said it was an increase in chloracne cases, after the time you had left Diamond?

A. You mean personal knowledge now?

Q. First of all, knowledge at the time. Did you have any knowledge at the time?

MR. COX: What time?

Q. At the time that you first learned of this 1969 report. Did you have any knowledge of what would have caused an increase in chloracne problems following the time you left Diamond?

A. No, but just to repeat, I told you all

I could remember in relation to what I knew at the time that this letter was written, which are these stories relayed to me. And then later, this would be in the 1973 to '76 period, as near as I remember, I was working at the same plant site for another company.

Q. By "same plant site," do you mean Diamond's Newark site?

A. Right.

Q. And what were you doing at the Newark plant site in the 1973 to 1976 time period?

A. Diamond had sold that plant to William Mitchell, who operated at different times under three different names that I can remember. One was Chloray, C-h-l-o-r-a-y; one was Chemland and another was Chemical Land. Mitchell had bought the plant with the idea of making another chemical unrelated to pesticides, I believe it was benzyl alcohol, but I'm not positive. But that venture failed and then he entered into a contract to make 2,4-D at that plant and I worked for him on and off as a consulting engineer in rebuilding what was necessary to make 2,4-D and then trying to get into operation.

Q. With whom was this contract to manufacture 2,4-D in the 1970's?

A. I'm not 100 percent -- I'm not clear on that, although I think the main contract was with Diamond.

Q. Did Mr. Mitchell, in fact, ever produce 2,4-D at the Newark location?

A. Yes.

Q. Do you recall during what time period he manufactured 2,4-D there?

A. No, but it would be in the latter stages, so probably in '75 or '76.

Q. And did he, in fact, sell or supply that 2,4-D to Diamond?

A. I don't know. There were a lot of companies that got involved in that project. One was Occidental Petroleum, one was Thompson Hayward and material was shipped out but I'm not sure to which company.

Q. Did Mitchell ever make any effort to manufacture trichlorophenol or 2,4,5-T at Newark?

A. No.

Q. What, if any, of what had previously been Diamond's production equipment did Mr.

Mitchell use in his processes?

A. The equipment for the manufacture of monochloroacetic acid, for the manufacture of dichlorophenol and for the manufacture of 2,4,5-T -- I'm sorry, 2,4-D acid. At times, we transferred a few items of equipment from other sections of the plant. I can remember one or two vessels we transferred from the trichlorophenol unit and I believe we used one or two or more vessels that had been involved in the 2,4,5-T acid production.

Q. Do you recall whether any of that equipment was tested, either prior to its first use by Mr. Mitchell or during his use, for Dioxin contamination?

A. No. On that equipment, I went in myself and inspected him to be sure they were visibly clean and apparently safe for transfer but there were no specific tests for Dioxin at any time.

Q. Was any of the 2,4-D material he produced ever tested for Dioxin contamination?

A. Not to my knowledge.

Q. Did he produce anything other than

Burton - direct

2,4-D at the Newark location?

A. I'm not sure this benzyl alcohol, or whatever it was, project I mentioned before my time, whether he actually produced any or not. But as far as the period when I was connected with it, the only product was 2,4-D acid or probably, and I don't remember this, but in the chlorination step, you form hydrochloric acid as a by-product, which is normally recovered and sold. So I presume -- I remember recovering it and the storage tank for it, so I presume it was also sold.

Q. And when you first mentioned your employment with Mr. Mitchell or with his company, I have been asking you about whether you had come to any conclusions about this chloracne incidence at Diamond reported in the 1969 report.

A. The reason I brought that up is because in connection with seeing the equipment and talking to some of the people that we had at Chemical Land who had also worked for Diamond and in connection with seeing some of Diamond's operating records, I had some other evidence or indication of what went on during the period of

making Agent Orange.

Q. Can you describe that evidence to the best of your recollection?

A. One was -- I think it was a monthly summary of batches made in the trichlorophenol unit, which listed some data. What interested me at the time, I remember, was that it listed the temperatures in the autoclave and the amount of Dioxin in the product. It listed some other factors, such as operating time, but since I was particularly interested in -- at this time, I had no interest in making 2,4,5 -- trichlorophenol but I still had my curiosity as to whether this assumption had been right about the effect of temperature on Dioxin. So I remember trying to correlate the operating temperatures versus the Dioxin content.

Q. And were you able to make any correlation between the two?

A. No. They didn't correlate. But from a scientific point of view, it wasn't a big enough sample. But within that sample.

Q. Do you recall any other information or evidence of what went on at Diamond following your

departure in 1960 that you may have gathered at this later period in the seventies?

A. This autoclave temperatures range from 160 to 172, which, of course, in my own opinion, was too high, but I didn't know what further data Diamond might have had that substantiated that as a safe temperature.

There was something about the anisole -- it's too vague to remember. It seems to me there seemed to be something about the mechanics of the anisole stripper that didn't look right but at this point, I can't remember what it was. But that was another unit we converted to a different purpose is how I came to be inspecting it.

Q. Is it your testimony, then, that the anisole stripper was used for some part of Mr. Mitchell's process?

A. Right. Oh, yes, I remember now what it was. It had to do with the control. This had high pressure steam tubes in it for heating and I thought in my own, at least in my own designs, I tried to avoid that to try to use low pressure steam to avoid overheating it.

Burton - direct

Q. What was the purpose of avoiding this overheating you described?

A. Again, in the anisole stripper, the total temperature was limited as far as the best of my knowledge and there was some question in my mind about the very complicated question about the possibility of forming Dioxin in the 2,4,5-T acid step, just based on the equipment I saw and how it was operated for 2,4-D, the two being parallel.

MR. SHEFT: Could you read that answer back, please.

(Whereupon the record was read.)

Q. If you can go back to the anisole stripper for just a moment, would the use of high pressure steam tubes have any effect on the formation of chloracnegens or employee exposure to chloracnegens?

A. Not -- employee exposure, I'm a little dubious on this but I do remember that at one step, and I'm not sure whether it's in here or not -- no, it's not mentioned in here, but I do mention limiting the pot temperature to 110 or 120 but --

MR. SHEFT: Let the record reflect Mr.

Burton - direct

Burton is referring to Burton Exhibit No. 2.

A. I recommended only 15 pounds pressure of steam being used.

Q. And how did that recommendation relate to either the formation of Dioxin or the chloracne situation, if it did?

A. Just that the material is temperature sensitive at varying degrees, varying stages of the process. Understand that this is sort of guesswork on my part and when I recommended a maximum of 15 p.s.i., this was just to be safe. Diamond may have been perfectly safe in what they were doing, but these were the questions I had, but they don't mean that Diamond was not operating properly.

Q. Was there any other information that you had at the time of your 1967 letter or even during the period of time when you were working at Diamond which would have led you to conclude the last sentence of your letter, referring to the sloppy Diamond operation?

MR. COX: I object to the form of the question. Can we break it into two? We have got two time periods, one running from presumably 1949

until 1967, at least. I'm not objecting to the question, but the form does trouble me.

Q. What I'm trying to determine is Mr. Burton, you have referred to the Diamond operation as sloppy in this 1967 letter and I'm just trying to determine if you have any other additional basis from your own knowledge of what you observed yourself or what you were told by present or former Diamond employees for referring to the Diamond operation as sloppy?

A. No. We went through that, I believe, once before. The only reason I said this was because of remarks made by Diamond employees or friends of or relatives of Diamond employees.

Q. You now told us that when you were with Mr. Mitchell's company, you saw some additional operating records of Diamond and attempted to make correlations between operating temperatures and Dioxin summaries; also reviewed the mechanics of the anisole stripper. Do you recall any other information or reports of Diamond's that you saw when you returned to the Newark plant site with Mr. Mitchell's company?

A. There were reports of the -- two

reports of the 1965 meeting in Midland, I think reports by Frank -- one report by Frank Kennedy and the other by Ed Chandler.

Q. Do you recall any other Diamond reports or records that you saw at the Newark site? Again, this is the 1970's.

A. None relating to this. Of course, the files were full of -- I was mainly interested in equipment and the files were full of equipment data, equipment troubles and so on, but nothing that sticks in my mind and nothing that relates to this.

Q. Do you remember any specific equipment problems at all that either you observed when you arrived at the site or that you read about in these files?

A. There was trouble with the pH controller in the acidification step and I don't remember whether this related to 2,4-D acid or 2,4,5-T acid, acidification, because the equipment was the same in both cases, and as I remember, some trouble on the reactor, the gear drives for the 2,4-D or 2,4,5-T reactor, again, their being duplicate units, but those were the units we were

having trouble with so I was particularly interested in checking the files on those.

Q. When you say those were units you were having trouble with, you mean you had been having trouble with them when you worked at Diamond or you were having trouble with them --

A. We were having trouble with them.

Q. When you worked with Mr. Mitchell?

A. Right. It may well have been other things but these I wouldn't have any reason to remember. I remember spending a lot of time going through equipment files trying to correlate their data on equipment in the Diamond files with the equipment we had in the plant but Diamond had one set of code numbers which we didn't have, so it was hard to establish which vessel in their day corresponded with which vessel that was still there.

Q. To your knowledge, was all of the equipment that Diamond had left behind when it sold the premises still present when you arrived in the mid-1970's?

MR. COX: Objection to the form of the question. He can answer it, if he can.

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A. No, it was not.

Q. Do you recall any specific items of equipment that were no longer on the premises?

A. The autoclaves for making trichlorophenol, pretty much the whole 2,4,5-T acid section of the plant. As I remember, there were only, of what might have been 12 or 15 vessels, there were only two or three left. That section of the plant seemed to have pretty much disappeared.

Q. Do you know whether it was Diamond that removed these pieces of equipment or Mr. Mitchell?

A. No, I don't. The only one I remember was a rotary filter, the 2,4-D rotary filter that disappeared, and I remember that because Mitchell was very incensed. He said Ray Guidi had sold it and pocketed the money.

Q. Do you have any knowledge of where any of the equipment that was no longer at the site, where it may have gone?

A. Yes. This rotary filter went to what was then Gelb and Sons because we bought it back when I was there.

Burton - direct

Q. Other than the rotary filter, do you have any knowledge of the disposition of any of the other equipment that had been removed?

A. I believe the -- I don't know for sure, although I understood that Ray Guidi had, through a company he was now associated with, had bought the autoclaves but this I don't know for sure. That was Mitchell's opinion.

Q. Do you know what company it was Mr. Guidi was associated with at that time?

A. It was a company in Memphis or headquartered in Memphis. At the moment, I can't remember the name.

Q. Do you know what use that company would have made of the autoclaves?

A. I don't know, but from some conversation with Charles Kolker, we assumed it was for the production of 3,4 dichloroanilone. But again, this was speculation.

Q. And what was your purpose in inspecting the equipment that was still at the Newark plant while you were in Mr. Mitchell's employ?

A. Just a matter of safety. Before

mechanics went in to work on it, I wanted to know myself to be sure it was clean, which was nothing unusual. This is something I might do in any chemical plant under any circumstances.

Q. In making sure that the equipment was clean, did you have any concern about the potential presence of Dioxin in the equipment remaining on the site?

A. Yes, but I had to assume, at least I assumed it was visually clean, that it was safe to handle.

Q. And what was your basis for assuming that the equipment was safe to handle if it was visibly clean?

A. That's the only way I had.

Q. Did you have any method available for testing equipment for Dioxin contamination if you so desired?

A. No.

Q. Earlier this morning --

A. Incidentally, in connection with that, we may have had, all during this period when I was working for Mitchell, contact with Diamond people because there was some agreement between Mitchell

and Diamond for assistance that Diamond would give Mitchell in getting into 2,4-D production. So that when I had specific questions about equipment, I would often call Gordon Steward or maybe Frank Kennedy or someone else at Diamond. I don't remember the specific thing, but it might well be that I might have asked for some verification that to their knowledge, these units were safe to transfer.

Q. The records that you saw when you went back to the Newark plant in 1970, I believe you stated that they included some monthly summaries and also that you looked at equipment documents. Were these documents still present at the plant site?

A. Yes.

Q. Where were they, if you recall?

A. Most of them were in the files in the office building. Some of the operators' records were in the operators' desks at various areas in the plant.

Q. Were maintenance records still at the plant site, as well?

A. Only in the equipment files in the

Burton - direct

office.

Q. And how long did you stay at the Newark plant in Mr. Mitchell's employ?

A. I'm not clear on this. At the same time, I was working on and off with Montrose Chemical next door and my mind is not clear. But between -- I was there first in '73 for a period of two or three months; then I was there, I think, on and off for several weeks in 1975; and then I think for a very brief period, maybe only one week in 1976 is my best recollection.

Q. Do you know whether the files that you have referred to, records were still on the plant site when you left, when you were last there in 1976?

A. As far as I know, they were all there.

Q. I should ask another question just to clarify. Was this occasion in 1976 the last time you were at the Newark plant?

A. I'm not really certain. I might have stopped in for conversation with Bill Mitchell at any time. I just don't know.

Q. Do you know how long Bill Mitchell continued to operate the plant?

A. I don't know. I would guess that it would be '76 or '77, but I have no recollection.

Q. Do you know whether he manufactured 2,4-D during the entire period once he started up, which I believe you said was in 1975?

A. Not in '73. I would think probably in '75 and '76.

Q. In the 1973 time frame, were you primarily assisting Mr. Mitchell in developing the 2,4-D process?

A. Again, please?

Q. In 1973, when you first began working for Mr. Mitchell, were you primarily involved in inspecting equipment and developing a 2,4-D process?

A. Primarily in repiping and in some cases, setting up equipment; in other words, trying to rehabilitate that part of the plant that we needed for 2,4-D production.

Q. How long or could you give us a time frame during which you were also working with Montrose Chemicals next door to the Diamond plant?

A. That's so difficult to do because I was in and out of Montrose for so many projects.

Q. Do you recall approximately when the first project would have been?

A. I think the first project, as I remember, I finished working for Bill Mitchell in the latter part of 1973 and started fairly promptly with Montrose and was there for the full year of 1974. I think it was one year that I was working full-time on a project at Montrose Chemical. But then other times than that, I was in and out. It's very confused.

Q. Do you recall the approximate date of the last project at that location?

A. Somewhere in the time frame around 1978, probably.

Q. What type of projects were you engaged in for Montrose Chemicals?

A. A project for making malononitrile, cyanoacetamide and another project on a rice herbicide but I can't for the life of me remember what the chemical was.

Then at one period in there, I managed the plant for something like nine months while they were trying to locate a new plant manager.

Q. Did any of your projects there relate

Burton - direct

to trichlorophenol, 2,4,5-T or 2,4-D?

A. Not working at the -- not my actual work at the Montrose plant but Montrose was involved in some design projects for 2,4-D and 2,4,5-T.

Q. And what was the purpose of those design projects, if you recall?

A. Referring to -- is this your number one?

Q. Yes, the handwritten notes.

A. Montrose Texas, there was a project by Thompson Chemical and Sonford Chemical to set up a plant in Texas for making 2,4-D and 2,4,5-T. Montrose -- I have to explain something else. At some point, Montrose set up a wholly owned subsidiary called Montrose Development Corporation and I think these projects were done under Montrose Development Corporation, which as I recollect was a means of Montrose Chemical avoiding any liability they might run into. But essentially it was Montrose Chemical. Montrose Chemical was to furnish the design data and engineering and so forth and in turn, I furnished that to Montrose.

So there was this one project, Thompson Chemical, Sonford Texas project which went through the design stage but went no further. Then in 1967-68, Montrose Chemical Development got a design contract for Thompson-Stearns Rogers who in turn had a contract to build a plant for Agent Orange and in turn, I had a contract with Montrose Chemical Development to furnish the design data and set right up the 2,4-D and 2,4,5-T units.

Then I did some work for one time, it was a small job and I don't see it on this Exhibit 1, for a company in South Africa that was interested in making 2,4-D and 2,4,5-T. I have forgotten exactly, but I was involved with it, Montrose Chemical Development was involved in it.

Q. You have been referring to what I believe is the last page of Burton Exhibit 1, your handwritten notes. I note at the top of that page, it says, the reference or title --

A. Yes, I'm sorry, that's another one, although it didn't involve 2,4,5-T. This third column there meant the plant only involved 2,4-D.

Q. My question is on this last page of

Burton - direct

Exhibit 1, it seems to have a label or title "D and T projects." Is this a listing of all projects you worked on involving either 2,4-D or 2,4,5-T while you were consulting?

A. Roughly, but it is not complete because I was involved a number of times in projects that furnished some preliminary information and didn't go further. For example, one time Allied Chemical was interested in making 2,4-D and 2,4,5-T and I had some degree with consulting them on the project before they dropped it, like this South African venture. There would be quite a number of those that I wouldn't remember or didn't get paid for or didn't consider significant.

MS. COOKE: We have had a request for a short break. Are you agreeable to that? We will try to keep it short.

(Whereupon a recess was taken.)

Q. Mr. Burton, have you ever given testimony in a deposition such as this prior to today?

A. No.

Q. Have you ever testified in a courtroom

or a hearing of any kind that you recall?

A. No.

Q. Did you discuss today's deposition with anyone prior to coming here?

A. Some discussion yesterday with Mr. Cox and Mr. Spivak.

Q. We were discussing the period of the 1970's, when you were working with Mr. Mitchell's company and also with the company next door in Newark. At the time that you were with Mr. Mitchell, do you recall whether there was a carbon absorption tower located at the Newark plant site?

A. I know where the tower had been located, at least that was pointed out to me, and I'm quite sure but I'm not a hundred percent sure that the tower was not there at the time.

Q. Do you know what purpose that tower had served when it was on the plant site?

A. Again, what I was told, but everybody had the same story, so it was fairly certain, this was the carbon absorption tower for absorbing Dioxin from the trichlorophenol.

Q. After you left Diamond's employ in 1960, did you stay or did you work with various

chemical plants in the Newark area up until this period you spent with Mr. Mitchell's company?

A. Would you repeat that, please.

Q. I'm just trying to determine whether you stayed at chemical plants in the Newark area from the time you left Diamond in 1960 up to and including this period in the mid-'70's, when you worked with Mr. Mitchell.

MR. COX: I think there may be some confusion. As I understood his testimony, it was he had been employed for two eight month periods but otherwise worked as a consultant. You are asking if he consulted at other plants?

MS. COOKE: Right. I'm being unclear.

A. I consulted at other plants, for example, I had a consulting project with Interprovincial in Canada. That project involved both doing design work, my office and my home, plus spending some time at the plant. Another project, for example, I consulted with Thompson Hayward in, I think, about the 1961 period or thereabouts, but this was purely -- not going there, this was just doing work in my own office.

So when you say in the vicinity, I'm thinking of where I was physically versus where the companies were that I might have done some work for.

Q. Where was your own office?

A. In the basement of my home in Cranford.

Q. Excuse me?

A. In Cranford, New Jersey.

Q. Do you know what percentage of your time you spent consulting and/or working for plants in the Newark vicinity between 1960 and 1975 or six?

A. That's a hard question to answer, but I would take a guess, maybe one third.

Q. Did you remain in contact with --

A. Or no, maybe one third to one half, I would say.

Q. Did you remain in contact with Diamond employees throughout that period?

A. Again, the period specifically?

Q. From 1960 up to and including 1975.

A. No, I didn't have much contact between 1960 and 1973. During the period from 1973 to 1976, I had contact quite often with several

ex-Diamond employees who were also involved working for Mr. Mitchell.

Q. Do you recall any contact between 1960 and 1973 in the form of conversations or correspondence with people at Diamond?

A. This is what we went over before. I talked various times to Frank Kennedy and Milton Rosenfeld, Homer Smith and people that were at the Doremus Avenue plant -- no, I guess that was all secondhand. I don't remember any Diamond employees coming down that I talked to directly. I guess that was all secondhand.

Q. Do you recall whether you ever discussed Diamond's operating procedures with Mr. Kennedy, Mr. Rosenfeld, Mr. Smith or any other Diamond employee from the time you left in 1960 up until the time you went to work for Mr. Mitchell?

A. As I said, someone, I don't remember which one, mentioned about this carbon absorption tower, which in effect was an operating procedure. At one point, I had some discussion with Frank Kennedy because we had a common interest in a question about dichlorophenol manufacture. I don't think, though, that got into

anything to do with Diamond's operations. It might have, but I don't recollect that it did.

Q. Did you ever discuss the Newark plant or Newark operating procedures with Mr. Guidi after the time you left?

A. No.

Q. When we were discussing earlier your 1967 letter, you said that you had heard various rumors or complaints about the Diamond Newark plant. Do you remember whether you discussed those rumors with any particular present or former Diamond employees?

A. That, in effect, is where I heard the rumors from.

Q. What I'm trying to determine is which people you heard the rumors from, if you recall.

A. I don't remember. Actually, it was a little confusing in my own mind because there were several families who had brothers and uncles and I never quite sorted out who was who. The Lamoreaux family had to do with them and Cundiff and I don't know, there was a set of related families, some were working at Diamond and some were working at Doremus Chemical. I don't remember specifically

who was who at this point.

Q. Who was in charge of maintenance at the Newark plant during the years you did work there, Diamond's Newark plant?

A. Homer Smith.

Q. Was he in charge throughout the period that you were employed at the Newark Lister Avenue plant?

A. I don't remember exactly, but it seems to me that he was starting in the early part of the 1950's. I don't remember exactly when. But most of the time, he was.

Q. Did the maintenance department have the responsibility to actually wash down plant floors when they were washed down?

A. Not when I was there. There was a little question in a lot of plants as to the maintenance departments, where they leave off, but when I had the management, the maintenance department had no responsibility except for the equipment. It was up to the operating department to see that the equipment was clean and ready for repair and take care of all kinds of cleanup. It might have been different in the Diamond time, but

I know specifically under my time what it was.

Q. So that the actual cleaning of equipment or floors would have been done by an operating unit?

A. Right.

Q. Would individual equipment operators be responsible for any cleaning that had to be done during their own shifts?

A. They were all responsible for keeping, maintaining good housekeeping.

Q. Do you recall any housekeeping problems during the years that you were at the Lister Avenue plant?

A. Nothing specific. Housekeeping was always a perpetual problem.

Q. What do you mean by that?

A. Which is at all places.

Q. What do you mean by "perpetual problem"?

A. Operators tending to be sloppy and keeping pressure on them to keep their units clean and neat and in order.

Q. Do you remember any individual instances of an operator not keeping an area clean

within the Lister Avenue plant?

A. No.

Q. I may have already asked this: Was Mr. Smith still at the Lister Avenue plant at the time that you left?

A. Again, please?

Q. Was Mr. Smith still at the Lister Avenue plant at the time that you left?

A. Yes.

Q. You testified earlier that it was on August 9, 1960, that you first recall hearing of Dioxin from Monsanto. Do you know whether Diamond was familiar with the term "Dioxin" as of that time, in 1960?

A. To my knowledge, they were not. Well, I have no idea what Diamond was doing meanwhile in connection with this except that I have no indication that they knew about it.

Q. When you heard of Dioxin in August 1960, did you relay your information on Dioxin to anyone else?

A. Not to my recollection.

Q. Do you remember the context in which you first heard of Dioxin?

A. Yes. At one point, when we were having the chloracne trouble, I visited competitors' plants to see what help I could get on this problem as a safety problem, even though they were competitors.

One of them that I visited was Monsanto and they were very cooperative and we exchanged, as far as I know, full operating information about the problem because they had had a lot of chloracne trouble previously and we had a joint venture over the period of a year or so of sending samples to this toxicological laboratory, some subsidiary of Mellon Institute, who did the rabbit ear test, and then Monsanto and I exchanged the results of the tests we made. In other words, we had a joint venture in trying to locate the cause and prevention of chloracne.

So that at the time he called me, I was no longer involved with trichlorophenol but my recollection of the context of the call was simply this is something that from a technical curiosity point of view, it would be of great interest and thought I would be interested in knowing what they had found out.

Burton - direct

Q. At the time of the joint venture, then, you were in Diamond's employ, were you not?

A. Right.

Q. And would that have been in the year immediately before you left Diamond?

A. I don't know how long -- wait a minute.

I don't recollect exactly, but I think it was 1957 and 1958 that we started this joint venture with Monsanto.

Q. When you discussed this topic with Monsanto in August of 1960, were the people at Monsanto aware that you were no longer associated with Diamond?

A. Yes. Actually, I was working at Doremus Chemical. They called me at my office at Doremus Chemical.

Q. And what were you doing at Doremus Chemical?

A. I was plant manager.

Q. What was being manufactured at that plant?

A. Plasticizers, methyl chloride, methylene chloride, methyl bromide, benzoic acid

Burton - direct

and later chlorine from caustic soda.

Q. Did you suggest to Monsanto or did Monsanto indicate to you that it was going to identify this Dioxin to Diamond?

A. I don't have any recollection of this being mentioned at all.

Q. Other than what you have told us about Boehringer and about Monsanto, are you aware of any companies that were producing 2,4,5-T or trichlorophenol and experiencing chloracne problems in the 1950's?

A. In what period?

Q. In the 1950's.

A. It was at Hooker Chemical who said that they had had some chloracne problem and I think still had one or more employees suffering from chloracne but had no current cases, no current new cases. Dow Chemical said they had had a lot of cases of chloracne I think in the thirties and I think they associated it with the manufacture of pentachlorophenol, but had no current problems. And Monsanto had had a bad outbreak in about 1950 but had no current problems.

Burton - direct

Q. At any point while you were employed by Diamond, do you recall hearing that any Diamond customers had complained of contracting chloracne from the use of Diamond's products?

A. No.

Q. When you were at the Newark plant, was Diamond selling the sodium TCP as a final product as well as using it as an intermediate in other products?

A. Yes.

Q. How was the TCP packaged for sale?

A. Shipped in tank cars.

Q. That would have been in a liquid form, I gather?

A. Yes, water solution of sodium trichlorophenate.

Q. How were these tank cars located from the Diamond plant?

A. Pumped from the storage tank to the tank car.

Q. Was there any point in the packaging or containerization process where employees had to come into contact with the sodium TCP?

A. No.

Burton - direct

Q. What form did the 2,4,5-T acid take which Diamond was manufacturing in the 1950's?

A. It's a solid material.

Q. And was that also sold as a final product?

A. I don't believe we sold any as a final product. We might have sold a small amount, but mostly we used it for manufacture of 2,4,5-T esters and amines.

Q. What form did the esters take, if you recall?

A. Liquids.

Q. How were they containerized and shipped?

A. Usually in 55 gallon drums, although I believe we sold a few tank cars, made a few tank car shipments.

Q. When these were sold in drums, how were the drums filled?

A. The material would be pumped, the drum would be put on a scale and a flexible hose connection from a pipeline put in the opening in the drum and filled until the drum was filled to the proper weight.

Q. What about the amines, do you remember what form they took?

A. The which?

Q. The amines.

A. Yes, they were all liquids.

Q. Do you remember how they were containerized and sold?

A. The same way. We sold some in tank cars and sold some in drums. In the case of the amines, they were finished products, so we sold amines in various sizes of containers.

Q. Were any of those containers filled manually, that is, a manual operation, an employee opening a valve or pouring material into the container?

A. Yes. We sold it in 55 gallon drums and 30 gallon drums, then we sold a lot in five gallon and one gallon containers and we had, I'm not sure on this, we had some form of filling machine for the smaller containers and perhaps for the five gallon containers. I'm not sure about the five gallon, whether they were strictly manual or whether we used a filling machine for them.

Q. Did the employees have any physical

contact with the amines when they were filling these smaller containers?

A. It would be only accidental contact. Theoretically, you shouldn't touch it. They wore rubber gloves. But I'm sure from time to time, there were accidental or careless contacts.

Q. Did Diamond continue to manufacture DDT also throughout the period that you were at the Newark plant?

A. I'm not sure. Let me see if I can refresh my memory here.

I don't remember. From my list here, apparently, we were operating in 1958 but there was some thought about shutting it down and only making DDT at the Greens Bayou plant, but I can't remember whether that was while I was still there or not.

Q. Other than the DDT and the dichlorophenol, trichlorophenol, 2,4-D and 2,4,5-T products, was Diamond manufacturing anything else in the period from, say, 1952 or three to 1960, that is, after they stopped manufacturing their own tetrachlorobenzene?

MR. COX: At Lister Avenue, you mean?

Burton - direct

MS. COOKE: Yes, I'm sorry, at Lister Avenue.

A. Chloral, which we manufactured as an intermediate for DDT and then later sold it as a chemical in itself, we were making that all during the period up until 1960 and I mentioned miticides, we made a miticide, which is a Kolker product, and then under contract, we made a similar product for General Chemical and benzene sulfonyl chloride was one of the related products we made and there were some other products that I can't remember similar to benzene sulfonyl chloride and the miticides. This was this family that I mentioned of related products.

Q. Were those products manufactured in the main building up until 1960?

A. Yes, but they were small scale and on and off in terms of production.

Q. Were you present at the Newark plant at the time of the February 20, 1960, explosion?

A. Yes.

Q. And what were you doing at the plant that day, if you recall?

A. As I often did, I came in Saturday

morning to catch up on paperwork. I don't remember specifically what I did that morning.

Q. Do you recall any details of the explosion on that date?

A. No.

Q. Was the entire plant shut down following the explosion, to your knowledge?

A. Yes.

Q. Do you know when any part of the plant first started up again following the explosion?

A. No.

Q. Had any part of the plant started up again prior to the time you left Diamond's employ?

A. Not to my knowledge.

Q. Do you know what, if any, specific structures were destroyed in that explosion?

A. The end of the main building, that is, the side nearest the river, was badly damaged. I believe that, I'm not certain, a portion of the 2,4-D building, that is, what we call the ester unit, was damaged but I'm not certain of that.

Q. Do you know what process equipment was either damaged or destroyed in the explosion?

A. The equipment in that end of the

Burton - direct

building, which would have been the hexachlorobenzene, trichlorophenol, Chloral and monochloroacetic.

Q. Do you know how Diamond went about removing any debris from the explosion after it occurred?

A. No.

Q. Do you know whether debris was, in fact, removed from the plant site?

A. Pretty obviously, it was, because it wasn't there when I -- no, I don't know. It could have been buried. No, I don't know.

Q. Do you know whether there was any release of either gaseous or liquid or solid material from the TCP process during that explosion?

A. The way we reconstituted what happened was that the temperature in the autoclave had gotten too high for some unknown cause, and this was something we never could -- there was a lot of speculation, but we never could figure out what happened. Once the temperature in that reaction gets to a certain point, then another reaction takes place which generates a tremendous amount of

heat. At that point, it becomes what we call a runaway reaction, it can't be stopped. So that would build up a pressure big enough to rupture the autoclave itself and in the autoclave were a lot of methanol fumes and methanol gas is explosive.

Although theoretically, all the equipment in that building was explosion-proof, the physical damage from the rupture of the autoclave could have caused a flying piece of metal to strike a spark, ignite this mass of hot methanol vapors. So that's what we assume in particular is what caused the main explosion.

Q. You stated what you concluded after the explosion was that there had been a runaway reaction in the autoclave. Were other parts of the Diamond plant also in operation on the Saturday when the explosion occurred other than the TCP unit?

A. I don't remember except from the list of employees who were there and injured, it seemed like some other parts probably were.

Q. Do you have any idea of what parts of the plant?

Burton - direct

A. I'm fairly sure the 2,4-D was in operation.

Q. Do you have any knowledge of whether the 2,4,5-T line was also in operation?

A. No, I don't. When I said 2,4-D, I was really thinking of that building just because there were some operators in the plant who wouldn't have been there unless that part of the plant was in operation.

Q. So in other words, if there were workers in that building, could it have been either the 2,4-D or the 2,4,5-T process that was operating?

A. Right.

Q. Did you ever return to the Lister Avenue plant as a Diamond employee following the date of the explosion?

A. I think I was back there once or twice.

Q. Do you recall for what purpose you went back to the plant?

A. In connection with plans for rebuilding.

Q. Were you involved personally in either

the investigation of the explosion or the rebuilding plans following the explosion?

A. I was involved in discussions of trying to figure out what happened, what caused the explosion, and involved to some degree in the plans for rebuilding.

Q. Do you recall any details of the plans for rebuilding? Specifically, do you recall any process changes that were to be made in the rebuilding?

A. No. It seems to me there was some discussion about the type of filter for filtering the sodium salt from the trichlorophenate, which is something we hadn't been doing but were discussing doing it when the operation was resumed, and some discussion about a design of the new autoclaves, a couple of things that stick in my mind.

Q. What would be the purpose of filtering the trichlorophenate?

A. To get a material that would simply be easier to handle the large sodium salt content of it. It was somewhat of a handicap in storage and shipping and perhaps in the reaction of 2,4,5-T.

It was sort of a general nuisance that we could live with but it would be easier to handle if we filtered it off. Whether they ended up filtering it off or not, I do not know, but I remember debating that question.

Q. Does anything in particular stick in your mind regarding the design of the autoclaves?

A. Yes, the possibility of what they call caustic embrittlement.

Q. What would that involve?

A. It has to do with steel, when heated for, I believe, some period of time at some high concentration of caustic, may suffer some mechanical degeneration and as I remember, I simply raised the question of whether that should be considered to be sure that we wouldn't run into that condition.

Q. By steel, you are referring to the steel structure of the autoclave?

A. Yes.

Q. Mr. Burton, I have a number of documents that have been provided to us by Diamond in this litigation and I would like to show a few of them to you now and ask you some questions

Burton - direct

about them.

MS. COOKE: First I would like to introduce as Burton Exhibit No. 3, it's dated April 4, 1960, from Mr. J. Burton to Mr. H.S. Weiner, entitled "River contaminants and your memo of March 31st." The Bates number is D256264-D256265, I believe.

(Whereupon the document was received and marked Burton 3 for identification.)

Q. I would like to ask you to look that over for a minute.

A. Okay.

Q. Do you recall writing that document, Mr. Burton?

A. No.

Q. Is that your name which, in fact, appears on the document? Do you have any reason to believe that you are not the person who wrote the document?

A. No. Everything in here that I see is clearly a statement of facts and what I would have written today if you asked me to write it today.

Q. The second full paragraph of that document, I believe you state that until 1956, all

plant effluents were discharged to the Passaic River. Do you recall what the specific effluents were from the Diamond plant prior to 1956?

A. It would be a wide variety. The biggest single one in terms of -- other than forgetting water, would be -- it's mentioned in here the 2,6 dichlorophenol and other -- that would be the biggest single one.

Another one that was at times of fairly high volume and a problem was muriatic acid. But all in all, it was a wide range of acids and bases and chemicals that had to do with all the various manufacturing processes.

Q. Would trichlorophenol liquid waste have been discharged directly to the river prior to 1956?

A. Only in very small amounts because trichlorophenol was an expensive chemical and except when it was present in such dilutions, it didn't pay to recover it, we would have recovered it.

Q. Were there any liquid wastes other than trichlorophenol itself from the trichlorophenol process?

Burton - direct.

A. When we were operating the trichlorophenol process by the dilution method, the first method that I mentioned, all the wastes except the trichlorophenol would have gone to the river. That is true of the whole trichlorophenol operation. What these wastes were, actually, I don't know, we didn't know and I don't know now. But they would be a relatively small volume of unknown impurities, probably including Dioxin.

Q. Do you recall any particular wastes from the 2,4,5-T process which were discharged to the river prior to 1956?

A. The wash water or part of the wash waters from the filtration of sodium 2,4,5-T and at times, the -- just part of the wash waters. Part of the wash waters would normally be recycled. I don't remember the specifics, but part of it discharged as heavy material too dilute to be worth recovering and in the centrifuge or filtration operation of the 2,4,5-T acid itself, again, in the filtrate and wash waters from there, there would be very small amounts of 2,4,5-T acid or even smaller amounts of trichlorophenol all present in such dilutions it wasn't worthwhile to

try to recover them.

Q. Did either the esterification process or the formulation of amines create liquid wastes that were discharged to the river?

A. Yes. The amines, there were no liquid wastes. In making the esters, most of the time we washed the esters to wash out impurities and I believe that part of the time or perhaps all the time, some of that wash water might have been recycled but some of the wash water very clearly was discharged as waste.

Q. Did any of the liquid discharges at the Newark plant pass through any sort of treatment system or sump prior to 1956?

A. No.

Q. In that same paragraph, the second full paragraph on page one of Burton Exhibit 3, you make a reference to the sewerage commission officially objecting to Diamond's polluting of the river. What did you mean by an official objection?

A. They caught us.

Q. Had the sewerage commission ever inspected the Diamond plant or criticized its

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waste discharges prior to 1956?

A. Yes.

Q. Do you recall when these inspections took place?

A. I remember problems before the plant was sold to Diamond. This was a recurring steady problem, the fact that we were discharging materials into the Passaic River which were illegal discharges and therefore, we had to -- actually, there were two -- at one point the Army Engineers had some degree of surveillance over it and then -- but the main inspection was from the Passaic Valley Sewerage Commission and they would come in at random times.

Q. Did you state that there were inspections as early as the time that you were with Kolker Chemical?

A. Yes. I remember specifically the Army Engineers inspector being in once. I don't remember specifically the Passaic Valley Sewerage Commission being in at that time.

Q. And did the Army Corps of Engineers inform Kolker that its discharges were illegal?

A. Yes.

Q. Do you remember what, if anything, the Army Corps of Engineers told Kolker it had to do to correct these illegal discharges?

A. I remember this one incident, the hydrochloric acid, it was the same as muriatic acid, you sometimes call it one or the other, being discharged and Charles Kolker blaming the maintenance foreman for allowing that to happen and apparently, discharging him, which the Army engineer inspector said don't discharge him for that violation.

Q. And your recollections were discharges of hydrochloric acid or muriatic acid, either one, were common while you were at Kolker?

A. What do you mean by "common"?

Q. You stated in one particular incident, Mr. Kolker blamed the maintenance man. Was that the only incident of such a discharge or did that happen to be a discharge that came to the attention of the Army Corps of Engineers?

A. No, my -- let me explain this thing about muriatic acid. Muriatic acid is a by-product from several of the operations there. It's desirable -- it's a salable by-product. So

it's desirable to sell it. But at times, as I mention in this memo, at times, when there are not sales for all of it, then we discharge it into the river. I think in the Kolker days, our sales were relatively fewer, so we probably discharged a larger percentage of it into the river and during the period when I was with Diamond, over the years, I would guess maybe we sold 90 percent of it.

Q. Do you have any recollection of the time when either the Army Corps of Engineers or the sewerage commission visited the Lister Avenue plant once Diamond had purchased it?

A. I think we probably had one or two visits a year.

Q. And were these random visits, as you stated before?

A. Yes.

Q. Did either the Army Corps of Engineers or the sewerage commission inform Diamond that --

A. I would like to make one point clear. I don't remember during the Diamond period, I only remember the Army Corps of Engineers that one instance. I don't remember the Army Corps of

Engineers being in later during the Diamond period.

Q. Did the sewerage commission ever advise Diamond that any of its discharges to the river were illegal?

A. They never caught us at it until this one instance in 1956.

Q. And what specifically did the sewerage commission say about the discharges in 1956, that is, what did --

A. A pump that was pumping alcohol had a small leak at the packing gland, it was dropping alcohol into a drainage ditch and in turn, right into the river, which was, in terms of total pollution, a ridiculously insignificant amount. But in the context of it, since he knew we had been playing a cat and mouse game, this was a legal reason for him to --

Q. When you say, "he," are you referring to a particular inspector with the sewerage commission?

A. I only remember one, although it was likely there were others, but it seemed to me that most of the time, there was one inspector.

Q. Do you recall his name?

A. No.

Q. Do you recall his title or position with the sewerage commission?

A. No.

Q. Was this alcohol leak that you described into the drainage ditch the only specific discharge that he noted on the visit in 1956?

A. Right.

Q. Did this particular inspector or anyone from the sewerage commission or any other agency return to Diamond after this occasion in 1956 to inspect your discharges?

A. I don't remember specifically, but my general recollection is that this was something that happened once or twice every year. I would assume it went on after that, but I don't remember specifically.

Q. Did Diamond receive a specific citation or fine of any sort in connection with this incident in 1956?

A. I'm quite sure there was no fine and I don't remember what happened except that in some

manner, being caught at having that one particular leak, even though it was a small one, was sufficient that I felt we had to put in a sewer line to get us out of future trouble. I think there was some strong -- I think they almost forced us to do it, but I don't know how.

Q. Do you know how long the alcohol leak had existed when the inspector located or detected it?

A. No.

Q. Do you know whether Diamond was aware of that leak at the time that the inspector detected it?

A. Certainly not of that leak. This was really an insignificant thing.

Q. Was Diamond aware of any other leaks at the time of this 1956 visit by the sewerage commission inspector?

A. They had to be aware. I say it depends on who you are talking about in Diamond. Diamond engineering, the management of chlorinated products division, had to be aware that we were dumping large amounts of chlorophenols in the river, for example.

Burton - direct

Q. And when you refer to the engineering in chlorinated products division, are you referring to people in Diamond's Cleveland headquarters?

A. Yes.

Q. Who within the Newark plant would have been aware of the discharge procedures?

A. Everyone.

Q. Excuse me?

A. Everyone except perhaps girls in the office.

Q. Was Diamond making any effort prior to this incident in 1956 with the sewerage commission inspector to either monitor or control the discharges from any part of the Newark plant to the river?

A. You have to realize that there is no point to monitoring it. Explain what you mean by "monitor."

Q. Were you taking any measurements of discharges or making any chemical analyses of their content?

A. No. Let's say the nature of the operation, we knew what they were without

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measuring.

Q. Do you recall what any of those specific leaks were?

A. I'm sorry?

MS. COOKE: Could you read back his last answer.

(Whereupon the record was read.)

Q. Let me rephrase my question. Apart from discharges at various points in the process, do you recall any process leaks would have leaked material onto the floors or into the river or into the drainage channels you described before?

A. No, but bear in mind that leaks were an infinitesimal part of the total discharge. It would be unimportant.

Q. What effluents, if any, continued to just discharge directly to the Passaic River after the sewer connection was made?

MR. COX: Could I have the question read back?

(Whereupon the record was read.)

A. The sewer line was connected only to the 2,4-D building. It would have been possible for us to have pumped some waste material from the

main building to the sewer connection in the 2,4-D building but I don't recollect doing that and I think it is very probable we did not do it. In other words, the effluents from the trichlorophenol and DDT and monochloroacetic continued to go direct to the river.

Q. Was the main building or were the waste lines from the main building ever connected to the sewer prior to the 1960 explosion?

A. Repeat, please.

Q. Were the waste streams from the main building ever connected to the sewer line prior to the 1960 explosion?

A. That's what I just said, to my recollection, they were not.

Q. On the second page of what has been marked as Burton Exhibit 3, the second full paragraph, there is a discussion of acetic and phenolic materials. Do you know whether after the 1956 incident with the sewerage commission inspector, Diamond made any effort to treat acetic or phenolic materials before discharging them?

A. I want to be clear. Will you say it again?

Q. Did Diamond make any effort to treat any acetic or phenolic wastes before discharging them to the river after this incident in 1956?

A. From when until when? '56 until when?

Q. '56 until the time of the plant explosion.

A. No. Well, I would like to qualify that a little bit, though. We were always trying to dispose as much of these effluents -- for example, the sale of muriatic acid, there was a steady press release by myself on the sales department to sell muriatic acid at any price so we wouldn't have to discharge in the river. At the time we were making DDT, we also recovered sulfuric acid from that operation, which at one stage was discharged to the river. We recovered this and sold this back to the manufacturers of sulfuric acid. So those were two materials that in terms of trying to dispose of them elsewhere, we were trying to do.

Q. Were there any breaks that you recall in the piping or waste lines of Diamond where waste could have escaped onto the ground before

reaching the river?

A. Yes.

Q. Do you recall where that would have been, what locations?

A. Our storage tanks for most of the raw materials and for most of the finished products were located in areas surrounded by ground so that leaks there would have percolated into the ground.

Q. Do you recall any other points on the plant property where wastes or materials could have leaked onto the ground?

A. No, it was only in connection with storage tanks.

MR. SHEFT: Could you read the last question and answer back.

(Whereupon the record was read.)

A. I might add that our tank car loading of products from storage tanks into tank cars or unloading of raw materials from tank cars also was in a ground area where the same thing would apply.

Q. Was sodium TCP kept in the storage tanks to which you referred?

A. No, that was one of the few products

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where the storage tank was inside the building. The loading would have been done at a railroad siding in the ground area.

Q. Was 2,4,5-T in any form kept in any of the storage tanks you referred to?

A. No. That was a solid material.

Q. Were finished esters or amines kept in any of the storage tanks you referred to?

A. Yes.

Q. Was recycled methanol or recycled trichloroanisole stored in the tanks you referred to?

A. No.

Q. Where would they have been stored?

A. In tanks in the building.

Q. Were there any provisions made to contain spills or leaks from any interior, inside storage tanks?

A. No.

Q. Referring again to page two of Burton Exhibit No. 3, paragraph five, which I believe is the last paragraph, you refer to unimportant violations resulting from washdowns. What did you mean by that reference?

A. Just what it says, we get from washing down the floors.

Q. What violations were you referring to, though? Violation of particular regulations?

A. The regulation on the Passaic River, you couldn't spit in the river without being in violation.

Q. Do you know how long these regulations you are referring to had been in effect?

A. No.

Q. Were they in effect when you arrived at Kolker, to your knowledge?

A. I'm quite sure they were.

Q. You also refer in the end of Burton Exhibit 3 to poor housekeeping at the riverfront or comments about poor housekeeping at the riverfront. What activities were carried on at the riverfront?

A. Normally nothing except the area adjacent to the riverfront, except by the main building, where there was no adjacent area, was a convenient area for storing drums or equipment or odds and ends.

Q. Were drums and equipment stored

directly on the ground at the riverfront in this 1950's time period?

A. My recollection is that all of that riverfront area at one point we had covered with concrete. It would be stored on that.

Q. Do you have any recollection of when that would have been that you covered the area with concrete?

A. No.

Q. Do you have any recollection of spills at the riverfront where these materials were stored, materials and equipment?

A. Nothing specific, but again, these would be small items that I wouldn't be concerned with.

Q. Was any housekeeping done at the riverfront in terms of cleaning up if there had been a spill or leak from stored equipment or materials?

A. The same as housekeeping everywhere, always a steady problem to try to keep things clean and orderly.

Q. Were there criticisms of the housekeeping of the riverfront on more than one

Burton - direct

occasion by either the sewerage commission or any other agency?

MR. COX: I object to the form of the question, the "more than one occasion." There is implication there was. I don't think there was any testimony to that.

Q. I believe on the second page of Burton Exhibit 3, there is reference to complaints of poor housekeeping at the riverfront. Let's first establish who made those complaints, if you recall?

A. Now would you repeat the question now that I read this?

Q. Who, if you recall, made comments or complaints about poor housekeeping at the riverfront?

A. This one inspector whose name I don't remember and it may have been others, but I remember the one inspector commenting about this.

Q. And did he comment about the particular issue on more than one occasion?

A. I don't remember. I will stand with what I said here.

Q. At the time that you wrote this memo,

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Burton Exhibit 3, did Diamond have the capability to separate or neutralize phenolic effluents from the rest of its waste?

A. It was always the capability of doing it, but the cost of doing it would make the whole operation uneconomical. For example, at J.T. Baker, we were making 2,4-D and discharging the effluent to the Delaware River and then when we found this was a serious contaminant and that we couldn't or shouldn't keep on doing it, we shut the whole operation down. It was not economic to continue the operation. In other words -- (no further response).

Q. Mr. Burton, I have another document which I would like to introduce as Exhibit 4 dated October 12, 1959, from Mr. J. Burton to Mr. P.J. Koskey, K-o-s-k-e-y. The Bates number is not decipherable.

(Whereupon the document was received and marked Burton 4 for identification.)

Q. I ask you to look at that.

Do you recall that memorandum, Mr. Burton?

A. No.

Q. Do you have any reason to believe that you did not write that memorandum?

A. I have no reason to believe I did not write it.

Q. Do you recall a visit by Mr. Holder to Boehringer?

A. I don't remember this specific one but I know that at various times, people from Diamond headquarters visited Boehringer and one of those would be Thornton Holder.

Q. What was Thornton Holder's position within Diamond at the time you wrote that memo?

A. I don't know what his title was, but he was what I thought of as a patent counsel; in other words, in terms of being involved in Diamond patenting processes or in terms of licensing Diamond's processes to others.

Q. What was Mr. Koskey's position, if you recall?

A. He was the production manager at the Newark plant.

Q. What would his responsibilities have been as production manager?

A. To supervise the production; in

relation to processes, to operate the processes in accordance with the procedures that you might say I authorized.

Q. You state in that memo that Boehringer's recommendation essentially confirmed Diamond's own test. To what test were you referring?

A. Actually, this very much surprises me because the 170 degrees operating temperature contradicts my recollection of what our conclusions were coming to be.

Q. Do you recall that you eventually reached a conclusion that differed from the recommendations you received?

A. Yes. My conclusion was 160 degrees was the maximum safe operating temperature.

Q. And I take it your conclusion differed from what you heard from Boehringer and others?

A. Yes. This 110 degrees in the methanol distillation, that was one of the points that I think I mentioned in this Exhibit 2 and it may be that this was one of the supporting reasons for my adopting that procedure myself later, although obviously, at the same time, I didn't drop the 170

degrees.

Q. What test was Diamond conducting at the time that the Boehringer information would have confirmed or not confirmed?

A. We were testing batches made at different operating temperatures to see if the operating temperature affected the chloracnegen properties of the material and actually, I think we were running tests to verify the other two, also. I think these were all three items that we at the Newark plant were trying to establish in relation to their effect on the chloracnegens in the product.

MS. COOKE: I would like to introduce as Exhibit 5 a memo dated July 6, 1955, from L.P. Scoville to Mr. J. Burton, Bates number D58830.

(Whereupon the document was received and marked Burton 5 for identification.)

Q. I ask you to look at that, Mr. Burton.

A. Okay.

Q. Could you tell us who L.P. Scoville was?

A. Yes. He was the manager of the

Burton - direct

chlorinated products division.

Q. Would he have been located in Cleveland?

A. Yes.

Q. Who was Mr. Renner, if you recall?

A. He was the operator of the trichlor -- one of the operators of the trichlorophenol unit and he had a bad case of chloracne.

Q. Was the bad case of chloracne the reason for Mr. Scoville's recommendation that you discontinue Mr. Renner's employment?

A. Yes.

Q. Do you remember any similar recommendations regarding any other Newark plant employees during the years you were at the plant?

A. You mean made from Diamond headquarters?

Q. First of all, yes, any from Diamond headquarters?

A. No.

Q. Do you recall whether you or anyone else in a supervisory position at the Newark plant made recommendations that any other employees discontinue their employment due to chloracne?

Burton - direct

A. No. As a matter of operating philosophy, I wouldn't discharge any employee. One employee I know, Walter Lamoreaux, had a bad case of chloracne and I found or made a job for him in office work so he wouldn't be exposed, as far as we knew then, to any of the fumes.

Q. Do you ever make a particular determination of where within the plant Mr. Renner was exposed to the chloracnegens?

A. Yes, he was the operator in the trichlorophenol unit or one of the operators.

Q. Following this memo from Mr. Scoville, did you or anyone else within Diamond arrange for an industrial hygiene survey of the Newark plant?

A. No, which I might add, because in the specific problems of this particular chemical plant, I thought it was meaningless. If Diamond said do it, I would have done it, but on my own volition I wouldn't do it because I didn't think it would do any help.

Q. Do you know why Mr. Scoville stated that industrial hygiene survey --

A. Scoville was a typical bureaucrat and it sounds like the right thing to do.

Q. My question is do you know why he specifically referred to testing the atmosphere or to ventilation as a problem?

A. Because this, again, is a textbook thing to do.

Q. Do you know what he meant when he referred to the bad actors in that memo?

A. I'm sorry, where is -- oh, I see. I presume -- I don't know why he said "bad actors" because as far as we knew then, there was only one bad actor and that was the trichlorophenol unit.

Q. Did Mr. Scoville's memo lead you to consult other manufacturers of trichlorophenol with respect to the chloracne problem?

A. This one puzzles me a little because consulting with the other manufacturers I thought was done around the 1957 period and I thought it was done at my own instigation. I remember myself badgering the management to permit me to do it, which doesn't match with this. So at this point, I don't know.

MR. SHEFT: Could you read that answer back, please.

(Whereupon the record was read.)

Burton - direct.

Q. So I take it you don't recall contacting other companies in 1955 on Mr. Scoville's recommendation?

A. Right.

Q. I would like to introduce as Burton Exhibit 6 an undated memo from Jean P-a-d-e-l-s-k-y, secretary to J. Burton and R. Guidi, to a Mr. Jeffries, and ask you to look at this once it's marked.

(Whereupon the document was received and marked Burton 6 for identification.)

A. No date connected with this?

Q. Apparently not. Have you had an opportunity to look at that, Mr. Burton?

A. Yes.

Q. Could you tell us who Mr. Jeffries was?

A. No. I don't remember the name at all.

Q. Do you have any recollection of a request for an exam of an employee of a M-e-l-o-s Electric Company?

A. No. Melos Electric, incidentally, was the firm that did all of our electrical work. They had someone working at the plant almost all

the time during the 1950's. But I don't remember this particular individual, although again, I probably would have known him by his first name and wouldn't be apt to remember this last name that appears here.

Q. Do you remember any occasion on which Diamond requested examinations of employees of other companies who worked on the Newark plant premises?

A. No.

MS. COOKE: I would like to introduce as the next exhibit a document dated 3/25/65 from E.L. Chandler to John Cort, Jr., Bates numbers D253697, I believe, through D253699.

(Whereupon the document was received and marked Burton 7 for identification.)

Q. I ask that you read that over, Mr. Burton.

A. Yes, I'm familiar with this.

Q. Can you tell me, if you recall, when you first saw this document that has been marked as Exhibit 7?

A. I don't know specifically what time, but it was when I was working for Bill Mitchell.

Q. Was that one of the documents you saw at the Newark plant site in the files there?

A. Yes.

Q. Apart from that document, can you tell us whether you had any knowledge of a meeting at Dow Chemical in 1965 on the topic of Dioxin in the time period of the meeting, that is, in 1965?

A. I don't know.

Q. Can you tell us who Cy Perkins is?

A. I believe he was in Diamond's research department at Cleveland.

Q. Do you know whether he is also known as J.H. Perkins?

A. Again, please?

Q. Do you know whether he was also known as J.H. Perkins?

A. No.

Q. During the time that you were employed at Diamond, did you ever hear that Mr. Perkins had suggested that Dioxin was a cause of chloracne?

A. Not specifically, but I do remember that a man Alex Hlynsky, H-l-y-n-s-k-y, had suggested this family of compounds, not specifically this one Dioxin, but this general

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family of compounds as likely suspects.

Q. I may have asked you this this morning, I apologize for repeating myself, do you have any recollection of the time period in which this Mr. Hlynsky suggested this family of compounds as a suspected cause of chloracne?

A. I would think in the '58 or '59 period.

Q. Do you know what, if any, efforts Diamond undertook at the time to confirm whether this family of compounds caused chloracne?

A. They were doing some analytical work but their infrared analysis, which was their mainstay, as I remember, was not applicable to these kinds of compounds.

MS. COOKE: I would like to introduce as the next exhibit a document dated April 12, 1960, from Mr. J. Burton to Mr. J.A. Borror. The Bates numbers appear to be D256725-D256726; subject: Meeting at Monsanto. I apologize, it's not very legible.

(Whereupon the document was received and marked Burton 8 for identification.)

Q. Mr. Burton, I recognize the second

page is very difficult to read. I'm not going to ask you specific questions on that page. Please don't be too alarmed.

A. I'm familiar -- I don't remember this memo but I'm familiar with the context of what it's about. Maybe I can answer your questions, if you have them.

Q. Does this memo refer to visits you made to Monsanto in connection with this joint venture to try to identify the cause of chloracne?

A. Yes.

Q. In I believe it's the third paragraph of the memo, you refer to a Monsanto chloracne problem which you understood came from efforts to clean up bad trichlorophenol distributed through Monsanto's building by a rupture in a vapor line.

A. Right.

Q. Do you recall any details, what Monsanto told you about either the cleanup of that TCP or about their chloracne problem?

A. Yes. About 1950 plus or minus a year, they had a buildup of excessive pressure in the autoclave and it blew out the rupture disk, which is what is designed to contain that pressure or to

relieve the pressure if it becomes excessive. That, in turn, liberated a lot of fumes and actually liquid spill. In other words, everything in the autoclave blew out in the adjacent area. And they had after that a very bad, some 50 cases, I remember, of chloracne, but it was prevalent principally among the men who were doing the cleanup work.

So the contaminant would have been in the batch itself, which was distributed around the area and then, in turn, cleaned up.

Q. Do you know whether there was any liquid spill associated with the explosion at Diamond in 1960?

A. I can say there has to be by the nature of what happened. But as we mentioned before, the fire and explosion afterwards presumably generated enough temperature to destroy the Dioxin because it's coincidental that the same thing I think mentioned happened at Thompson Hayward. Did I?

MR. SHEFT: No.

A. They had an explosion in their autoclave and they had a fire afterwards and there

was no problem from Dioxin. So if you have an explosion followed by a fire, you are lucky.

Q. When you say no problem from Dioxin, do you mean no chloracne outbreak in the cleanup process?

A. Right.

Q. So I take it from your knowledge, there was no distinct chloracne outbreak in the Diamond cleanup process following the 1960 explosion?

A. Right.

Q. What, if any, conclusions did you draw about the cause of chloracne from the fact that Monsanto had experienced a major outbreak in cleaning up its trichlorophenol?

MR. COX: Could we get a time on that? You could ask him at any time you want, but I'm troubled by it.

Q. At the time of your meeting with Monsanto, did you draw any conclusions about the cause of chloracne from what Monsanto told you about their rupture disk failure and cleanup efforts?

A. I don't remember -- I do remember

diagnosing probably why they had the trouble, that they probably had a methanol leak in the batch was probably the reason for the excessive reaction temperature that blew the rupture disk. I don't remember drawing any conclusions about that relation to Dioxin, although I think we all generally understood at the time that this would be a very high temperature and at very high temperature, Dioxin was likely to be formed.

Q. At the time of this April 12, 1960, memo, other than Mr. Hlynsky's suggestion that a certain family of compounds may have been the cause of chloracne, did you have any knowledge of Dioxin as a chloracne cause?

A. At what time?

Q. At the time of your April 12, 1960, memo, this exhibit.

A. No.

MS. COOKE: I would like to introduce as the next exhibit a document, the date is in 1956 but it's not completely legible, from Mr. J.J. Browne, I believe, B-r-o-w-n-e, to Mr. J. Burton; subject: Chronological listing of process development, 2,4,5-TCP, Bates numbers

D49603-D49604.

(Whereupon the document was received and marked Burton 9 for identification.)

A. Okay.

Q. Do you recall that document, Mr. Burton?

A. No.

Q. Does the content of the document appear familiar to you?

A. Yes.

Q. There is a reference in the document, I believe it's on the first page, to the years 1952 through 1954 and referring to a large and small autoclave. It may be on the next page.

A. I see it.

Q. Is that what you described this morning about the installation of a second autoclave, second larger autoclave?

A. Yes.

Q. Did the small and large autoclave or did both continue to exist until the time of the 1960 explosion?

A. Yes.

Q. And which autoclave was it that --

A. The large one.

Q. Which was destroyed in the 1960 explosion?

A. The 1953, I believe it was.

Q. The large one was installed in 1953?

A. I think that's the date that I gave you before, which I simply took by looking at this other exhibit.

Q. So what you just indicated was that it was the large autoclave that was destroyed in the explosion?

A. Right.

Q. There is also reference to July 13, 1954, to the first batch being steam stripped. I take it that refers to the steam stripping process we discussed earlier?

A. Right.

Q. There is an additional reference to October of 1954 and 2,4,5-T production. Was that the first time that Diamond produced 2,4,5-T?

A. No. Under the dilution process, we didn't -- the direct sodium salt was not applicable.

Q. For November of 1954, there is a

reference to there being no production. Do you recall the reason for not having any production at that time?

A. No, but this is -- I'm surprised it's even entered in here because in terms of sales and production planning, there would often be periods where we would shut down production because we foresaw we had too much inventory.

Q. There is a reference in January '55 to use of the Badger still as a steam stripper. Was Diamond using something other than the Badger still as a steam stripper prior to January of 1955?

A. Apparently so, but this is something I don't remember. I had thought we were using the Badger still all the time but from this, obviously we were not.

Q. Was there any particular significance to the use of the Badger still as opposed to some other vessel?

A. No.

Q. There is also reference to March 1955 and April 1955 of rupture disk failures. Do you recall rupture disk failures in 1955?

A. I recall one of them, yes.

Q. Did that --

A. I recall it happening at one time, but I don't remember when.

Q. Did the failure that you recall involve an actual explosion?

A. No.

Q. Did --

A. The rupture disk did what it's supposed to do, relieve excess pressure.

Q. Did that release of pressure involve the release of any gaseous or liquid material, to your recollection?

A. Yes, it would have relieved gasses and perhaps almost probably some liquid, too.

Q. Were the gasses released into the process building?

A. No.

Q. Where would they have been released?

A. The rupture disk line was vented to a pipe that led over the edge of the riverfront, so in effect, it would be released toward the surface of the river adjacent to the plant.

Q. How far above the surface of the river

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would the gasses have been released?

A. I don't remember.

Q. Is this a vent that came out of the side of the process building, as opposed to the roof?

A. It would come out the side of the building and then face down toward the river, in other words, the place that would seem to be least likely of any problems for anything vented out.

Q. Where would the liquid have ended up if the liquid was released?

A. In the river.

Q. Would it have escaped through some sort of release pipe?

A. The rupture disk, yes, was connected to a pipe and this is a pipe that in turn led to the edge of the river.

Q. So the liquid would have left the autoclave in the same manner as any gasses?

A. Right.

MS. COOKE: Off the record.

(Whereupon a discussion took place off the record.)

THE WITNESS: Thinking further about

this pipe, I said it bent down toward the river. I don't think it did. I think it ended up facing horizontally toward the river.

(Whereupon a discussion took place off the record and a recess was taken.)

CROSS EXAMINATION BY MR. SHEFT:

Q. Mr. Burton, good afternoon. My name is Peter Sheft. I'm an attorney with the firm of Sheft, Wright and Sweeney. I represent certain underwriters at Lloyds and certain companies, certain foreign insurance companies.

I would like you to take a look at Burton number three, which has been previously marked and identified. This is a memorandum that you authored dated April 4, 1960. Mr. Burton, do you have any recollection of what precipitated this memo, what the basis of it was?

A. No.

Q. Can you define for me what is meant by an effluent?

A. All of the liquid discharges from the plant.

Q. We are speaking of discharges from the

Lister Avenue plant?

A. Right.

Q. So this memorandum --

A. More commonly, the word would not include something like cooling water. Commonly it's thought of in terms of things that might have some contamination or other problems.

Q. What do you mean when you say the word "contaminated"?

A. Have any chemicals of any kind in them.

Q. Would that also include toxic substances?

A. Yes.

Q. And there were toxic substances which were discharged into the Passaic River from the --

A. In the broad context of toxic, yes.

Q. What do you mean by "the broad context of toxic"?

A. I mean they weren't necessarily toxic. It wasn't necessarily toxic to any materials in the river. They could be toxic, for example, if ingested, but --

Q. Ingested by a human being?

Burton - cross

A. Yes, or ingested by anything.

Q. What type of substances would those be?

A. The most --

Q. I'm referring specifically to discharges from the Newark plant into the Passaic River.

A. The principal one in terms of toxicity would be the chlorophenols, more specifically the 2,6 dichlorophenol.

Q. And this was an effluent. Where did the 2,4,6 chlorophenol come from?

A. It was a by-product of making 2,4-D acid.

Q. In addition, were there by-products of the 2,4-T operation that were also discharged into the Passaic River?

A. Yes, although relatively minor in amounts.

Q. And what were those by-products?

A. We don't know precisely because we never analyzed the impurities connected with trichlorophenol. There would be some of the 2,4,5 trichlorophenol itself and in connection with

that, and in connection with 2,4-D, there would be some 2,4,6 trichlorophenol and there would probably be minor amounts of various chlorinated phenols that I wouldn't know specifically what and in what amounts, but the biggest single one would be this 2,6 dichlorophenol and the second biggest one would be probably 2,4 dichlorophenol.

Q. You had testified earlier that the discharges also included Dioxin. Is that correct?

A. Only because not that we ever analyzed it, but just by the nature of the fact we knew we were producing them and logically, from a technical point of view, some of these would be carried, for example, over to the -- in the anisole and some would go into the water layer, where the anisole was separated from the water layer and the water layer, in turn, discharged to the river. Some were probably carried on into the 2,4,5-T acid step and discharged as waste water during that operation, but this is all just theoretical estimation.

Q. So is it fair to say, then, in each of these steps that you just referenced in your answer, these by-products included Dioxin?

MR. COX: I object to the form of the question as to what is fair to say.

Q. Can you answer the question, please.

MR. COX: The question is is it fair to say this.

MR. SHEFT: Excuse me, Mr. Cox, would you let the witness answer the question.

MR. COX: I want the witness to understand the question, which is silly.

MR. SHEFT: If the witness doesn't understand the question, he can say so on the record.

A. I will answer it this way: In my opinion, from a technical point of view, it is probable that there were some amounts of Dioxin discharged.

Q. And those discharges came from where, Mr. Burton?

A. From the trichlorophenol and 2,4,5-T acid manufacturing steps.

Q. And those were discharges into the Passaic River. Is that correct?

A. No, only prior to the connection in, when was it, 1956 or whenever to the city sewer.

Burton - cross

After that, discharges from the 2,4,5-T acid section would have gone to the city sewer.

Q. You also mentioned another area where Dioxin was a possible by-product that was discharged.

A. From the trichlorophenol operation itself.

Q. Right.

A. That, in turn, would always have gone to the river.

Q. That would have always gone to the river?

A. Right.

Q. Even after 1956, when the sewer connection was hooked up?

A. Right.

Q. And that discharge continued through 1960, when you left the plant. Is that correct?

A. Right.

Q. Mr. Burton, just bear with me for a second. It wasn't until 1956 that there was a sewer connection with the Passaic Valley Sewerage Commission. That's correct, right?

A. Whatever I gave before.

Burton - cross

Q. That's what the memorandum says.

A. Okay.

Q. And that hookup was not made until that time, you testified, because it wasn't until that time that the Passaic Valley Sewerage Commission caught you. Is that correct?

A. Correct.

Q. Caught you in discharging waste into the river. And I believe you also testified earlier that from the time that you began your employ at Kolker Chemicals through your employ at Diamond Shamrock, there were regulations promulgated which made it illegal to dispose of any substances into the Passaic River. Is that correct?

MR. COX: I object to the form of the question. He testified to whatever he testified to. Why don't you go ahead and ask him a question instead of did you testify to something. Obviously, he testified to whatever is on the record. Why don't we get ahead and ask him a real question.

MR. SHEFT: I will conduct the examination as I see fit, Mr. Cox.

Burton - cross

MR. COX: You are wasting our time and you are wasting the witness's time.

MR. SHEFT: That may well be. Bear with me.

Q. Would you answer the question, please, Mr. Burton.

MR. SHEFT: Would you please read it back to him.

(Whereupon the record was read.)

MR. COX: Do you believe that's what he believes, sir.

MR. SHEFT: Please stop coaching the witness.

MR. COX: I don't have to coach the witness. Your question starts off "I believe," "is that correct." How does he know what you believe is correct?

MR. SHEFT: That wasn't the question.

MR. COX: That's the way it was read.

Q. Would you answer the question, Mr. Burton, please.

A. To the best of my knowledge, that is correct.

Q. So Diamond Alkali was never caught

Burton - cross

until 1956 by the Passaic Valley Sewerage Commission. That's correct?

A. Correct.

Q. And who at Diamond made the decision to dispose of effluents and other by-products into the river from 1951 through 1956?

A. The decision as such was never made. When I came to work for Kolker in September 1949, these materials were being discharged into the river and when Diamond bought the plant, we continued to do it.

Q. It was just a matter of custom and practice, in other words?

A. Right.

Q. And that custom and practice was in violation of applicable law. Is that correct?

A. Yes.

Q. The memorandum also makes reference to the New York Harbor Commission. The memorandum states the New York Harbor Commission was also interested in keeping it free from strong acids as a safeguard to shipping. Do you have any recollection of that?

A. It rings kind of a faint bell but

nothing specific. That might have been connected with the Army Corps of Engineers, who had the same kind of interest.

Q. Do you have any recollection whether or not the Passaic Valley Sewerage Commission ever fined Diamond Alkali for any discharges into the river?

A. I have no such recollection.

Q. The last sentence of the second paragraph says that in the past year or two, the PVSC, I assume that means the Passaic Valley Sewerage Commission, has apparently been making more efforts to clear these up. Was that with reference to contamination in the river?

A. Yes. It refers to references everywhere in the river because there were a number of people violating, clearly violating the regulations.

Q. The third paragraph, the first sentence, states "As I recollect, the official rules by the sewer department of Newark are that no material be put into the city sewer unless it is neutral and pretty free of chemicals."

Was the sewer department of Newark a

Burton - cross

separate and distinct entity from the Passaic Valley Sewerage Commission?

A. Yes, in the sense that when we put the sewer line out to the Lister Avenue sewer, I had to get approval from two departments of the City of Newark, one was some branch of the health department and one was a branch of the engineering department.

Q. What I'm trying to ascertain is whether or not the Passaic Valley Sewerage Commission was a separate sewage authority from the Newark city sewerage department.

A. Yes.

Q. And when you were hooked up, when you made your connection on Lister Avenue to the sewer system, were you connected to the Newark city sewer?

A. I'm not sure on this. My recollection is somewhat vague but I understood we were connected into a so-called industrial sewer, which apparently in some form was under supervision of the City of Newark and yet the overall responsibility for the whole sewerage in that section of New Jersey was the responsibility of

the Passaic Valley Sewerage Commission.

Q. I understand. Thank you.

The next sentence says, "We checked our particular Lister Avenue branch before we connected to it, however, and found a variety of acids and chemicals which were actually being put in it."

Where were these acids and chemicals coming from?

A. From other chemical plants. See, my point was that the materials that we were putting in under the regulations of the health department would be illegal. But on the other hand, it was like the 55 mile speed limit, everybody was doing it. So that I had samples taken prior to our connection and stored for future reference, if needed, so that if I was challenged that we were illegally putting contaminants in the sewer, I could at least point out that lots of other people were doing it before us. In other words, it was common practice.

Q. So Diamond Alkali was discharging contaminants into the sewerage?

A. In terms of the regulations of the

health department -- I say health department, I'm not sure that's the right department, but in my mind, it was connected at least with the health department.

Q. And Diamond's discharges were not in compliance with the applicable regulations at that time?

A. Right.

Q. And was Dioxin also discharged into the sewer from the plant?

A. Going back to what we said before, I would presume that small amounts, and this might well have been amounts that were toxicologically insignificant, would have been discharged as a by-product of the 2,4,5-T acid or 2,4,5-T ester operations. But this is speculation.

Q. The top of page two of the memorandum, the first sentence indicates that "All of our unsold muriatic acid is dumped in the Passaic."

Was that true on April 4, 1960, when you wrote this memorandum?

A. Yes, except the plant was shut down from February 20th to some indefinite period, but it was true up to the time when the plant was shut

down because of the explosion.

Q. In 1958, the memorandum indicates 2,000 tons of muriatic acid were dumped into the river. What would the commercial value of that product have been at that time, that amount of product?

A. It was selling somewhere between $20 and $30 a ton. Although we had a contract made at some time to take some at $16 a ton, but I thought that was on the basis they had to take everything, but obviously, they didn't, since we dumped both in '58 and '59.

Q. Why did you dump, was there not a commercial market for this amount of product?

A. Right. Generally speaking, at that time, in the Newark area, hydrochloric acid was a surplus commodity.

Q. Would it not have been considered a surplus product in another part of the United States?

A. Right, in some parts of the United States, such as in the southwest, they were manufacturing it.

Q. For sale at $20 or $16 a ton?

Burton - cross

A. I don't know what the prices were in different parts of the country.

Q. You go on to say that "incidentally, this may seem like a large amount." Was this a large amount of product in terms of its volume?

A. A pound of muriatic acid weighs-- I'm sorry, a gallon of muriatic acid weighs about ten pounds or nine pounds, so you can calculate, if you want to, what the gallonage was.

Q. Would you consider that to be a significant quantity of product?

A. Yes.

Q. 2,000 tons? Yes?

A. Yes.

Q. You go on to say, "As I indicated before, this may seem like a large amount but the flow in this river is very large and we get no apparent corrosion in our cooling water system, even though our river water pump intakes are located between our points of dumping muriatic." Did you have a concern, was it your concern that this discharge of acid was corroding your pipes?

A. I don't recollect specifically except obviously, if we are putting acid in the river and

at the same time, taking water out of the river and pumping it through iron pipes, it's something to think about.

Q. The same pipes which --

A. Not the same pipes.

Q. Could you explain, then?

A. Let's see what I said here. It's the by-product, muriatic acid, the principal point of discharge of surplus muriatic was maybe 40 or 50 feet upstream from where we took cooling water from the river. Another point where we would have occasionally discharged but not often would have been maybe 30 feet downstream from where we took out cooling water.

Q. So with reference to the discharge of muriatic acid above the pipes, upstream, did you --

A. And this stream flowed both ways. It was on tidewater, so it flowed in and out.

Q. So in either direction, given the predictable tide, did you have a concern that the acid in the river might, when mixed with the water which was pumped from the river into the pipes, might cause corrosion?

Burton - cross

A. We had a concern but the evidence indicated that the dilution was so great that nothing was happening.

Q. The next paragraph references discarding approximately 400 tons of 2,4-D per year. Where was that discarded? How was that discarded and where did it wind up?

A. This would be discarded as a liquid effluent from the 2,4-D building.

Q. Into the river?

A. Until the time when we put in the connection to the discharge in the sewer.

Q. What would be the gallon equivalent of 400 tons of 2,4-D?

A. It's hard to estimate, but I would say it might be on the order of one to two million gallons a year, even though it would be present in a diluted form in the water solution.

Q. I'm sorry, so if the tonnage were undiluted, would it be one to two million gallons?

A. No, if it were undiluted, this material weighs about -- I think about 12 pounds per gallon.

Q. So when mixed with water, it would be

one to two million gallons?

A. Yes, thinking of the normal amount of water that would be associated with it.

Q. As an effluent?

A. Yes.

Q. And up until 1956, that was just discharged into the Passaic River?

A. Right.

Q. And subsequent thereto, it was discharged into the sewer system?

A. Right.

Q. The next paragraph references the disposal of acidic effluent from our Chloral sulfuration operation. Is that correct?

A. Right.

Q. To either the city sewer or the river. I assume this referred to the time period in 1960?

A. I didn't hear the last part.

Q. I'm sorry. Did this refer to the time period of 1960, the disposal of this particular effluent?

A. Yes. This went on up until the plant was shut down.

Q. What would determine whether it would go to the sewer or to the river?

A. Actually, this point surprises me and maybe contradicts something I said once before in some previous testimony today, that I did not think we had a connection from the main building to the city sewer but I wasn't sure. When I said it would go either to the city sewer or the river, this indicates that we did have such a connection, which I don't remember, but at this time, I would have certainly remembered about it.

Q. This was --

A. So we probably --

Q. This was an effluent from the main building?

A. Yes. So we probably had a pipeline that sometimes we pumped effluent from the main building over to the 2,4-D building and in turn into the city sewer.

Q. But otherwise, you just pumped it into the river?

A. Otherwise, it would flow by gravity into the river.

Q. When would you do one rather than the

other?

A. I don't know. The river was so convenient to the main building and we were already putting in lots of acid contaminations that I am surprised at reading this that we had apparently took the trouble to pump it over to the 2,4-D sewer. At this point, I can't understand why we would do it.

Q. Because the river was more convenient?

A. Right.

Q. The next paragraph references the 2,4,5-T effluent and you say that it is only approximately one quarter of the amount. What do you mean by that, do you mean the amount that was dumped, disposed of?

A. Yes. At this point in time, it seems to me to be less than a quarter.

Q. What would that be in terms of gallons?

A. I don't know. I hate to answer the question on either the gallons of the 2,4-D effluent or 2,4,5-T effluent because to give an answer really meaningful, I would have to do quite a bit of speculation and calculation.

Q. I appreciate that, but could you just give me your best estimate?

A. To use the numbers here, I said the equivalent of 400 tons of 2,4-D, so now, based on my memo, we are now talking about, apparently, 100 tons of 2,4,5-T waste, which is 200,000 pounds, and this might be on the order as much as -- as low as a tenth of a pound per gallon, so we might be talking anything from half a million gallons to two million gallons a year.

Q. That was discharged on an annual basis?

A. Yes.

Q. The next paragraph states that "the above represents the major contaminants, although at various times, we have spills or special products which involve additional contamination problems."

At this time, you considered the foregoing effluents to be major contaminants. Is that correct?

A. Right.

Q. Do you have any recollection of what the spills or special products were which involved

additional contamination problems?

A. At times, we were making what Diamond called specialty chemicals, which were -- we were trying to get into the market on some other products and since we were basically involved in chlorination or chlorosulfonation operations, most of those would be acidic by-products. At this point, I don't remember the specific names of any of these chemicals but that would be the type of thing that would be involved in the special products.

Q. How would those special products involve additional contamination? How would those special products involve additional contamination problems?

A. There were very, very few chemicals that I can think of that you make without involving some effluents that have some degree of contamination, either the product itself or a by-product. So as a general principle, unless you take steps to clean up the effluent, you are going to have contaminated effluent. Without even remembering the specific products, I can state that as a general truth.

Q. You also reference spills. Were these spills that occurred during the ordinary operation of the plant?

A. I don't remember any particular spills but in a plant where you have a hundred tanks and a lot of operations going on, there is bound to be one now and then. I don't remember at any time any specific spill.

Q. These would just occur as a general practice of operations. Is that correct?

MR. COX: These spills he doesn't remember, yes.

MR. SHEFT: Thank you, Mr. Cox.

Q. As a general practice, spills did occur as part of the general operation, spills or leaks?

A. It's recognized as something that is apt to happen. It perhaps most commonly happens when an operator gets careless and pumps more material into a tank than the tank will hold and something spills out the top and before he sees it, you have a spill because some of that material has gone onto the floor or wherever it is, or it can happen -- another common way of it happening,

if a pipeline develops a leak and an operator is pumping material from one tank to another and a leak appears in the pipeline and before he sees it, some material has spilled onto the floor.

Q. Thank you.

Your last paragraph says, "My suggestion on handling the muriatic effluent is to try to get sales to make commitments whereby we sell it all even at a lower price." Was that statement made by you in order to prevent the further dumping of acid into the river?

A. Yes. This was always sort of a perpetual argument between myself as production versus the sales department. I wanted to sell at any price and they resisted because that would break the market price and cause a price war.

Q. So in other words, for pricing strategy, it would be more effective sometimes to dump it in the river rather than to sell it. Is that correct?

A. Right.

Q. The last sentence says, "If we have to improve our phenolic effluent handling, my suggestion would be to segregate and separately

discard the concentrated phenolic effluent and to blend, neutralize and discard to the city sewer the remainder of the phenolic effluent."

Could you explain that to me, please?

A. This phenolic effluent, the chlorophenols are basically toxic materials in terms of skin contamination or ingestion and have a very bad smell, to boot. So in all ways, they are bad chemicals.

But it is -- it would be possible to do what I said here, to take this 400 -- the molecular weight equivalent of 400 tons of 2,4-D would be maybe 350 tons of dichlorophenol. It would be possible to separate that out as 400 tons at -- I forgot, around maybe 12 pounds per gallon, and have that limited number of gallons to be disposed of.

Q. Why was that not done? Was that ever done, to the best of your recollection?

A. No. Incidentally, it was a common problem with most 2,4-D producers.

Q. How do you mean?

A. Thompson Chemical, for example, their effluent all ran into the Mississippi and

eventually, they were closed down because of that. Hercules ran into -- I forget the name of the river they were on. Dow, to the best of my knowledge, treated theirs and I think Monsanto did, too. But I just want to make the point that this was a common problem in making 2,4-D.

Q. But it was something that could be remedied. Is that correct?

A. Yes.

Q. And it wasn't done?

A. It was always a question of economics and we did make sometimes some estimates of the cost of doing this operation differently, which would at least reduce the volume of these, but the estimated cost always appeared too high to be economically justified.

Q. So in other words, it was just easier to dispose of it in the sewer or the river?

A. Right.

MR. SHEFT: Do you want to adjourn until the third? Thank you, Mr. Burton.

C E R T I F I C A T E

I, GARY M. TALPINS, a Notary Public and Certified Shorthand Reporter of the State of New Jersey, do hereby certify that prior to the commencement of the examination, JOHN BURTON was duly sworn by me to testify the truth, the whole truth and nothing but the truth.

I DO FURTHER CERTIFY that the foregoing is a true and accurate transcript of the testimony as taken stenographically by and before me at the time, place and on the date hereinbefore set forth, to the best of my ability.

I DO FURTHER CERTIFY that I am neither a relative nor employee nor attorney nor counsel of any of the parties to this action, and that I am neither a relative nor employee of such attorney or counsel, and that I am not financially interested in the action.

Gary M. Talpins, C.S.R.
License No. XI00561

T & T [illegible] - 5

Contract			Earnings
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[illegible]			61, 63
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77 - [illegible]

BURTON - 1 ID
3/18/87 [illegible]

MAXUS1069011

MAXUS1069012

August 8, [illegible]

Mr. John Bre[illegible]
Hoffman Laboratories
[illegible] East First Avenue
Roselle, New Jersey 07203

Dear Jack:

This is to confirm the important points I brought up yesterday at the meeting in Springfield regarding safety in the manufacture of 2,4,5 trichlorphenol.

There are two main problems. An impurity often formed in the manufacture of TCP causes chloracne among exposed workers. Also there have been about five serious accidents when excess pressure developed in TCP autoclaves causing rupture of the autoclave or its connection.

The chloracnegen is believed to be 2,3,7,8-tetrachlorodibenzo-p-dioxin. I have been indirectly told that Boehringer and Badische have identified this as the chloracnegen; this matches the information you received from Dow. Badische reported that injection of 5 micrograms per kg. of body weight is lethal to rabbits. I suggest you use your gas chromatograph to check for the presence of this in samples of your laboratory product, including samples of batches from the autoclave, and samples of the same batches after purification. I am quite certain that the chloracnegen can be formed both in the autoclave and in processing the autoclave batches. Because of the extreme toxicity of this chemical, even laboratory work must be done with extreme caution.

Badische reported that the above compound is formed by the reaction of 2 mols of NaTCP, splitting off 2 mols of NaCl. Boehringer also reported the above compound was the culprit. Both Boehringer and Dow had previously reported that chlorinated diphenyl ethers having 3 or 4 Cl atoms were chloracnegens, with Boehringer's data indicating that the dioxine was 10 times as reactive as the diphenyl ether.

Information that I have received from several sources indicates that 160°C is the maximum temperature in the autoclave to avoid formation of the chloracnegen there. I feel strongly that you should drop your proposed 170-180°C autoclave

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MAXUS1069013

temperature to 160°T to avoid undue lengthening of the autoclave time. I suggest you try increasing the NaOH to 2.5-3.0 mols NaOH per mol of tetra. I believe the increased NaOH does not promote chloranegen formation.

I am not certain about the effect of varying the quantity of methanol. In general, there is some evidence favoring the use of generous amounts of methanol. I mentioned one figure that was given me by a manufacturer with a good safety record in TCP, they suggested a minimum of 1 gal. methanol per 7.2 lbs. of solids. Unless you develop further information on this point, I suggest you use this ratio. It would be helpful to run some lab experiments with the solids/methanol ratio as the only variable to determine how the amount of methanol affects the reaction rate and the autoclave pressure. To me, it seems likely that with your continuous feed of tetra, a high methanol ratio may slow up the reaction appreciably and, in terms of safety, the importance of methanol in excess as a diluent is diminished in the continuous feed method.

Although I have had no experience with it myself, continuous feed of tetra seems highly desirable as a general principle in order to diminish the chances of a runaway reaction. Also, as we have both been informed, Montsanto has had successful experience with it. On a plant scale, the continuous feed of one reactant also eliminates the delicate and risky problem of heating up the batch to the operating temperature without initially overshooting the desired temperature because of the exothermic reaction.

I can't say that your tentative plans to strip off the methanol, rectify it and strip off the anisole all in one combined operation would not work. However, unless you have time to work out the details thoroughly on a lab scale, I think it is safer to do these three operations in three separate steps.

First I would distill off most of the methanol at atmospheric pressure without rectification. Then I would add some water and distill off most of the remaining methanol. It may be desirable from a practical viewpoint to save this last water-methanol solution and recycle it to the next batch at this same point so as to decrease the amount of water in the methanol to be rectified. From a safety viewpoint the objectives are to keep the temperature at 110° max. and to avoid letting the slurry get so thick that you would have any local overheating of the solids due to poor mixing. You may find it more practical to leave some methanol in and let it be lost in the next step.

The wet methanol - probably 80-85 - would then be rectified in a separate rectification unit. The aqueous bottoms from this would be fed to the anisole stripper or used as part of the water addition to the methanol still.

After removing all or most of the methanol, add water (presumably recycled from the anisole receiver or methanol rectifier) to dilute the batch to 35-40 TCP. Distill off a water-anisole mixture, adding more water as needed to maintain a maximum of 40% strength in the still pot, until no more anisole appears in the distillate. This condenser will have to be kept warm to prevent the trichloranisole from freezing and I expect most any methanol present will go out the condenser vent. The maximum safe temperature in this still pot is also reported a 110°, although 120° may be safe. It will probably be necessary to do this anisole stripping under some vacuum in order to limit the pot temperature.

In both the methanol still and in the anisole stripper, be careful about having the jacket or coils extend above the liquid surface so as to avoid overheating and drying out of liquid splashes.

The recovered anisole can be recycled to the tetra feed tank or direct to the autoclave for subsequent batches. I think it would be better to charge uniform amounts to each autoclave batch. If any chloracnegens are present in the anisole stripper, they will probably be steam stripped out and be in the recovered anisole. Therefore, (contrary to what we decided yesterday) I think it might be better to put the anisole directly into the autoclave instead of drying it, heating it and putting it in the tetra feed tank.

The recovered anisole will be a good point for routine analysis for the presence of 2, 3, 7, 8-tetrachlorodibenzo-p-dioxin for which you have the gas chromatograph procedure. If any of the chloracnegen is found here, then samples of the batches from the autoclave and from the methanol still should be checked to locate the source of trouble.

The product from the anisole stripper should have the insoluble salt filtered from it, then diluted to the shipping strength and stored for shipment. The presence of dissolved salt is no handicap when making 2, 4, 5-T acid from TCP, but it is a nuisance if it settles out and plugs lines and if there should be any chloracnegens present, clearing out such plugs is apt to be a hazard if done carelessly.

Most of my information on the safety problem in TCP manufacture was acquired directly and indirectly, from Monsanto, Pittsburg Coke and Chemical, C. H. Boehringer and Badische and of course my own experience at Kolker Chemical and Diamond Alkali Co. However, after comparing all of this data, I can offer it only as the best advice I have to offer, prior to actual operation

of your plant I assume you will duplicate the proposed operation as closely as possible in the lab and will verify by gas chromatographic analysis that your process will avoid formation of chloracnegens. Gas chromatography was not available when I was involved in this work. By rabbit ear tests, my results generally confirmed the data I received from Germany, but there were occasionally contradictory test results which I had to assume were errors in the rabbit ear test itself.

I have heard recently that Diamond has found the tetrachlor dioxin in at least some of their product and plan to remove it with activated carbon. It seems to me it would be well for you to check this in your lab and be set up in the plant to use this treatment when and if needed, although I am quite hopeful that you will be able to avoid its formation. From various rumors I hear about the sloppy Diamond operation, I am not surprised that they have it present.

Best regards,

John Burton

JB/ls
CC: Mr. J. Rundell

Mr. [illegible] Weiner

April 4, 1960

Mr. J. Burton

River Contaminants, and
Your Memo of March 31st

cc: R. Steinmetz
L. P. Scoville
E. C. Sutter

C O N F I D E N T I A L

The complete story of our various effluents and our disposal history is pretty long and complicated, but I will give you a rough outline below as a starter. To get more accurate measurement and composition data on these, will require some time and engineering and lab work. Please keep me posted as to the amount of this which you may wish to do.

Until approximately 1956, we disposed of all our plant effluents into the Passaic River. Approximately 1956, the Passaic Valley Sewage Commission (PVSC) officially objected to our polluting the river, and we spent approximately $15,000 for a sewer connection to the Newark city sewer. Since that time, we run some of our effluents to each of these outlets. The ruling on the Passaic River is that no materials should be put in it which are not as pure as the river itself. PVSC does the spot inspection approximately once a month. The New York Harbor Commission also was interested in keeping it free from strong acids as a safeguard to shipping. I believe the Coast Guard is the official inspecting agency on this. Approximately once a year we get a very fast check by them, looking for acids only. The Passaic River is seriously contaminated at present by other industries, particularly in regard to oil effluents. In the past year or two, PVSC has apparently been making more efforts to clear these up.

As I recollect, the official rules by the Sewer Department of Newark are that no material be put into the city sewer unless it is neutral and pretty free of chemicals. We checked our particular Lister Avenue branch before we connected to it, however, and found a variety of acids and chemicals which were actually being put in it. I believe this is fairly common throughout Newark, although I have had the feeling that we might at some time have to separate out or neutralize our strong acids and perhaps the bulk of our phenolic materials. My impression is that the city sewer is a pretty good bet for getting rid of modest amounts of chlorophenols which otherwise would be serious contaminants in rivers, etc.

All of our unsold muriatic acid is dumped in the Passaic. The Sales-Production-Inventory schedule will show our current figures on this. In 1958 we dumped 2000 tons; in 1959 we dumped 1400 tons. Incidentally, this may seem like a large amount, but the flow in this river is very large and we get no apparent corrosion in our cooling water system even though our river water pump intakes are located between our points of dumping muriatic.

We produce approximately 2000 tons of 2,4-D per year with a yield slightly less than 80%. This means that we discard approximately the molecular weight equivalent of 400 tons of 2,4-D per year. I would guess that at least three quarters of this is in the form of 2,6-dichlorophenol, 2,4-dichlorophenol, and 2,4,6-trichlorophenol. Considering molecular weights, this would be approximately 110 tons of chlorophenols. I would guess we lose 50 tons of 2,4-D acid, 2,4-D sodium salt and 2,4-D esters. The pH and concentration of these different streams varies. If we were to undertake an effluent treatment system, we could concentrate most of the chlorophenol effluent to a relatively small ~~[illegible]~~ volume.

COPY

We discard the acidic effluent from our chlorosulfonation operations to either the city sewer or the river. This effluent contains dilute sulfuric acid and/or dilute muriatic acid together with small quantities of sulfuryl chlorides, etc. I do not have even good guesses at hand on the quantities of this, but it is much smaller in acid content than the muriatic acid, and much smaller in organic content than the 2,4-D effluent.

The 2,4,5-T effluent is generally similar to 2,4-D, but is only approximately one quarter the amount. The effluent would consist of mostly trichlorophenols with some 2,4,5-T acid and 2,4,5-T esters.

The above represents the major contaminants, although at various times we have spills or special products which involve additional contamination problems. The "unimportant violations" are minor quantities of slightly dirty liquids which we sometimes get from washing down the floors near the river or the river front. I call them "unimportant" because overzealous inspectors sometimes comment on slight signs of poor housekeeping at the river front even though it is pretty obvious spills from them would be cleaner than the often dirty-looking river itself.

My suggestion on handling the muriatic effluent is to try to get Sales to make commitments whereby we sell it all even at a lower price. If we have to improve our phenolic effluent handling, my suggestion would be to segregate and separately discard the concentrated phenolic effluent, and to blend, neutralize and discard to the city sewer the remainder of the phenolic effluent.

100

J. Barton

JB:jp

CONFIDENTIAL

259265

Diamond Alkali Company

INTER-OFFICE CORRESPONDENCE

October 12, 1959

TO: Mr. P. J. [illegible]

FROM: Mr. J. Burton

SUBJECT

W. [illegible]

cc: Mr. R. A. Guidi

Thornton Holder visited the Boeringer plant recently and checked on their experience with chloranane. They had had a serious problem, and had done extensive checking on the problem.

They recommend:

1. Reaction temperature should not exceed 170°C. max.

2. Methanol distillation should not exceed 110°C. They strip off the last bit of methanol with steam.

3. The steam distillation should not exceed 110°C. max.

All of the above roughly checks our own tests and confirms the importance of careful control on these temperatures.

J. Burton

JB:[illegible]

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BURTON-4 ID
3/18/87

MAXUS1069019

July 6, 1955

Mr. J. J. Burton - Newark

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I have just received and read Mr. York's report on his visit to your plant on June 23. I have also reviewed Bert Ingley's file in connection with Mr. Renner which contains the letter correspondence as well as letters from Dr. James.

I am very much concerned about this whole problem as I am sure you are. I feel that it is something we can not allow to continue, and we must take positive action as rapidly as we can. Since I am leaving for a vacation the end of this week and I do not feel that action on this matter should be put off, I am requesting Bruce Gleissner to work closely with you in arriving at some plan of action. My suggestions to you at the moment would be for action something along the following lines:

1. Discontinue Mr. Renner's employment. (This, however, is not to be done until cleared with Don Carmichael.) In connection with this, we should, of course, be fair to Mr. Renner, and if he is able, find him another job where he would not be subjected to chlorinated products, preferably arranging a transfer to another Diamond plant such as Kearny or Jersey City.

2. Get the Industrial Hygiene Foundation in to survey our plant. This work by them should be done on as quiet a basis as possible without any fanfare so that the men at the plant will not become unduly alarmed. I would assume that we would wish them to do analytical work on the atmosphere at various locations in the plant, survey the bad actors as far as our chemicals are concerned, and make recommendations to us for improved ventilation and/or changes to equipment which would remove the cause of the trouble.

3. Obtain all possible information from other companies such as Monsanto or others handling chlorinated phenols.

4. After we have received their report and find that we can take action to remove the cause of the trouble, it may well be that we will wish to refer a case to Dr. Salsburger as recommended by Dr. York.

The above are merely my thoughts at this time in connection with a line of action. We would, of course, wish to have you head up any work to be done and would want to outline a program that had your full concurrence. It is for this reason that I have urged Dr. Gleissner and Bert Ingley to visit your plant and go into this problem with you in detail at the earliest possible opportunity.

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L. P. SCOVILLE

LPS:md

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MAXUS1069020

TO: Mr. Jeffreys DEPT:

	ADVISE ACTION		FOR YOUR INFORMATION
	FOR PROCESSING		RETURN

MEMO

We requested Mr. E.Zilocchi, the second employee of Melos Electric to present himself for examination, but he did not appear at neither first or second request. We are covered by "hold harmless" clause on purchase order, but wanted him examined.

Jean Padelsky, Secy to J.Burton & R. Guidi

FROM

DACO 268

Burton-6 ID
3/18/87
[illegible]

202508

55777

Diamond Alkali Company

INTER-OFFICE CORRESPONDENCE

DATE 3/25/65

TO JOHN CORT, JR. ✓

FROM E. L. CHANDLER

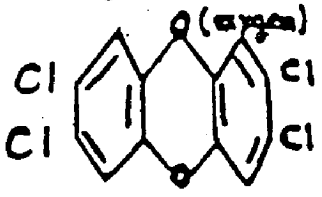
SUBJECT: CHLOROACNE - DOW MEETING

REPLY RECEIVED BY (DATE)

cc: F. R. Kennedy - Mgr., Newark plant
J. O. King
M. F. Wilkerson

On March 24, Mike Kennedy and I met with two people from Hooker Chemical Co., two from Hercules, and with the Dow group to discuss the toxicological impurities associated with 2,4,5 trichlorophenol and related materials.

Dr. Rowe of Dow Chemical opened the meeting by stating that they had operated for 25 years without trouble; but, in the last year, they had 60 to 70 cases of chloroacne. Ten of these were moderate, and five to ten were extremely severe. Their approach was a qualitative one at first. They wanted to find the causative material, learn how to identify it, and try to avoid continual trouble with the unknown. They tested various materials from tar fractions and from, as they put it, "gunk", etc. They found that there are a number of suspect materials, probably 26 or 27; but the major "bad actor" that they identified and which seemed to consistently cause the problem was 2,3,7,8-Tetrachlorodibenzo p-Dioxin (symmetrical



→ 2,3,7,8-TETRACHLORODIBENZO p-Dioxin (Symmetrical)

This incidentally was previously listed as a suspect material by Cy Perkins of our company. A similar material is the unsymmetrical 1,3,7,8-TCDBD, also sometimes listed as 2,3,7,9-TCDBD.

The Dow people used the white glove approach and found this contaminant on tool handles, benches, instruments, and other fomites. In test animals, they could consistently cause the symptoms to appear. Dr. Holder of Dow, one of their medical doctors, had excellent color slides of the various patients. The difficulty starts with multiple blackheads resulting in closed cystic structures which make the patient look like he needs to wash his face. The disease develops slowly, not appearing until six weeks to two months after mild exposure but appearing in five to seven days with very heavy exposure.

One bench chemist has been under treatment for two years and his face is starting to show signs of clearing. Dr. Holder says that he believes this man's problems will be solved in another six months. Dr. Sadek, who does their microscopic work in connection with their animal laboratory, showed photo micrographs of the cysts as they formed in the ears of rabbits. The cysts correlated with those found on the faces of the men.

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Basically, there is a carotinoid deposit in the hair follicles and oil ducts in the face. These eventually go from the blackhead stage to form a closed, heavy core deposit. The chemical cannot be found in the facial tissues or in the cores, but the problem still persists after exposure. The best description of the acute stage is that the facial tissues resemble the exaggerated surface texture of an orange rather glazed and marbly with the enclosed hard core deposits.

A secondary symptom, which does not correlate directly with the amount of facial dermatitis, is a fatigue reaction where the employee is completely listless, tired out, and nearly incapacitated. A complete biopsy of liver, kidney, etc., show no degeneration of major organs. A complete clinical examination of the patients showed no measurable affect on heart, blood pressure, respiration rate, blood sugar, etc. The fatigued patients seemed to be helped by heavy doses of vitamins, perhaps related in some way to the carotene metabolism of the body (involving vitamin A, etc

An oral dose of 17 micrograms immediately killed the test animals. The Dow people did not lower this dosage to obtain an LD_{50} but decided that, when they can detect this compound, it should not be in the product. They found that, after exposure to the material, washing within 15 minutes did not help a great deal, but did slow down the speed at which the symptoms appeared. Washing after one hour was of absolutely no help whatsoever in reducing total dermatitis or speed of appearance of the reaction. Moderate scrubbing with detergent does not remove this material. Extremely hard scrubbing can accomplish the task or the use of solvents, such as 1,1,1-trichloroethene.

Dow has developed a new analytical method in which they have confidence in their sensitivity to 1 ppm. They can only state in levels below this that some may be present below the 1 ppm. They stated that they have not used micro-colorimetric methods, and the electron capture tests that they ran made only a very slight improvement in sensitivity with this compound. Their analytical chemist stated that the electron cell saturates because of the presence of other materials in high concentration compared to the dioxin.

This material has some strange properties. It has a fairly high vapor pressure but nevertheless is quite persistent as a contaminant. It can be separated from benzene by boiling if it is not carried down to dryness. The Dow people are extremely careful in all of their work with this compound. They use PVC throw-away gloves, and all samples are burned in a special furnace which operates at 800°F. These samples are sealed before going to the burner. They use bioassay methods on rabbits for qualitative checking only.

The Dow people state that they intend to set a limit of zero with sensitivity of plus or minus 1 ppm on this material. They have analyzed materials from other companies, including our company, and have found amounts as high as 10 ppm in 2,4,5-T acid and 20 to 30 ppm in phenates.

They have made a single application to the ears of test rabbits and found that 20 ppm will not give folliculitis. Forty ppm does give a slight effect, and 100 ppm is severe. They have made repeat applications of from 10 to 100 ppb, and 25 of these treatments do not cause a response; however, 1000 ppb (1 ppm) gives a slight response with nine applications and a severe reaction with 11 applications.

They conclude, therefore, that 1 ppm with repeat exposure can create a real problem.

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Dow's people outlined a method for extracting and running samples on 2,4,5-T; 2,4,5-TP; and phenols. It involves a chloroform extraction, followed by

a caustic wash, and a reduction by boiling to one-tenth the volume before putting it in the chromatograph. They have given the gas-liquid chromatography method to us, along with analytical-grade dioxin material. Mike Kennedy has these materials and intends to pursue the laboratory work necessary to ascertain where and how much, if any, of this dioxin appears in our 2,4,5-T process.

The purpose of this meeting was obviously designed to help us solve this problem before outsiders confuse the issue and cause us no end of grief. Dow is sending the test results on our material to us, incidentally; and this will further check our technique, etc.

Sincerely,

E. L. Chandler

ELC:eem

CONFIDENTIAL

DATE: April 12, 1960

TO: Mr. J. A. [illegible]

FROM: Mr. J. Burton

SUBJECT: Meeting at [illegible] with [illegible] of [illegible] and Your Report of 4/5/60

cc: R. A. [illegible]
W. J. [illegible]
R. F. [illegible]
J. J. [illegible]
J. E. [illegible]
L. P. [illegible]
R. J. [illegible]
H. S. [illegible]

Thank you for the detailed report on this meeting. [illegible] visits to Monsanto, I am attaching my comments on various items in this report.

On Page 4, it appears that they are [illegible] on their batch #117 which blew a rupture disc. [illegible] of it in the report, but I wonder if this does not indicate [illegible] a substantial shortage of methanol in the batch so that the normal [illegible] vapor pressure did not develop. In turn, the absence of methanol could possibly have caused the abnormal reaction as I discussed in a separate memo to you.

Your report seems pretty specific that they did not have a rupture in their system at the time of their two bad batches. [illegible] too important, but this does contradict their direct statements to me which I checked again in my [illegible] notes, that at the time of their second bad batch they had a rupture in their vapor line. This [illegible] the bad TCP through a portion of the plant and their [illegible] came from their efforts to clean this up.

On Page 5, you mention that they use 3-1/2 moles of NaOH per mole mole of tetrachlorobenzene. I believe this may be an error since they told me they used approximately 2.5 moles. Also, the [illegible] caustic in the end of the reaction would indicate approximately 2.5 moles. On the other hand, I have had a preliminary comment from the plant that the sodium TCP we are purchasing from them has an abnormal amount of caustic in it. If we should go to their type of continuous reaction, we should [illegible] this point further.

The question of the best technique for a continuous operation is of primary importance. In my opinion, we should proceed [illegible].

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[illegible]

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[illegible] with this. Even though they have operated [illegible] with no trouble, this is no guarantee of safety. [illegible] had operated two years with our [illegible] prior to [illegible] to [illegible] mechanism [illegible] hand, there are certain other problems which we [illegible] before we can go to a continuous operation.

This report indicates that they charge all of the caustic and methanol and then continuously feed in trichlorobenzene. This checks with what they told me but I am still somewhat puzzled as to why they do not get an excessively dark color from the [illegible] large excesses of caustic present during most of the [illegible]. I had intended to try to develop this point further with them prior to the initial operation here. In spite of their apparently [illegible] cooperation, I prefer to think they [illegible] certain parts of their processes and [illegible] [illegible] [illegible] excessive caustic and I did not press it with them, since I thought I could find it out later under the right circumstances.

[illegible]

[illegible] [illegible] these conditions.

J. [illegible]

JB:jp

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Diamond Alkali Company

INTER-OFFICE CORRESPONDENCE

DATE [illegible], 1955

TO Mr. J. Burton

FROM Mr. J. J. [illegible]

SUBJECT. Chronological Listing of Process Development - 2,4,5-TCP

cc Mr. J. R. [illegible]

A chronological list of the process changes that have been instituted is attached.

Of particular interest is the series of failures of the rupture disc on the large autoclave in March and April 1955 concurrent with the 32° low reading on the temperature recorder. This combination may have introduced extreme amounts of chloracne producing materials in TCP stock. The storage tanks were very rarely emptied in this period since it was a production season. The impurities would then be mixed with normal material resulting in contamination of TCP solutions for several months coincidental with the major outbreak of chloracne cases in May-June of 1955.

Change of caustic ratio was made based on results of Boehringer Report No. 573. Graph of data is attached.

Following are some notes on the material contained in the report:

1. Adjustment of the pH of sodium salt to 10.1 results in almost quantitative removal of anisole while stripping at higher pH results in retention of 15 anisole in TCP. Perhaps this pH adjustment would improve our product and assist in removal of other organic compounds during the steam distillation.

DATE	DESCRIPTION	MOLS [illegible]	MOLS [illegible]	RATIO [illegible]	TEMP. RANGE
	Smith report	1.0	2.50	2.50	
1st Op'n	Original plant operation	3.[illegible]	8.75	2.70	
1/2/52	Oper. Inst. rev. [illegible]	3.72	10.0	2.70	
1953-54	Oper. Inst. large & small autoclaves	10.4	25.0	2.40	180-186*
6/54	Oper. temp. raised to conform with oper. inst.	10.4	25.0	2.40	180
7/13/54	First batch steam stripped in plant ([illegible]) following lab. check in June by [illegible]	10.4	25.0	2.40	180

*Survey of 31 autoclave batches from 12/22/53 to 6/7/54 indicated a plant practice of operating about 170°C. with some batches as low as 160°C. Operating instructions called for 180-186°C. so this temp. range was maintained from 6/54 to 9/54 lacking any other information.

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Date	Production	[illegible]	[illegible]	[illegible]	[illegible]
5/54	Caustic ratio changed from 2.4/1 to 2.7/1 temp. 170-180°	11.1	30	2.70	170-180
	Steam stripping all production in small autoclave-acidifying.				
10/54	First 2 plant 2,4,5-T batches made from direct sodium salt. 50% of sodium salt made by direct process.				
11/54	No production.				
12/54	All sodium salt by direct method.				
1/55	Changed to crystalline caustic replacing flake.				
1/55	Badger still used as steam stripper. Production increased by 1 large-1 small batch/shift.				
3/55	Rupture disc failed in large autoclave, at 452 psi. Temp. recorder found to be reading 32° low.				
4/55	Rupture disc failures. Large autoclave. 4/8 4/22 4/23. Standards on [illegible]. Lowered from 1.25 to 1.20 due to high conversions.				
7/55	Test Ba [illegible] for process evaluation.				
7/29/55	Process changes to improve color-clearness [illegible]-caustic [illegible].				
	1. Autoclave temp. 175-180°C. batch to be held as close to 180°C. as possible but no higher.	11.1	30	2.70	175-180
	2. MeCl dist. 120°C. max. (formerly 130°C.)				
	3. Steam dist. 120°C. max.				
	4. City water substituted for well water in dilutions.				
8/29/55	Lowered caustic ratio and temp. result of last batches.	12.1	30.2	2.5	170° max.
8/28/56	No major process changes to date.				
9/4/56	Caustic/2,4,5 ratio changed from 2.5/1 to 2.7/1.	12.1	32.7	2.7	170° max.

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