UNITED STATES OF AMERICA

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CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

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PUBLIC MEETING

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WEDNESDAY,

OCTOBER 29, 2003

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The meeting came to order in the Cafritz Auditorium, 800 21st Street, N.W., Washington, D.C. at 2:00 p.m., Carolyn Merritt, Chair, presiding.

PRESENT:

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| Carolyn Merritt | Chair |
| John Bresland | Member |
| Irv Rosenthal, Ph.D. | Member |
| Andrea K. Taylor, Dr. P.H., MSPH, | Member |
| Charles Jeffress | Chief Operating Officer |
| Chris Warner, Esq. | General Counsel |
| Lisa A. Long | Chemical Incident Investigator |
| Mark Kaszniak | Chemical Incident Investigator |

A-G-E-N-D-A

P-R-O-C-E-E-D-I-N-G-S

2:01 p.m.

MS. MERRITT: Good afternoon and welcome to this public meeting of the U.S. Chemical Safety Board. I'm Carolyn Merritt, Chairman of the Board. With me today are our other board members, Dr. Taylor, Mr. Bresland, Dr. Rosenthal, and also Charles Jeffress who is our COO and Chris Warner who is our General Counsel.

Our fifth board member, Jerry Poje, is not here today. He is testifying on another important issue in New York as a matter that came out from the Kaltech investigation with regard to revising the city fire codes. He is testifying before the New York City Council.

Today's meeting is being videotaped for rebroadcast tomorrow on the agency's website at csb.gov. I extend a cordial welcome to all of you here, as well as to our visitors, on the world wide web.

So that our proceedings are not disturbed if you would please turn off your mobile phones or put

them on vibrate. Then also in the event of an evacuation emergency in this building, fire exits are in the back of the auditorium and then this door also exits for fire evacuation.

Our main subject today is the reactive chemicals explosion that occurred at Catalyst Systems plant in Gnadenhutten, Ohio, on January 2nd of this year. This is the second public meeting in as many weeks on a serious reactive incident which has occurred following the release of the board's report last year on hazards of uncontrolled reactive chemical events.

The board made recommendations last year that OSHA and EPA improve their regulatory coverage of reactive hazards. I applaud OSHA and EPA for their renewed attention to the problem of uncontrolled chemical reactions.

In the last several days OSHA has released a useful guidance document available on its website and is providing free of charge the Center for Chemical Process Safety's book, Essential Practices for Managing Chemical Reactivity Hazards.

The incident at Catalyst Systems which injured one person and caused substantial property damage underscores once again why industry and government should strengthen controls on processes that involves reactive chemicals and mixtures.

There is a particularly acute need for outreach to smaller businesses that are often unaware of good engineering or control practices and who do not recognize the hazards in the materials that they are handling. We investigate the results of these failures which often have tragic consequences.

The CSB encourages chemical vendors and business associations to help small business and distribute this resource and to strengthen the compliance mechanisms for voluntary reactive hazard programs in small business as well as large corporations.

Better guidance, education, and enforcement are all welcome measures. Nevertheless, the board continues to believe that new rulemaking will ultimately be required before a substantial reduction in reactive incidents is going to be

realized.

Our format for today is going to be, as usual, first we will hear the presentation by the staff and our investigators on the Catalyst Systems explosion, followed by a period of board questions. At that point we'll have an opportunity for public comment. Any commentors should please register at the sign-in table in the lobby and comments should be held to three minutes or less.

After public comment we expect to proceed to a vote on the case study report on Catalyst Systems. That will be followed by an administrative update and an update on remaining open investigations.

Are there any other comments or opening statements from any of the board members? If no, then I would like to ask Mr. Jeffress to introduce the investigation team.

MR. JEFFRESS: Thank you, Madam Chairman. The incident at Catalyst Systems was investigated by a team of two folks. Lisa A. Long was the lead investigator. Mark Kaszniak accompanied her. The two of them have done the analysis and written a report

and they will be presenting the report to us.

Lisa Long, who is the lead investigator, has been with the agency for three years. She has served as lead investigator not only on this investigation but also on Georgia Pacific that we concluded last year about this same time.

Prior to joining the agency Ms. Long spent 11 years in private industry in various positions and plant operations, management safety, process engineering. She holds a BS degree in chemical engineering from Virginia Tech.

Mark Kaszniak, who has been assisting the investigation and will be assisting today, joined the agency last year following a 20-year career in health and safety. He served as Director of Health and Safety for IMC Global Corporation, as is a Corporate Safety Manager for Vigoro Corporation, as a Senior Safety and Health Administrator for Morton International, and for eight years served as an OSHA Safety Engineer investigating numerous fires and explosions during that tenure. He is a certified fire and explosion investigator and has a B.S. in chemical

engineering from Illinois.

Lisa, you want to start?

MS. LONG: Thank you, Charles. Good afternoon, board members. At 11:55 a.m. on January 2, 2003, a vacuum dryer holding benzoyl peroxide exploded at Catalyst Systems, Inc., production facility in Gnadenhutten, Ohio. Employees were drying 75 percent granular benzoyl peroxide to make 98 percent when the explosion occurred.

One Catalyst Systems employee received a minor injury while evacuating. All other employees evacuated safely. The explosion and subsequent fire caused significant damage to the BPO production building.

This incident was a reactive incident. A reactive incident is a sudden event involving an uncontrolled chemical reaction with significant increases in temperature, pressure, or gas evolution that has caused or has the potential to cause serious harm to people, property, and the environment.

In September 2002 CSB completed a major hazard investigation of reactive hazards entitled

Improving Reactor Hazard Management. The investigation found that reactive hazards need to be better managed to prevent these incidents. The January 2 incident at Catalyst Systems reiterates the need for better management of reactive hazards.

Catalyst Systems is a subsidiary of U.S. Chemical and Plastics, Inc. It's only facility is located in Gnadenhutten, Ohio. Gnadenhutten is about 110 miles northeast of Columbus.

Catalyst Systems manufacturers several grades and concentration of BPO at this facility. These include a paste containing 50 percent BPO, granular 75 percent BPO, and granular 98 percent BPO. The paste has a consistency similar to toothpaste while the granular material looks similar to beach sand.

U.S. Chemical and Plastics is a subsidiary of Alco Industries which is a private company that owns 13 diversified companies including U.S. Chemical and Plastics. U.S. Chemical and Plastics makes repair and maintenance products for marine, aviation, and automotives.

This is a picture of the U.S. Chemical and Plastics Gnadenhutten facility. It employs 25 people. Catalyst Systems operations are located in Building 2 and employs less than half of these workers.

The substance involved in this explosion was benzoyl peroxide or BPO. BPO is used for a range of things such as plastics manufacturing, automotive repair products, dental resins, and even acne medication. Of course, the concentration of BPO in acne medication is very low, typically five to 10 percent.

BPO belongs to a group of chemicals known as organic peroxides. A peroxide is any compound with an oxygen to oxygen or proxy bond and an organic peroxide has an organic or carbon containing molecule attached to one of the oxygens.

The peroxide bond is weak and this causes organic peroxides to be unstable and sensitive to shock, impact, and friction. The temperature at which a peroxide will undergo a rapid and violent decomposition is known as the self-accelerating decomposition temperature, or SADT. This value is

specific to the container and process conditions and when dealing with organic peroxides, it's a very important value to know.

Organic peroxides are not as energetic as conventional explosives but when they decompose they can still be very destructive. The degree of hazard posed by organic peroxide varies by concentration and can be reduced by dilution. The National Fire Protection Association, or NFPA, divides organic peroxides in their solutions into hazard classes based on reactivity and destructive effects.

This table list the NFPA hazard classifications for selected concentrations of BPO. The table clearly illustrates the effective delusion or concentration on BPO. Catalyst Systems was significantly increasing the hazard of 75 percent BPO by increasing it to reach a concentration of 98 percent.

Catalyst Systems began producing 98 percent BPO about five years ago. In June 2001 they modified their process and began using a jacketed glass lined vacuum dryer they purchased from a used

equipment manufacturer.

This is a picture of a vacuum dryer similar to the one being used at Catalyst Systems. When a system is dried under vacuum as in a vacuum dryer, the temperature at which water evaporates is lower. This allows the material to be dried at a lower and usually safer temperature.

The BPO dryer was installed in the paste room of Building 2 shown here. This diagram also shows the location of the lunch table and several exists. We will be referring back to this diagram throughout the presentation.

I'm going to use this diagram to explain Catalyst Systems 98 percent BPO process. First, a vacuum dryer would be loaded with 200 pounds of 75 percent BPO. Hot water was circulated through the dryer's jacket to indirectly heat the BPO.

The dryer rotated slowly causing the BPO to tumble and heat it evenly. The dryer's atmosphere was placed under vacuum. The vacuum system pulled air and water vapor from inside the dryer through a poly propylene bag filter, then a separator, and finally to

a water suction vacuum pump.

The hot water circulating through the jacket was supplied by the building's heating system. There were three automatic valves installed in the piping. When operating normally, valves V1 and V2 are open and valve V3 was closed allowing hot water to circulate through the dryer's jacket.

The temperature control system used a temperature probe to determine when to open and close the hot water valves. When the probe reached 42 degrees C the inlet and outlet lines closed and the bypass lines opened which stopped the hot water from circulating through the jacket.

Catalyst Systems personnel worked eight hours a day, five days a week, and they only processed a 98 percent BPO during these working hours. A typical batch took two to two and a half days to dry from 75 to 98 percent.

The drying system was started in the morning, went through several heating cycles until about 2:00 p.m. when the hot water was shut off for the evening. The dryer, however, continued to rotate

until about 3:30 p.m. when the entire system would be shut down for the evening.

On the second day of drying the same procedure was followed. On the morning of the third day the cover would be removed and a sample taken for analysis. If the concentration was at 98 percent, the dryer would be unloaded. Otherwise, the BPO would be put through additional heating cycles.

The 98 percent BPO was emptied from the dryer and packaged in one-pound plastic bags. The dryer was cleaned after every second batch by rinsing with water and allowing it to air dry.

Now Mark Kaszniak will describe the incident details, identify potential initiating scenarios, and review safe handling practices.

MR. KASZNIAK: Thank you, Lisa. Good afternoon, board members. As Lisa previously explained, it normally takes two and a half eight-hour work shifts to dry a batch of BPO from 75 percent to 98 percent concentration. In this case, the batch was dried for two and a half work shifts but over a six-day period with two interruptions.

Drying was first stopped for a weekend and then again for the New Year's holiday. When not being dried the BPO remained sealed in the dryer. On the morning of the day the explosion occurred, the dryer was opened up and a sample was taken.

Lab analysis determined that the concentration of BPO in the dryer was 97 percent. The dryer was closed up and the BPO was subjected to another heating cycle. When this cycle was complete, the hot water was shut off but the dryer continued to rotate.

During the lunch break an employee heard an unusual noise coming from the vacuum pump. He decided it wasn't serious and that he would attend to it after he finished his lunch. During the lunch break there were only four employees in Building 2. They were sitting around the lunch table in the northeast corner of the paste room.

As you can see from the diagram here, the lunch table is approximately 30 to 35 feet east of where the dryer was rotating. At 11:55 a.m. the dryer exploded. Upon hearing and seeing the explosion, the

four employees immediately existed the paste room through the doorway directly east of the lunch table as is shown in the photo. While evacuating the employee closest to the explosion received a minor laceration to his arm probably from flying debris.

This photo shows explosion damage in the northwest corner of the paste room, the area where the dryer was located. The force generated during the explosion caused the spherical portion of the dryer, which ways about 3,200 pounds empty, to break free from the cradle on which it rotated.

The dryer then burst through the wall that separated the paste room from the BPO manufacturing area. It was fortunate that the explosion occurred during the lunch break and that the force of the explosion was directed to the north and to the south while the four employees evacuated to the east. Otherwise, more serious injuries or fatalities may have resulted.

Also, note the overturned cradle of the dryer located in the bottom center of this photo. It was pulled about four to five feet north pass the

doorway from where it was originally positioned. The cradle, which also weighs about 3,200 pounds, was not anchored to the floor but was attached to water pipes and electrical conduit as shown in the photo.

This photo shows the southwest corner of the BPO manufacturing area, the other side of the wall from the previous photo. After bursting through the wall, the spherical portion of the dryer plowed through two parallel rows of pallets loaded with full fibre drums stacked four high.

The rotary dryer came to rest on the floor of the BPO manufacturing area near the west wall as shown in this photo. It traveled about 35 feet as measured from the overturned cradle.

Based on our interviews and examination of the explosion scene, CSB determined that the explosion originated inside the dryer. The explosion most likely resulted from the thermal decomposition of 98 percent benzoyl peroxide. Decomposition is a chemical reaction that leads to breakdown of a chemical into smaller molecules or elements while liberating energy and gases.

When BPO decomposes heat is produced and oxygen and flammable gases are generated. The heat produced causes further decomposition. This causes the decomposition reaction to self-accelerate. As the BPO decomposed inside the closed dryer, the gases created pressure inside the dryer. This pressure built up until the feed port lid and the clamps attaching it failed.

After the wood failed the gases expanded out through the feed port. This generated a force on the dryer which caused the spherical portion to break free from its cradle and propelled it like a rocket through the wall and the pallets and drums stored behind it.

In this close-up photo of the spherical portion of the dryer, you can see that it is intact. You will notice that it has been scraped but very little fire damage. The lid that was clamped over the feed port is missing.

CSB observed that the glass lining inside the dryer was cracked and very little BPO residue remained. This indicates that the BPO was either

consumed or expelled by the force of the explosion.

Also note the damage to the bearing on the right side which clearly shows that it was torn free by force from its cradle. These two photos show the damage to the feed port lid. The lid was found in the storage area of the paste room about 10 to 15 feet south from where the dryer was originally positioned. As you an see from the photos, the lid was bent outward by the force of the explosion and the connecting clamps were severely damaged.

After exiting the dryer, the gases expanded into the paste room. As it was winter and the doors were closed, the increased pressure inside the room blew out the west and south walls. The flammable gases ignited causing a fire inside the paste room.

This photo shows the explosion and fire damage to the west wall of the paste room south of where the dryer was installed. As you can see, the pressure generated by the explosion has blown out the metal corrugated wall. Also note that some of the stored fibre board drums in this area were burned

away.

These drums contain 50 percent BPO paste which is spilled out onto the floor. This graphically illustrates the difference in hazards posed by a class one organic peroxide versus a class four organic peroxide as Lisa previously discussed.

This photo is an exterior view of the south wall of Building 2. Note that the corrugated metal panels were blown off by the force of the explosion with the greatest damage on the west end. Also, the building numbers and the overhead door were damaged.

What initially caused the 98 percent BPO to thermally decompose? CSB was unable to conclusively determine the specific initiating event that led to the BPO thermal decomposition but a number of possible initiating events were evaluated. While evidence indicates some of these events to be more likely than others, all of the events I'm about to discuss could have led to the BPO thermally decomposing inside the dryer.

As Lisa will discuss later, all of these

initiating events can be traced back to inadequacies in system design due to a lack of management systems. Again, as Lisa pointed out earlier, BPO when heated above it's self-accelerating decomposition temperature, the SADT will begin to thermally decompose.

CSB identified a number of possible initiating events related to heat that could have caused the BPO to begin decomposing. These include the temperature probe may have malfunctioned. Although the probe was calibrated when the system was installed about two years ago, it had not been inspected or maintained since then.

A hot spot may have developed in the BPO in the dryer. A clump of BPO may have adhered to the wall or formed in the dryer as it slowly rotated and then overheated. The vacuum pump may have failed. If the vacuum pump failed, it would have resulted in the loss of evaporative cooling causing heat to build up inside the dryer. The BPO may have been heated in the dryer too long. As I mentioned earlier, the 2.5 work shift drying cycle occurred over a six-day period.

As BPO is highly reactive and sensitive to sparks, friction, and shock, there are other possible initiating events that could not be ruled out by CSB. These included contamination of BPO in the dryer. Contamination of BPO may cause it to decompose at a lower temperature.

Foreign material could have been introduced into the dryer from the previous batch when the current batch was being loaded or when the QC sample was taken. Contamination could also have occurred if the BPO contacted the metal shell of the dryer. Employees noted that chips had developed in the glass lining over the past two years of operation that had not been repaired. If the chip area exposed the metal shell of the dryer, then the BPO may have contacted it.

Static electricity could also have accumulated in the dryer and generated the spark. Static electricity could have been generated as moist air laden with fine BPO particles passed through the poly propylene filter. Or if clumps had developed inside the dryer as the BPO tumbled. Finally,

friction could have occurred as the dryer rotated or if clumps again had formed and were being tumbled.

All of the potential initiating events that I have just outlined are well known and discussed in various standards and guidelines pertaining to BPO and organic peroxides in general.

The CSB case study has an annotated bibliography containing references which discuss organic peroxide hazards including descriptions of prior explosions, as well as recommendations for safe storage and handling.

In this bibliography there are references that deal specifically with benzoyl peroxide such as the ones listed here published by the National Institute of Occupational Safety and Health and the Manufacturing Chemist Association.

The bibliography also list references pertaining to organic peroxides in general such as those listed by the National Fire Protection Association, Factory Mutual Global Loss Prevention, and the Society of Plastics Industry, Organic Peroxide Producer Safety Division.

Finally, there are references that address process safety management systems such as those developed by the American Institute of Chemical Engineers, Center for Chemical Process Safety. The previously mentioned references outline safe handling practices to be used when storing and handling BPO and other organic peroxides. In general these standards recommend that safeguards be put in place to avoid BPO decomposition including methods to prevent overheating, confinement, and contamination.

Safeguards also need to be in place to prevent initiating a thermal decomposition by sparks, friction, and/or shock. This includes installing appropriate electrical wiring in areas where BPO is processed and adequate grounding of BPO processing equipment.

Lisa Long will not return to the podium to discuss management and process safety and present the conclusions of this case study.

MS. LONG: Process safety management is the application of management systems to control hazards and prevent catastrophic incidents. It is

considered to be good practice in operations that process hazardous materials. The core elements of a good process safety system are described by CCPS in their book, "Guidelines for Technical Management of Chemical Process Safety" that was mentioned earlier by Mark.

Catalyst Systems did not have a process safety management program in place and employees were not trained in the use of these management systems. During our analysis we determined that lack of management systems contributed to the January 2nd incident.

A reactive hazard evaluation is a formal way to identify and quantify hazards caused by chemical reactivity. It can be used to quantify the magnitude of a hazard in order to determine safe operating limits and other necessary safeguards. Catalyst Systems did not complete a formal reactive hazard evaluation for their BPO process.

They did gather some publicly available data on 98 percent BPO but they did not evaluate BPO in conditions specific to their process. If they had

determined the SADT, or self-accelerating decomposition temperature for their process, they would likely have found that it was lower than that found in the literature for one-pound bags.

The vacuum dryer was set to rotate slowly enough to prevent the build-up of static friction and the dryer base was grounded. However, the electrical wiring was not in accordance with the standards as Mark described earlier and Catalyst Systems did not determine whether static charges accumulating in the dryer would be able to dissipate.

A process hazard analysis is a systematic way of analyzing hazards and their consequences. Catalyst Systems could have used the process hazard analysis to determine whether safeguards for previously identified hazards such as reactivity, static and friction sensitivity were adequate to prevent incidents such as the one which occurred on January 2nd.

A pre-start up safety review completed prior to starting up a new process should ensure that equipment is properly installed and operates as

intended. During installation of the BPO system employees were unable to install some intended redundancy in the hot water valves. A pre-start up safety review would have determined whether or not this change compromise safe operation.

Although the operators appeared to have good knowledge of normal system operation, there were no written operating procedures. Additionally, there were no procedures for abnormal situations. Operating and maintenance procedures should be written and include instructions for dealing with abnormal situations. For example, the procedure should have detailed what to do if a chip was found in the glass lining of the dryer or the vacuum pump made unusual noises.

Of course, once procedures are developed, employees should be trained on both normal operation and how to respond and react or how to recognize and react to abnormal conditions.

The Occupational Safety and Health Administration's, or OSHA's, Process Safety Management Standard, PSM, was intended to protect workers from

releases of highly hazardous chemicals including reactive chemicals. Ninety-eight percent BPO is covered by OSHA's Process Safety Management Standard because of its reactivity. However, Catalyst Systems' process was not covered because they kept less than the 7,500 pound quantity required for coverage by the PSM standard.

Ninety-eight percent BPO is very hazardous regardless of the regulatory coverage. As we have demonstrated throughout this presentation, good engineering practices, safe handling guidelines, and management systems could have helped to prevent this incident.

The explosion at Catalyst Systems was most likely the result of a thermal decomposition of 98 percent BPO. As Mark pointed out earlier, the hazards of BPO are well known and documented in numerous standards and guidance documents. Catalyst Systems should have used good engineering practices in management systems to incorporate the hazards of BPO into the design and operation of its drying system.

That concludes our presentation. Before I

take questions, I would like to acknowledge those who assisted us in the investigation. First of all, Catalyst Systems cooperated with CSB throughout the investigation and has helped the entire process go smoothly.

The Society of Plastics Industry provided us with valuable information on organic peroxides and benzoyl peroxide specifically. Hazards Research Corporation was consulted for expert opinion on BPO and other organic peroxides. OSHA conducted an independent investigation of this incident and reviewed our case study for factual accuracy.

We'll now take questions.

MS. MERRITT: Thank you. Dr. Taylor.

DR. TAYLOR: Thanks for the presentation, Lisa and Mark. I have just one question currently. In your presentation you mentioned that they had no written operating procedures. Were the employees aware of the potential hazards associated with drying the BPO and were material safety data sheets on site to let them know exactly what the problem would be?

MS. LONG: The employees had a pretty good

awareness of the hazards of benzoyl peroxide, especially at lower concentrations because the company had been in business for about 25 years making 75 percent. They understood that 98 percent was hazardous and there were MSDSs available. I'm not sure if they understood what they needed to do to prevent all the hazards.

DR. TAYLOR: As a follow-up to that you said this dryer was put into place two years ago. Is there another dryer on site that they used prior to that?

MS. LONG: This dryer had been in service for about a year. Before that they used an open oven type dryer.

DR. TAYLOR: Oh, I see. Okay. Thank you.

MS. MERRITT: Any other questions? Dr. Rosenthal.

DR. ROSENTHAL: Recently we talked about the need to do a hazard analysis and hazard identification process. This is a subjective question I'm asking you but did they employ engineers or people who would normally expect would be familiar with that

type of analysis? Had they ever done that type of analysis?

MS. LONG: At the Gnadenhutten site they didn't have any engineers. None of them worked in Catalyst Systems. They did have some engineering assistance from U.S. Chemical and Plastics at their Massilon but this was sort of -- it wasn't a part of the organization.

It was someone they could go to if they needed help so it wasn't built into their structure. Even the people in Massilon were not really familiar with management systems and the rigor of applying management systems to the processes.

DR. ROSENTHAL: The materials are benzoyl peroxide from their supplier. Do they discuss the possibilities of what occurred here like being concentrated beyond a certain point or don't hold it at elevated temperatures. Do they talk in those terms?

MR. KASZNIAK: In this case they were purchasing 75 percent benzoyl peroxide and concentrating it to 98 percent.

DR. ROSENTHAL: Right.

MR. KASZNIAK: There's only one other U.S. manufacturer of 98 percent benzoyl peroxide and they did have the data sheet from that manufacturer on site that warned about hazards of shock friction and even temperature sensitivity of the benzoyl peroxide. They were aware of some of the hazards. Whether they recognized the magnitude of these hazards when they put 200 pounds of it in the dryer can be questioned.

MS. LONG: Irv, I would just add that when they designed that process, they thought about certain things like they knew they shouldn't overheat it so they had a temperature that shut off at a certain point. They were worried about static so they made sure the dryer didn't tumble that fast. They just didn't apply a rigorous systematic way to make sure to put in safeguards for all of the ways that these hazards could --

DR. ROSENTHAL: But other than they recorded temperature, the temperature of the shell or the material, what temperature did they actually record?

MS. LONG: They didn't record any temperature but they had a temperature probe inside the dryer so it would record -- I'm sorry, it would measure the temperature of the material and then cause the valves to close but it wasn't recorded or read in anyway.

DR. ROSENTHAL: Okay. So that was the single control instrument and it was not recorded so there was no backup, no layers of protection.

Last question. Going back to days of practicing powders, was there the possibility -- I find it unusual to have a lunch table in a room that's doing a chemical process just because of the possibility of dust vapors and things such as that. Was that at all discussed? I know it's not the subject of this investigation.

MS. LONG: We didn't really look into that further in this investigation but that was, I think, something that -- a practice that developed over the years that there was a lunch table.

DR. ROSENTHAL: Nice friendly place.

MS. MERRITT: You like to be close to your

work.

DR. ROSENTHAL: Yeah. Okay.

MS. MERRITT: I have a question whether or not -- I mean, handling chemicals is serious. It is just kind of a surprise to me that in this day and age there would be an organization who would have really no controls over a process that uses something that could be explosive.

Was Catalyst Systems a member of SOCMA or ACC or any other of the associations that helped their members understand or know about management systems and safe practices, things like that?

MS. LONG: No, they weren't a member of any of the trade organizations. They were a small company and they didn't see a benefit that they would get from that so they weren't a member.

MS. MERRITT: What about U.S. Chemical and Plastics? Were they a member, do you know, of any of these associations where they get information on safety precautions and cost benefits of running safe operations or anything?

MS. LONG: They weren't a member of a

trade organization.

MS. MERRITT: Let's see. You said that they were not covered by process safety because the pounds didn't reach the 7,500 pounds that was necessary. Right?

MS. LONG: Correct. The threshold quantity was 7,500 pounds and the maximum concentration or maximum amount on site would be about 2,500 pounds so they weren't covered.

MS. MERRITT: Did you know -- I mean, one of the things -- I mean, you said they probably were aware that when they took their sample at 97 percent that they were very close to the sensitive concentration of 98 percent. They would have been aware.

There weren't any precautions there knowing they were dealing with a heated 98 percent? There weren't any vacuum gauges or temperature or readouts or shutdown alarms or anything on this equipment?

MS. LONG: No, there wasn't any automation and they had put in the automatic shutdown of the

water valves once the temperature probe reached a certain temperature that they considered to be too high but there weren't any alarms or anything else. No readout, no recording of temperatures.

MS. MERRITT: When the vacuum dryer was shut down, the water was shut off but the hot water stayed in the jacket, didn't it? Or did it drain?

MS. LONG: Right, it would stay in the jacket. There was no means to drain the jacket so even thought they would shut off the water, the water would slowly cool down with loses to ambient environment but initially it was still hot water in contact with the peroxide.

MS. MERRITT: Okay.

DR. ROSENTHAL: Is this a publicly owned or a private company?

MS. LONG: Privately owned company.

DR. ROSENTHAL: Okay. I was just wondering if their sales $10 million, $100 million to get some idea of their size.

MS. LONG: I don't know what their sales are but they are a pretty small company.

DR. ROSENTHAL: Okay. Do you know how many employees total?

MS. LONG: Twenty-five at Gnadenhutten and I'm not sure about U.S. Chemical.

DR. ROSENTHAL: Twenty-give at this location?

MR. KASZNIAK: That's correct.

MS. LONG: Then they had another location and I'm not sure how many people were employed there.

DR. ROSENTHAL: Okay.

MS. MERRITT: Did OSHA do an inspection after this event?

MR. KASZNIAK: Yes, OSHA did an inspection. In fact, they were there when we were there investigating the accident. Several months after their inspection they issued a citation. The primary citation that they issued was a general duty clause violation because, again, they determined that Catalyst Systems was under the threshold quantity for process safety management and under those standards could apply.

They cited them under the general duty

clause for the recognized hazards of benzoyl peroxide and not having put in appropriate management systems for dealing with them so they asked them as part of their abatement to conduct the process hazard analysis, install additional equipment design features on their kettles should they decide to start up this process again and other things like that. Put in written operating procedures and maintenance procedures as part of the general duty clause violation.

MS. MERRITT: Okay. Are there any other questions? Mr. Bresland?

MR. BRESLAND: Was the company fined by OSHA or did you say that?

MR. KASZNIAK: The company was fined by OSHA. They received I think approximately $104,000 in penalties.

MR. BRESLAND: In your experience with OSHA would that be a high fine, a low fine?

MR. KASZNIAK: OSHA considered the case to be a significant case from their point of view and issued a press release, yes.

MR. BRESLAND: They weren't covered by the OSHA PSM standard because they had less than 7,500 pounds? They had approximately 2,500 pounds on site and 200 pounds in the dryer. Does that reduce or relieve the company of their obligation to handle a hazardous chemical any less safely because it's less than the threshold quantity?

MS. LONG: No, obviously in our presentation we felt regardless of the quantity with a chemical like this, you have to handle it safely and follow good engineering practice and management systems. Clearly OSHA felt the same way because of the citations under the general duty clause.

MR. BRESLAND: When you get to 98 percent, what is the temperature that is the critical temperature for this material?

MS. LONG: When you have 98 percent in one-pound plastic bags, the SADT self-accelerating decomposition temperature is 68 degrees C. This temperature would be different for a larger volume. It would probably be lower than 68 for a larger volume.

MR. BRESLAND: What was the temperature of the water that was used to heat the dryer?

MS. LONG: It was about 82 degrees.

MR. BRESLAND: Does that mean if the water is flowing through the jacket on one side and then on the other side of the jacket you have the benzoyl peroxide that some of the benzoyl peroxide would be in contact with water that is of a higher temperature than SADT?

MS. LONG: Depending on the heat transfer properties of the metal and the glass it is higher than the 68 degree temperature.

MR. BRESLAND: Would that be a normal practice for designing a system where you have that potential for the temperature higher than the danger temperature being in contact with the material?

MS. LONG: I would think you would want to put in safety precautions to ensure that you didn't get higher than that dangerous temperature.

MS. MERRITT: On the BPO dryer, was this a new dryer?

MS. LONG: It had been purchased used from

a used equipment vendor.

MS. MERRITT: Was it previously used as a BPO dryer or was it used for something else?

MS. LONG: We don't know the history of the dryer. It was manufactured in Germany and used in the UK and brought over to the US. All we know is who they purchased it from here. We don't know what its prior uses were.

MS. MERRITT: And were there engineering drawings and electrical drawings and things that would have come with it that they could have used to identify safeguards that might be used in a process where you were going to dry something?

MS. LONG: There was one engineering drawing, one vessel drawing that came with it but nothing that they would get from a used equipment manufacturer would be specific to the process that they were using in drying benzoyl peroxide.

MS. MERRITT: This is very scary.

DR. ROSENTHAL: Here is it a matter of public record as to which company ensured this facility?

MS. LONG: I'm not sure if it's a matter of -- I know who it is. Factory Mutual.

DR. ROSENTHAL: I don't know if this is confidential information. It shouldn't be but I'll ask you privately. I'm just curious. You have an operation which after the fact we all clearly recognize how could you possibly do it. Yet, of course, here are workers who put their lives at risk and management and put themselves at risk.

First it goes through an insurance company, I presume, who presumably had experts. The question goes through your mind how come? Why do people do after the fact what appear to be silly or serious or whatever you want to call it.

MS. MERRITT: Scary.

DR. ROSENTHAL: Scary? Okay. I was going to use the word stupid but I didn't want to use that. So I think in our investigations we have to go on looking for what is it that causes people to do this? Is that they've operated for 20 years and nothing has happened so who knows? I just think in the future we have to keep looking -- we have been looking. Keep

looking for this reason why do people do what we think after the fact is silly or crazy or stupid?

MS. MERRITT: I didn't say that. Oh, I'm sorry. Dr. Taylor.

DR. TAYLOR: There are just two follow-up questions. The facility is one of only two that produce 98 percent benzoyl peroxide? Is that true?

MS. LONG: There's one other manufacturer.

MR. KASZNIAK: From our research we could only find one other manufacturer domestically of 98 percent benzoyl peroxide, a much larger facility than this facility.

DR. TAYLOR: And the 98 percent is used for, you mentioned, for plastics manufacturing?

MR. KASZNIAK: It can be used for initiators and polymerization reactions. In this case this facility was using it to make automotive catalysts for marine and automotive repair operations.

DR. TAYLOR: So then from our report what do you think -- what would be your proposal as the staff to do with our findings? Since this is a case study, who will get this report and how will they be

able to use it?

MR. KASZNIAK: Well, from our perspective while there is only a limited number of manufacturers, the key message from this report is that if you attempt to concentrate benzoyl peroxide, it's very commonly sold in the 50 to 75 percent range in this country and goes into a variety of products.

For those people who decide that they want to create a more concentrated product and decide that they want to explore a new market or something like that, this case study would serve as a warning that by simply concentrating this product going from a Class 3 to a Class 1 increases the hazard of this product tremendously. You should not attempt to do that without proper engineering design and proper safety considerations in putting a product like that on the market.

MS. LONG: This is also a very good general example of the importance of management systems regardless of what --

DR. TAYLOR: Of what the chemical -- right.

MS. MERRITT: It's a case study. Generally when we do a case study we do it for an event that may have what seems to be limited application with regard to possibly the chemical that was involved or the process that was involved. There are certainly management system broad issues here.

One of the things that I would think that we would want to do as a board in our outreach is distribute this widely to organizations who deal with small businesses or deal with small chemical facilities who might be considering this as an economical way to do business as not bothering to put in the controls or not thinking it's necessary when they are dealing with a material as dangerous as this one is. We should probably think about doing that.

DR. ROSENTHAL: Well, peroxides as a class are involved in a lot of serious incidents. They are widely used. They have different stabilities. People unintentionally put them under conditions where they decompose or they start deactivating very rapidly so I think a wide distribution report with perhaps some words of saying that we're looking at this particular

instance but organic peroxides per se have to be handled with care and formulated with care and utilized with care.

MS. MERRITT: Well, are there any other questions or any other comments at this point? Thank you, Ms. Long and Mr. Kaszniak. I appreciate your presentation.

At this time I would like to open the floor to any public comment and we have no one. No public comment. We can proceed then to asking for someone to present a motion that we accept this study. Is there anyone who is willing to make that motion? Dr. Taylor.

DR. TAYLOR: Madam Chair, I move that we approve the CSB case study regarding a benzoyl peroxide explosion and fire that occurred on January 2, 2003, at the Catalyst Systems facility in Gnadenhutten, Ohio.

MS. MERRITT: All right. Is there a second, please

DR. ROSENTHAL: I second the motion.

MS. MERRITT: Mr. Bresland seconds it and

Dr. Rosenthal seconds it. I guess that's a third. At this time then is there any other discussion concerning acceptance of this report that we would like to carry on as a board?

Dr. Rosenthal.

DR. ROSENTHAL: I guess -- I think the report is fine as it is. I'm just interested in finding out who had the privilege of insuring the facility. I can do that privately.

MS. MERRITT: All right. If there are no other comments then, I would like to again read the motion. The motion was to approve the CSB case study regarding a benzoyl peroxide explosion and fire that occurred on January 2, 2003, at the Catalyst Systems facility in Gnadenhutten, Ohio. I would like to take a oral vote.

Dr. Taylor.

DR. TAYLOR: Approve.

MS. MERRITT: Dr. Rosenthal.

DR. ROSENTHAL: Approved.

MS. MERRITT: Dr. Poje has the right to vote within 24 hours of this. Since he is not here

we'll leave his vote open.

John Bresland.

MR. BRESLAND: Approved.

MS. MERRITT: And I approve it as well so it carries with four votes. Thank you, board, and thank you, staff. At this time I would like to turn it over to Mr. Warner who has an update for us briefly.

MR. WARNER: Thank you, Madam Chair. Due to Dr. Poje's absence, we do have a variety of procedural matters that we will provide to the board through our notation and voting procedure. We will provide you a document and a voting sheet and allow you time to read it and discuss it with the staff.

These are more sort of business procedural issues. We have a requirement to publish our organizational structure so we have a final rule for you to review just very simply going over our structure.

We also will have as part of our annual financial audit we'll have a letter coming to you as we have every year. The third document you'll be

getting this week is one on personnel policy on overtime. We made a few amendments to that policy that will be passing through for your consideration.

Finally, we have an investigation that is ongoing that Mr. Jeffress will describe at the CTA. We have need of doing some additional testing on equipment which will require approval because of the amounts involved and due to a continuing resolution we have to bring this to the board. Those would be the four notation items coming to you this week.

MS. MERRITT: Thank you. Is there any question on that? Now I would like to ask Mr. Jeffress who is going to give us a summary rundown of the current active investigations and their status.

MR. JEFFRESS: Thank you, Madam Chair. With this vote today you all have closed the fourth report in the past two months. The First Chemical incident in Mississippi, Kaltech in New York City, Catalyst Systems and the BLSR in Rosharon, Texas. The past two months have been very busy months for the board and for the staff.

With the closing of these four we still

have seven open investigations and we also have three studies in front of us. I'm going to give for the benefit of the audience and you all a quick review of where we are on these and where we are headed on these.

The most recent incident was a company called Isotec in Miamisburg, Ohio, which was producing isotopes of nitrous oxide and their tower, which was actually was sunk in the ground several hundred feet, exploded causing destruction that you can see in this picture here. We have a team of three people that have been out there investigating it.

They have been to two meetings and will be going to another community meeting next week. It's too soon to say exactly where we're headed with this investigation but it is an unusual process, perhaps a one of a kind process and we will determine as we collect more facts where we are headed with this one.

Most recent is the Honeywell incident in Baton Rouge, Louisiana, August of 2003. This facility actually suffered three separate incidents over the course of a three or four week period. Lisa Long is

the lead investigator on this one as well. The picture up there is a picture of tanks. One of these thanks was mislabeled and contained chemicals that it was not intended to contain.

When a worker was cleaning out these tanks antimony pentachloride, I believe it was, came out of that tank and exposed the employee to that and killed the employee. That was one of three incidents. Another one involved hydrogen fluoride. The third incident was a chlorine incident at this same facility.

These three incidents at one facility we are investigating. As we collect information we will decide whether to report them as three separate ones or three chapters in one incident but it is one facility and that is the next most recent one.

Avery Dennison, a facility in Millhall, Pennsylvania, where the company was producing the glue that goes on the back of postage stamps and also on the back of file labels and other things, had a ruptured disk blow when a chemical reaction took place that they did not anticipate. They did not understand

their own chemistry.

That incident resulted in, as the press reported it, billions of sticky cobwebs descending from the sky onto the public surrounding that facility. That investigation is close to finishing. I suspect that will be finishing after the first of the year.

Next is DD Williamson in Louisville, Kentucky, April 12, a facility that produces caramel coloring for soft drinks and perhaps other uses as well. They had a pressure vessel that was unvented and unregistered and had been uninspected that exploded and caused the damage that you see here. This investigation is also close to completion and anticipate that completion in December.

MS. MERRITT: Wasn't there also one fatality?

MR. JEFFRESS: There was one fatality in that incident as well. This facility is Technic, Inc., in Cranston, Rhode Island, February 2003. It's an electroplating facility that actually produces chemicals for the electroplating industry. They had a

number of different exhaust vents from various vats tied in together into one system.

There was an incident within that system that was an explosion and a fire resulting in severe injury to one worker and damage to the facility. In this incident our investigation is also close to completion. I expect this to be completed shortly after the first of the year.

The one that Mr. Warner mentioned just a few minutes ago, CTA Acoustics in Corbin, Kentucky, a dust explosion. We had a community meeting in Corbin, Kentucky. This is one of the more complex investigations we've undertaken and the one where the most people were killed. Seven people died as a result of this incident.

Because of the number of different parties to this investigation, completing the investigation is complicated. We will be seeking to do some testing on our own. The vote that we will bring to you will be a vote to authorize the money to do the testing on this incident. Because of the complexity of the number of parties involved, this will take some time to

complete. I expect it will be well into next year before we complete this investigation.

Just prior to the Corbin, Kentucky incident there was one in Kinston, North Carolina, West Pharmaceuticals Incorporated, January 29, 2003. This was also a dust explosion, the result of dust accumulation above a false ceiling. It was not recognized by people in the plant. This investigation is well along and probably early next spring we should complete this investigation.

Those are the seven investigations that are open and we will continue to pursue and close in the course of time over the next year. In addition to these seven investigations there are three studies that have been authorized by the board that are in various stages of completion.

The first, toxic gases from sewers as a result of the Georgia Pacific investigation last fall that we closed last fall. The board asked the agency to look at the incidence involving toxic gases escaping from sewers. The result of this study, while it's not yet to you, will be to you shortly but we

have actually found few incidents where the gases came out of the sewer and caused fatalities.

I don't think there will be enough data here to pursue. We found lots of incidence in sewers, especially confined space kinds of incidence, but those are well studied and documented elsewhere. We did lots of incidents involving toxic gases. I think there is probably going to be insufficient data on incidents where the gas actually came out of the sewer for us to pursue much from this study.

The second study that we are doing also came out of the Georgia Pacific investigation and that is the handling of sodium hydrosulfide. We are close to completion on this and we have at your request looked at the MSDSs provided by manufacturers. We have looked at the handling practices.

We've looked at the number of incidents that have occurred with this material and we think there are several recommendations that you will want to pursue as a result of this. You will be getting this study here before the end of the year.

The final study which you all have

authorized really is an outgrowth of the Kinston and Corbin incidents. There's a study on explosive dust. The staff is doing this study in conjunction with the two investigations.

We are well on the way in the study of how many incidents have occurred involving explosive dust in this country and in the last 20 years and we will have an analysis of those incidents as a first part of this study. Following that we will have the reports from Kinston and Corbin and we will conclude with some further research in where we should go with respect to the explosive dust.

Those are the seven current investigations we have open and the three studies that we have open at this point.

MS. MERRITT: Thank you very much. Are there any questions from the board on those?

DR. ROSENTHAL: Roughly what quarter of the year do you expect that the first Corbin and then the Kinston incident investigations might be done?

MR. JEFFRESS: West Pharmaceuticals will be the first of those two to finish. I expect that

will be in early spring next year. March perhaps of next year.

DR. ROSENTHAL: So it's the second quarter of --

MR. JEFFRESS: Second quarter of this fiscal year. First quarter of next calendar year.

DR. ROSENTHAL: Okay.

MR. JEFFRESS: Then the Corbin investigation is likely to be next summer.

DR. ROSENTHAL: Okay.

MS. MERRITT: Thank you very much. Thank you, Charles.

With the completion of that report, that would conclude our business portion for our meeting. But there is one other function that I have to perform today and that is to report that today is the final meeting that will be officially attended as board members. I hope you will come back and visit us otherwise at the holiday party for Dr. Rosenthal and Dr. Taylor.

Both of their terms on the CSB expires in the next few days. There will be a reception for Dr.

Taylor and Dr. Rosenthal at the CSB offices at 2175 K Street this evening beginning at 5:30. Those of you who are here are certainly welcome to attend that and offer your well wishes to them. This is certainly a bittersweet event for the agency.

I want to say, however, that the board and the mission for which it was created as been advanced by your contribution over the last five years. Those who have followed the board from its launching to current day know that this birth was not an easy one.

Starting any endeavor like this is always difficult but Dr. Rosenthal and Dr. Taylor, along with Dr. Poje, persevered through this five-year period and, as a result of their hard work and their dedication to the mission of this agency to conduct excellent investigations of industrial chemical accidents and promote prevention of their recurrence, this agency has survived, it has grown, and our mission has been furthered and strengthened. I know that because of your efforts lives have been saved and that communities have been protected. I think you carry that with you forever.

Anthony Thompson from Monsanto e-mailed us the other day with very gracious words and I would like to repeat those in that it was his compliment and his recognition that the words that he could say were well done and well done.

Both of these dedicated people are leaders in their own fields. They have given to the agency their time and talents and much more than can ever be given back to them in recognition, in plaque, or in honors from us.

But they leave the agency with our heart-felt thanks and with that of other board members and if Jerry were here I know he would have many fine and kind words to say but I think you will hear those this evening when he gets back.

It is also our pledge of those board members who carry on to carry on the work of the board. You will receive and have received the respect of your professional friends and acquaintances that you have made in the last five years and, as a result, the board has shined even brighter because of that. This board's work is really a labor of love and a true

example of public service and we thank you.

And with that, would anyone else have any words to say? Charles?

You're going to have to get the last word. You always get the last word.

DR. ROSENTHAL: I try.

MR. JEFFRESS: I'll have more to say tonight at the reception but, since this is on the record, this will be much kinder and gentler.

Irv, I can't think of anyone who could have given the Chemical Safety Board more stature from the outset of this board than you. I think your background and reputation in the industry brought an instant credibility to the board. I think the staff values that and is very appreciative of the kind of leadership you've shown and the kind of willingness to mentor and share with our staff and bring people along.

On behalf of the staff, I thank you for your leadership. I thank you for your contributions. For the most part, we thank you for your extensive comments on the reports as they go along. It has been

a real pleasure working with you and I'm sure that we will continue to hear your voice so even though you will no longer be a member of the board, we certainly expect to hear your contributions and your advice as the years go forward.

And to Andrea. Let me say that some of you may not realize this is the second time that Andrea has been on the board supervising my work. Like the previous time in terms of the sensitivity to what this board covers, the kinds of people that we try to protect, the kind of processes that we investigate, you bring your experience as an industrial hygienist. You bring your experience as an advocate for workers and a sensitivity to the importance of our work that serves the board well that has helped to establish a positive reputation for this board.

Like with Irv, I don't expect that this is the last we're going to hear from you but on behalf of the staff I want to thank you for your contributions, for your input, for your leadership, and we look forward to continuing to work with you.

DR. TAYLOR: Thank you.

MR. BRESLAND: I would just like to say that it's been a pleasure. I've worked with the both of you for the last year. I've work with Irv in the past in his days back with Roman & Haas. I hadn't met Andrea until I met her for the first time about, I guess, August of last year but I have enjoyed my year and a bit working with them both and I look forward to continuing to work with you in the future.

I know Irv is moving on to the University of Pennsylvania. Andrea is moving on to still undecided. All sorts of opportunities but still hasn't decided which one of those she's going to take. We look forward to continuing to work with you over the years. Thank you both very much for all of your efforts.

DR. ROSENTHAL: I just wanted to say that my problem is in spite of all the heartache and the aggravation, I enjoyed it. I think the board was an opportunity to get involved with real problems and real people and a learning experience. I look back at it as a very, very rewarding experience for which I

guess I have to thank the citizens of the United States for giving me the opportunity.

DR. TAYLOR: Then I'll get the last word. I have to say, too, I was going back through my files as I was packing up my things and I'm looking back to see. The board has come a long way in five years. I really feel good about being a part of this process, getting the board established to where we are today.

We have seven investigations that are ongoing and three reports. That was unheard of before. I wish you all the best. To the staff, thank you for listening to me. I hope that I was able to provide something to you guys. Again, I want to say keep the public in your presentations. Remember that we are an agency that respond to the public. That's why we were established. Thank you for my time. I enjoyed it.

MS. MERRITT: Are there any other comments? Well --

MR. WARNER: I would just like to make one.

MS. MERRITT: You get the last word.

MR. WARNER: Lawyers always love the last word. Having served as the acting chief operating officer for two and a half years, very short years, but I would like to express my thanks to both Andrea and Irv. It was an exciting time. We've done an awful lot. I've learned an awful lot.

Although many of you don't know Irv probably has a variety of degrees. He has a legal degree. What he doesn't have his sons and grandsons and relatives have so it's like Irv has it. I've enjoyed working with you both. But I would like to say as far as the legacy that I see from our conversations that I've had with both of you, you have always stressed that we push. It is not just the investigation. It's not going out there.

It's not the reports. It's making sure that we take this message much, much further out to the communities, to the organizations, safety organizations. It's getting what we have here and translating that into prevention and making sure that it really does make a change for the better so, both of you, that is a great legacy to have.

MS. MERRITT: Thank you very much with that final word from our general counsel, but I'm sure we'll have more later. I would adjourn this meeting. Thank you very much.

(Whereupon, at 3:15 p.m. the meeting was adjourned.)