UNITED STATES OF AMERICA

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CHEMICAL SAFETY AND HAZARD INVESTIGATION BOARD

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PUBLIC MEETING

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TUESDAY

MAY 14, 2002

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WASHINGTON, D.C.

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The Public Meeting convened in Suite 400, 2175 K Street, N.W., Washington, D.C. 20037, pursuant to notice, at 10:00 a.m., Gerald Poje, presiding.

CHEMICAL SAFETY BOARD MEMBERS PRESENT:

GERALD POJE
ANDREA K. TAYLOR
IRV ROSENTHAL

ALSO PRESENT:

CHRIS WARNER
WILLIAM HOYLE
STEPHEN SELK
KEVIN MITCHELL
LISA LONG
STEPHEN WALLACE

C-O-N-T-E-N-T-S

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

10:00 a.m.

CHAIRPERSON POJE: Good morning, everybody. My name is Jerry Poje. I'm a Board Member of the Chemical Safety Board.

Unlike our past meetings, today I am chairing this meeting. The Board has been busy over the last month on a number of fronts, but one of the fronts has been in dealing with the interim basis of Board leadership during the period when we're absent a Chairperson.

Let me just review for you the history of events briefly and give you the update on where we are as of this meeting. In January of 2000, the original Chair of the Board resigned from that position. Based upon extensive discussions between our Office of General Counsel and the White House and the Office of Legal Counsel in the Department of Justice, the Board at that point in time issued a Board Order, 003, that allowed for the Board to take the role and responsibilities of the Chairperson and fractionate them and divide them amongst the remaining Board members.

In February of this year, a little more than two years afterwards, the Inspector General for the Chemical Safety Board issued a recommendation to the Board that we reconsider such matters and seek additional input on that. As of February, we had transmitted a letter to the Department of Justice, Office of Legal Counsel, expressing our willfulness to reallocate such responsibilities, such that a single Board Member would be given greater responsibilities for executive and administrative functionality.

In March we issued that request. In April we received an affirmative response from that Office. So in coordination with the Office of Inspector General recommendation, a legal opinion from the Department of Justice, and extensive notification to our congressional authorizing and appropriating committee members, we have taken the action last week that allowed for a redefinition of Board Order 003.

The delegation was done through a voting notation item. Specific delegations were assigned for this individual Board Member with executive and administrative functionality, to have oversight for personnel, administration, funds up to $50,000 expenditures, oversight for investigations, conduct of Board meetings, and communications on behalf of the institution.

Specific restrictions were established

assuring that all such actions would be in compliance with federal rules and regulations, and that the oversight for Equal Employment Opportunity functionality for the Board would still reside with a second Board member.

In addition to that, there were explicit exclusions that we established that retained to the Board as a whole, namely, the three existing Board Members, their specific functions. We individually and independently need to approve and oversee all investigation reports, all safety studies. All Board regulations will be established by a Board as a whole. Budget proposal and budget executions will be overseen by the Board as a whole. Large contracts and expenditures greater than $50,000 will still be a Board as a whole function. The establishment of heads of major operational units for the institution will still be held by the Board as a whole, and strategic plans will still be a Board as a whole function.

This redelegation, this authority also gave us the responsibility for such an individual to have the rights of redelegation to the Chief Operating Officer. The duration of this assignment is based upon three different contingencies. Should a new Chairperson be nominated, confirmed, and sworn in, then the function of an Executive Administrative Board Member will cease as of that point in time.

We will also commit ourselves, if that hasn't occurred within a six-month period, to formally review and reapprove such an assignment, or this can be terminated at any time by a quorum of the Board voting to exercise such.

The delegation has been assigned to myself. So, as of this moment, for this public meeting, I am the Board Member with executive and administrative functionality.

On May 9th, following up on this assignment, I also executed full delegations to our Chief Operating Officer for a whole bunch of day-to-day operational responsibilities. So in doing such, we have completed action on two major recommendations from our Inspector General, and I will conduct the rest of this meeting as the presiding officer for the Board at this public meeting.

Several other activities are ongoing. Since we last met in public session on April 17th, the Board has initiated two new investigations. So the staff has been, as I said in public, working to the max. We have fully deployed two separate teams for ongoing investigations in the last month and are happy to see ourselves so deployed, but we also are reaching the maximum of the possible expenditure of staff, time, energy, and resources. So I'm proud of the staff and we are proud of the institution, and we are on with our work.

With that, I would open up to any other comments from my fellow Board Members. Dr. Rosenthal?

DR. ROSENTHAL: Well, nice to see many old friends here at the meeting. I must say that I believe that the changes we have taken, after receiving authorization, or at least no objections from the legal offices, is most welcome. Running any organization by committee is not a desirable thing. So I look forward to having Dr. Poje exercise some of the day-to-day responsibilities of the Board. I think it should lead to more effective, more efficient action, and will certainly make my life more peaceful.

(Laughter.)

MS. TAYLOR: I want to ditto what Irv just said. I think this has been a great move for the agency. Fortunately, we did receive the report from IG, but it feels good to do this and now have one person responsible for the administrative function of the agency. It is hard to have three heads. So now having one, then that makes it much easier for us.

CHAIRPERSON POJE: Thank you both.

Chris, do you want to say anything in opening remarks as Chief Operating Officer?

MR. WARNER: I would like to echo Dr. Poje's comments. We have an awful lot on our plate. As he said, we have two new investigations that are ongoing, one in New York, one in Texas. We also have a variety of investigations where the field investigations have been completed and we are doing additional research. That is Georgia Pacific. We have Motiva Enterprises in Delaware. We have the huge reactives hearing coming up in Paterson, New Jersey, and our reactives report, and of course the closeup of BP Amoco. So with our small staff, we are fairly busy with a large variety of things, as well as meeting all of our administrative responsibilities.

I do look forward, even in this short-term of carrying out the delegations from the Board. I think we are well on our way to meeting all of the recommendations from the IG, and certainly sets us up for a very even, smooth transition as we look forward to getting a new Chairperson for the Board, a new Board Member, as well as a new Chief Operating Officer.

So with that, we will move on to BP Amoco.

CHAIRPERSON POJE: Okay, the major bulk of our meeting today is focused on the item on the screen, if we could have Bill Hoyle, our Director of Investigations and Safety Programs, open up this portion of the meeting. Bill?

MR. HOYLE: Well, it is my pleasure to introduce our four-member team that has worked on this report that you will have presented to you today. The lead investigator is Steve Selk, and he is joined by three of our investigations staff: Lisa Long, Kevin Mitchell, and Steve Wallace. I understand each of them will be taking a portion of the presentation today.

I also would ask you to appreciate Steve Selk and Kevin Mitchell's. They have just returned from an investigation in New York City. They are doing double-duty, to say the least, of pursuing that investigation and then bringing to conclusion this BP Amoco investigation. So we very much appreciate their efforts.

So I am going to turn it over to Steve Selk, the lead investigation. He will start off the presentation, and he will recognize his other partners at the appropriate time.

MR. SELK: Good morning. Let me just make a few adjustments so I can get my paperwork here.

Members of the Board, you have asked that we assembly today to present our findings and conclusions on the incident that occurred at the BP Amoco's Polymer Plant in Augusta, Georgia 14 months ago. We are ready to do so, and we expect that the investigation will be further advanced through your reflection and subsequent counsel.

In addition to myself, the field investigation team consisted of Stephen Wallace, Kevin Mitchell, and Lisa Long. They are all chemical engineers, and you will hear from each of them today. All have more than 10 years of industrial or consulting engineering experience. Additionally, our analysis benefitted from the advice of the Director of the Investigations and Safety Programs, Bill Hoyle, and the head of our Recommendations Program, Don Holmstrom.

The investigation was also advanced through the full cooperation and goodwill of British Petroleum. I compliment them for the excellent leadership they have shown in this regard. Yet, today we will criticize them because their management of technology and the human endeavors associated with it was insufficient to prevent the incident we will tell you about.

It is fitting that we be critical for exactly 14 months ago three employees of the company were fatally injured by a sudden catastrophic event. They were Heinrich Kohl, age 24, John Rowland, age 35, and George Sanders, age 42.

Shortly, we will discuss root and contributing causes. We will state our conclusions using phrases that will tend to indicate that the accident happened because the company didn't do something it could have. In so doing, it is not our objective to hold the company in a bad light. We conclude that no one in the Augusta facility had any idea that an incident of this nature could have occurred. Indeed, we observed that there were many things that they did very well, but we won't speak to them. Instead, we will focus on things they could have done better. Our sincere objective when pointing to these root and contributing causes is to identify how technological operations that are potentially hazardous can be more effectively managed.

Bear with us now because we can't begin to discuss the root and contributing causes until we explain the technology involved. I will review the basics of the manufacturing of the process. Then

Kevin Mitchell will describe the incident. After that, Lisa Long and Steve Wallace will discuss pertinent management systems that contributed to the incident. Finally, I will emphasize what we believe the root and contributing causes were.

The manufacturing process involved produces a nylon plastic called Amodel. This is a picture of the plant involved, a petrochemical-type, outdoor operation. Amodel is a form of nylon created through the reaction of a di-amine and di-carboxylic acid. Each time a molecule of raw material is added to the molecular chain, a molecule of water is released as a byproduct.

Nylons, of course, date back to the era of the Second World War, one of the first applications being toothbrush bristles. Most of us are aware of other applications. But Amodel is an advanced form of nylon. While it is moldable, it is very hard, very strong. It melts at a temperature of 600 degrees Fahrenheit.

Amodel was Amoco's only entry into the nylon business. They only built one plant. Development started in 1979 in Naperville, Illinois, the first R&D efforts. Pilot plant production began there in 1981. Then an experimental unit was built in

Greenville, South Carolina, followed by a semi-works unit to produce sample commercial quantities in Augusta, Georgia in 1992, and then, finally, the commercial unit in 1993.

Our story is complicated a little by changes in ownership. In 1998 British Petroleum acquired Amoco. They held the facility for less than two years. In November of 2001, BP Amoco and Solvay exchanged certain assets, and the Augusta site is now owed by Solvay Advanced Polymers.

The ingredients used to make Amodel are solids at ambient conditions. In the first step of the process, the ingredients are dissolved in water. This creates an aqueous solution of what is effectively a salt. The preparation is done batch-wise. However, the rest of the process is conducted continuously. That concept, that the process operates continuously, is important to understanding the incident that occurred.

The liquid salt solution is pumped to a pre-reactor, where it is heated. The addition of heat initiates the polymerization reaction, and some of the water produced is released as a vapor. The partly-reacted liquid is then pumped to a very high pressure and passed through a series of heaters. This advances the reaction further. Then the pressure is allowed to suddenly drop. In so doing, much of the water present vaporizes to steam. The result is a dispersion of prepolymer droplets that is conveyed by a rapidly-flowing volume of steam.

This enters a second reactor, where further heat is added. Because the polymer is now in the form of droplets, it is easier for by the byproduct water that is being formed in the reaction to diffuse from the droplets and vaporize to steam.

The polymer passes through the reactor in a matter of seconds. Upon leaving the reactor, the polymer is fed to an extruder, where the reaction is completed. An extruder is a device much like a large meat grinder. It mixes, kneads, and shears the polymer aggressively while simultaneously adding more heat. That shearing action drives the reaction to completion.

From the extruder, the finished product is pumped through a die that has holes in it. Strands of plastic are created that are cooled and chopped. The result is these granules of pellets of finished nylon plastic. I would like to pass this sample of the material around to you to look at it.

Bear with me; we've got a little more

technology to cover before we get on to what happened. That is the basic technology of how Amodel is made. However, there are many complexities involved. In particular, matters that are of interest to us in understanding the incident have to do with how the process is started up and shut down.

To start the process, water is first circulated through the equipment. The temperature is raised, and in the second reactor the water turns to steam. The steam can't be directed to the extruder. So, instead, it is directed to another vessel called the polymer catch tank. It was in this vessel that the incident occurred.

During startup, the effluent from the reactor is diverted by this three-way valve so that it enters the catch tank. The steam leaves the tank and passes to a recovery system. Once water is circulating through the process and the temperatures are high enough, the water is replaced by the salt solution. The solution makes its way through the equipment, polymerizing as it goes.

At first, it is not of sufficient quality to send to the extruder. So the effluent from the reactor remains directed to the catch tank. I mentioned earlier that the reactor effluent is composed of drops of polymer dispersed in a flow of steam. It is this mixture that enters the catch tank, steam and droplets of polymer.

Schematically, the catch tank looks like this: piping inlet on the one end and a vapor outlet for the steam here. Polymer accumulates inside. These two connections, one is for nitrogen, one is for steam. There's a drain on each end of the vessel.

Because the fluid that is entering is a mixture of steam and droplets of polymer, this vessel is actually a separator. The polymer accumulates inside, and steam leaves through the top. There's no active cooling. Heat losses are through the walls of the vessel only. Eventually, those heat losses cause the molten polymer inside to solidify.

During startup of the reactor, the effluent is diverted to the catch tank for 50 minutes before flow is swapped to the extruder. You will hear later from Steve Wallace that it wasn't always 50 minutes. They had changed the process, but all the ramifications of that change were not carefully considered.

That is the actual vessel. The cover has been removed from one end. The cover weighs about one ton.

Beyond startup, the catch tank also plays a role during shutdown, but it is a more complex role. When the process is shut down, the flow of salt solution is stopped, and it is immediately replaced by a solvent. The purpose of the solvent is to dissolve any remaining polymer in the reactor, heaters, and piping. Otherwise, the polymer would solidify inside the equipment.

The solvent and dissolved polymer flows to the polymer catch tank. There the solvent vaporizes and leaves the vessel just like the steam does during startup. The polymer is left behind. Eventually, the shutdown is terminated by a flush of water.

Once the process is completely shut down, maintenance personnel remove the cover from the vessel and remove the plastic. Typically, that is the type of mass that is extracted from the vessel. That is a rack inside the vessel with a hook on it, and they would connect a wire and an eyelet to that hook and pull this mass from the vessel using a forklift truck.

Now there's only one other reason that they would use the catch tank to receive the reactor flow, and that is if there are problems with the extruder. Recall that this is a continuous process. If the extruder inadvertently shuts down, the process flow must be directed to some other location, and that is the catch tank. If the problem with the extruder is not quickly resolved, the flow of raw materials must be stopped and the flushing solvent injected.

We are coming to the end of the technology section, so bear with me just a few moments longer. The catch tank has a sister vessel called the reactor knockout pot. Its primary purpose is to serve as a destination, should this pressure or safety release device here in the outlet of the reactor burst. This is what we call a ruptured disk or bursting disk. So if some obstruction should form anywhere in here, this disk will open and allow the reactor flow to go to the knockout pot. Additionally, the knockout pot serves as another place that the reactor effluent can be diverted to, should the catch tank become too full.

Kevin Mitchell will shortly describe the incident, but to help you follow it better, let me tell you now that what happened in this incident was that they had problems during the startup of the plant. They put a very large quantity of hot plastic into the polymer catch tank in one continuous shot. Because so much hot material entered all at once, the thermal energy sustained further reactions of the plastic, both side reactions and decomposition and degradation reactions. Kevin will explain how those reactions, which were unanticipated in the design of the plant, and other complicating factors resulted in the incident.

Kevin?

MR. MITCHELL: Thank you, Steve. Members of the Board, good morning.

The Amodel unit was operating normally during the week prior to the incident. On Saturday, March 10th, a problem, a malfunction in the extruder caused the Amodel unit to shut down. A repair was made, and the unit was scheduled to restart on Monday, March the 12th, 2001.

During the period of the shutdown, the polymer catch tank, the subject vessel, was opened, emptied. As Steve showed you, the polymer was removed from vessel, and the picture he showed was, in fact, the polymer that was removed during that shutdown.

At 6:45 a.m. on March 12th, operators prepared to start up the Amodel unit by commencing their pre-startup checks. As part of the normal startup checklist, the extruder was supposed to be pre-run for approximately one to two minutes to verify its operability.

The lead operator on duty at the time of the incident was told that the extruder had been run the previous evening during the purge procedure to clean the screws. The lead operator thought it was not necessary to again rerun the extruder before startup, and his supervisor agreed. Therefore, the extruder was not pre-run on this particular startup.

After resolving several last-minute maintenance items, raw material feed was introduced into the Amodel unit at 1:29 p.m. on March 12th. Unit temperatures and pressures were within normal operating ranges at that time.

As was typical on startup, and as Steve mentioned, the initial flow of material coming from the reactor was sent to the polymer catch tank for approximately 50 minutes, after which time it would have been swapped to the extruder using this valve.

To finalize startup, personnel attempted to start the extruder at 2:17 in the afternoon. At this time it was determined that the extruder screws would not turn. The unit supervisors were immediately notified, and maintenance was called in to work on the problem.

Over the next 25 minutes, several attempts were made to diagnose and resolve the problem with the extruder. During that period of time, polymer continued to accumulate in the polymer catch tank, as the reactor and upstream equipment was operating.

At 2:30 p.m., with the extruder malfunction still unresolved, a decision was made to abort the startup and prepare for a unit shutdown by immediately going to a solvent flush. The flush solvent was injected at 2:41 p.m. It took several minutes for the polymer to be displaced by the solvent, and during that period of time material continued to accumulate in the polymer catch tank.

The flushing operation continued normally for approximately one hour. At 3:45 in the afternoon, an engineer noticed a small leak of vapor coming from the cover of the polymer catch tank, about right here. Plant personnel described the vapor as being characteristic of the solvent. Unit supervisors were made aware of the leak, and a decision was made to divert the flow of solvent from the polymer catch tank to the sister vessel Steve mentioned, the reactor knockout pot.

Shortly after flow was diverted, a leak developed at the cover of the reactor knockout pot as well. No immediate action, however, was taken in response to this leak. From this point forward until the time of the incident, no additional material accumulated in the subject vessel, the polymer catch tank.

At 6:53 p.m., several hours later, the solvent flush was discontinued and the unit was put on a water flush. Operators continued to monitor unit temperatures and pressures and other operating conditions for several hours, and at 11:21 p.m. water flush was discontinued and the unit was shut down.

Instructions were left on the night shift to clean the polymer catch tank vessel of the accumulated material. Maintenance technician arrived at the scene at approximately 2:15 a.m. on March 13 to conduct the work. Prior to conducting the work, operators closed a valve connecting the nitrogen line to the reactor knockout pot and the polymer catch tank and placed energy isolation tags on those valves. A lockout tag-out energy isolation form was completed and signed by both the operator and the maintenance technician, and the cleanout work at this point was ready to commence. It should be noted that no other connections to the polymer catch tank were locked or tagged at this time.

Two operators went to the vessel to assist the maintenance technician in opening the cover. At 2:25 a.m. on March 13th, the maintenance technician began to remove the 44 1-and-1/8th-inch bolts that connected the cover of the polymer catch tank to the vessel with the assistance of two operators.

He had removed approximately half of the bolts at the time of the incident. At 2:36 a.m., as the restraining force of the cover was being gradually reduced, as the bolts were taken off, a sudden and explosive release of energy broke the remaining bolts. The cover was ripped off the vessel and propelled upward. It struck a girder on the overhead rain canopy, shown here, and it came to rest approximately 15 feet from its original position on the vessel. Here's a picture of the cover as found.

A mass of hot molten polymer was ejected from the 48-inch diameter opening of the polymer catch tank. The molten polymer traveled as far as 70 feet, striking workers and equipment as it traveled. Here's a picture of the molten polymer in the area of the unit.

The maintenance technician and two operators suffered severe impact trauma. Two men died at the scene, and a third was pronounced dead on arrival at the Medical College of Georgia.

The force of the initial explosion ignited -- or pardon me, caused damage to nearby hot oil piping in the area. Hot oil was released and a flammable vapor cloud formed that ignited at 2:42 a.m. and burned in the area behind the polymer catch tank for several hours. After emergency responders had isolated the hot oil system, the fire was extinguished at approximately 8:15 a.m.

I have a sample of the polymer that you see in this particular photograph that I would like to pass out so that you can see its characteristic color, texture, and shape.

That concludes a brief description of the incident itself, and I would like to take a little bit of time this morning to talk about some aspects of the incident reconstruction which will help you understand why this incident occurred.

First of all, with regard to the extruder that failed to start, inspection of the extruder after the incident revealed a significant quantity of ash had accumulated inside the extruder in the barrels. The ash was most likely the result of an internal fire that had occurred in the extruder prior to the incident -- prior to the startup of the unit, rather. Because the extruder was not designed to convey powders, the accumulated ash probably caused the screws to bind up when repeated attempts were made to start the extruder on the afternoon of March 12th.

Statements from several operators have indicated this was the first time at which the extruder had failed to start concurrently with the startup of the production unit. However, the machine or its components were known to occasionally fail during normal production, and it was extruder component failure that had caused the shutdown on March the 10th, and a nearly identical incident occurred the prior week during normal production.

BP Amoco personnel were aware of the possibility for extruder malfunctions during production, regardless of the cause. When the extruder experienced certain mechanical difficulties, it was necessary to divert flow, as Steve mentioned, into the polymer catch tank. On at least two prior occasions, this resulted in overfilling of the polymer catch tank or the sister vessel, the reactor knockout pot, and plugging of their overhead vent lines.

Now the polymer catch tank itself, most of the contents had been expelled during the incident. However, a solid layer of polymer, ranging from 3 to 5 inches thick, remained and coated the entire inside surface of the vessel, including the shell and both ends or covers.

The vessel nozzles, including the vent nozzle, were completely plugged with polymer. This is a photograph of what should be the 6-inch vent nozzle here, shown from the inside of the vessel. You see the 3-to-5-inch thick layer of polymer, and this is a plug of polymer, very hard polymer, completely obstructing the vent nozzle from the vessel.

Significant amounts of polymer were found within the vent system itself, which led to questions from the investigators as to how much material actually went into the polymer catch tank during the aborted startup. During a typical startup, the amount of polymer sent to the catch tank would fill it to less than half full. As a result of the aborted startup on March 12th, more than twice the normal amount of polymer had been directed to the tank, and this had not occurred uninterruptedly in a single shot, as Steve put it, on any prior occasion during the history of the commercial Amodel unit. Therefore, the amount of heat and energy inside the vessel was likely larger than it had ever been in the past.

The public literature on nylon plastics describes them as being possibly susceptible to thermal degradation and side reactions, and both mechanisms can produce gases which can include carbon dioxide, ammonia, and water vapor. Among other evidence, this led investigators to theorize that the source of energy and pressure inside the vessel was caused by an unintended chemical reaction.

Investigators arranged for testing of typical extruded Amodel. One sample was tested by thermogravimetric techniques when subject to conditions which we expect would have been similar to that within the polymer catch tank. The test revealed that Amodel does undergo a significant weight loss at the test conditions, and investigators concluded that this weight loss was partly due to decomposition reactions and partly due to side reactions.

Further more sophisticated analysis confirmed this, finding such gases as carbon monoxide, carbon dioxide, and water vapor, all of which are consistent with these reactions. These substances are all gases at moderate temperatures and would develop pressure inside a closed vessel under those conditions.

As I mentioned before, no additional material entered the polymer catch tank after approximately 3:45 p.m. on March 12th. Over the next several hours, the core of the vessel continued to react. This caused the viscous, as gases were involved from these reactions, it caused the viscous molten contents of the polymer catch tank to swell and expand, and likely it occupied the entire volume of the vessel.

Further swelling and expansion likely pushed material from the vessel into the vent system and the emergency pressure relief inlet lines. Once this material reached the relatively cool surfaces of the pipe in the vessel, heat loss occurred, and the polymer solidified. Here's a picture of the amount of polymer we found in the 6-inch vent line itself.

Once this occurred, once the solidification of the polymer occurred in the vent lines, the vent nozzles, the evolving vapor from the chemical reactions had no pathway to escape, and over a period of several hours the polymer catch tank became pressurized. That was the source of the pressure in the vessel.

Now I will turn it over to Lisa Long and Steve Wallace, who are going to explain some of the management system causes as to why that condition developed.

MS. LONG: Hello. Kevin talked a little bit about how this incident happened. I'm going to talk a little bit about why this happened. Steve and

I are going to tag team a little bit, so we will switch back and forth once.

But in this part of the analysis, typically, we discuss management systems and deficiencies in management systems that could have caused or contributed to an incident such as this. So we will be focusing on management systems in the Amodel process that could have contributed or caused the incident.

Kevin spoke about the reactive chemistry hazard in the Amodel process, and it is common industry practice to manage reactive chemical hazards with an appropriate management system.

The Amoco development team did not conduct research into the hazards of normal or unanticipated reactions. They were unaware that a reactive hazard existed that could result in an incident such as this.

There is industry guidance which contains information on how to develop a reactive chemical management system. This includes publications by CCPS and HSC, and although these publications were not published until the 1990s, they were based on practices that were developed and in practice in the 1980s, when Amodel was first developed.

As Kevin mentioned, reference materials

that contain information about nylon chemistry refer to and describe potential decomposition and cross-linking reactions that can occur within the nylon family. Had developers looked at this information, this could have been used to do some initial screening and perhaps led to further testing that would have uncovered the reactive hazard that existed in the Amodel process.

Amoco did do some product degradation testing in 1990 and then again in 1994. This was done for applications and product development. They did thermogravimetric analysis, and the testing showed that Amodel, when held at temperature, did decompose and this could affect product quality. However, the significance of this testing was never realized with respect to process safety.

The reaction that took place on the day of the incident was a slow endothermic reaction. Typically, when people think of reactive chemistry, they think of exothermic runaway reactions. While this common and does cause incidents, maybe more so than the endothermic, the endothermic hazard is a known hazard, and it is described in a limited way in some of the industry guidance.

Another important management system is

process safety information. Process safety information is covered in various industry guidance, and it is a way of describing process information such that operators and engineers understand how to operate the process, how to manage changes, and why certain decisions should or shouldn't be made.

While Amodel did have process safety information, the principles of operation for the polymer catch tank were not documented in the process safety information. In particular, the design information did not explain that the catch tank was acting as a separator and, as such, there were important operating parameters such as maximum operating level that should have been identified in order for this vessel to operate efficiently as a separator. This was not covered in the process safety information.

The documentation explained the vessel's role during the flush process, but not particularly during startup, shutdown, or process upsets. It was used during all of those phases in operation. A certain amount would have been collected during startup, a certain amount during shutdown, and then a certain amount of space should have been reserved for process upsets. The process safety information should have described the use of these vessels during the various phases and also how much space should have been left in the vessel to be used in the event of a process shutdown, so that this vessel could still operate properly.

Again, industry guidance such as material published by CCPS explains the need for documenting this process knowledge and also explains what should be contained in it, and certainly would include some of these items.

I am going to pass this over to Steve for a minute.

MR. WALLACE: Thank you very much, Lisa.

As Lisa mentioned, she and I are tag teaming. We are going to talk about some of the management systems. I want to tell you a little bit about the system that existed for managing changes in the unit, as well as some design issues that we found in our analysis, and the procedures that were in place to ensure that the vessel was isolated prior to opening, as well as the system that existed for reviewing hazards that may be present.

I want to start with the system for managing changes in the unit. The Augusta site used a process change request procedure, or what they called a PCR. Basically, it documented and managed changes to the unit, the safety basis and the technical basis of any changes to the unit. In the Amodel process it was applied to hardware changes, but we found that it was not necessarily applied to modifications to practices and procedures.

The example that Steve touched on, and I want to go into a little more detail, is that in the mid to late nineties the time that the startup material was sent to the catch tank was increased from 30 to 50 minutes. Since the startup material is mostly water for the first 20 minutes of the startup, and that is vaporized and goes off, the rest of the material that goes in for the rest of the time is actually polymer. This increased the volume of the polymer accumulated during the startup threefold.

In other words, when it was started up for 30 minutes, 20 minutes of that was water; the other 10 minutes was accumulated polymer. When it was changed to 50 minutes, still 20 minutes of that was water, but now a full half hour was polymer accumulation. So this increased the amount of polymer threefold. As we have discussed throughout this presentation, the amount of polymer that went into the vessel that day was much greater, so the margin of safety or the amount that could be sent to the vessel was less than it had been in previous years.

This change decreased the capability of the catch tank to hold additional material in the event of process problems downstream. As Kevin pointed out in his portion of the presentation, the fact that the extruder did not work required them to send additional material here as well. So this was a factor as well in the incident.

Now I want to talk about process hazard analyses and the method for reviewing, periodically reviewing, the hazards that could be present in the process. To the company's credit, process hazard analyses were conducted on this process both in 1990, during the design phase of the process, and also in 1999, using the HAZOP technique.

Just as a review, the HAZOP technique is a system where you review your hazards, you basically break the unit up into chunks -- vessels, pipes, reactors, heat exchangers -- and you evaluate how each one of those pieces can deviate from its original design intent. Then you evaluate what your consequences are, what could cause it. You evaluate what type of safeguards you have in place, and then, based on the safeguards you have and the consequences, you try to develop recommendations, if they are necessary, to prevent the consequence or to decrease the likelihood.

We did a thorough review of the hazard analysis and found that, while they contained much important information, much of the analyses were not comprehensive, and we will go into some detail about that at this point.

Credible scenarios that could lead to excess level were not identified, and recommendations to prevent them were not developed. During the first PHA, that is, the one in 1990, during the design, the Amoco team noted that insufficient design information was available to conduct a full analysis of the extruder, and they recommended that consideration of those issues be performed in a follow-up HAZOP. However, that follow-up HAZOP was never conducted. I want to note again that it was failure of the extruder to start that resulted in additional material flowing into the catch tank.

In 1993, the catch tank was overfilled, when the extruder malfunctioned, a different scenario. It was actually in process. It was not during a startup, but the extruder did malfunction. However, the HAZOP conducted in 1999, which was supposed to take into account previous incidents, did not identify means by which an excess level could occur in the vessel, along with level credible scenarios that could lead to excess pressure were not identified and recommendations made.

During the 1990 PHA the Amoco team noted that high pressure may not be relieved if the relief line was plugged with polymer, and they made a recommendation to ensure that the line was clear during operation, but our investigation team found no evidence that such a system was provided. In a polymer service, fouling and plugging of equipment is a very credible scenario that must be considered.

During the 1990 PHA the team identified that the relief system was an adequate safeguard against high pressure and did not recognize the credible scenario that both the normal vent and relief lines could both become plugged. This is a common cause failure that should be considered when you are evaluating the systems of polymer where there is plugging and fouling, but that did not occur. This is actually what occurred on March the 13th.

Some other issues that we found in our analysis of the PHA process: A local pressure gauge was installed to alert personnel of the potential for pressure in the vessel, but neither PHA team, that is, in 1990 or 1999, considered that the gauge could become plugged and could also become useless.

The HAZOP method which was utilized contained no protocol for examining startup and shutdown issues during operations involving the extruder, and that would include problems associated with an aborted startup, which was the situation that occurred on March 13th, 2001.

The HAZOPs did not document any discussion of reactivity issues associated with the catch tank. Lisa went into some detail about a comprehensive reactive management program. Considering that during your process hazard analysis is not something we would contend substitutes for a comprehensive reactive program. However, it is a part of the program.

When you go through and periodically re-evaluate your process, that is a good opportunity to look at the hazards of reactive chemicals. There was no specific guide word to guide the team to reactive chemicals. There were some guide words which included reactivity. However, there was no documentation that those discussions took place.

I want to talk a little bit about design deficiencies, and I want to preface this by pointing out that, in the spirit of comprehensiveness, we are going to talk about a number of design deficiencies. Some of these were more causally related to what occurred on March the 13th, 2001 than others. I will try to point those out as well go along, but I do want to say, not all these were directly related, but we did want to comprehensively present this to you today.

A number of design deficiencies became apparent as operating experience and problems occurred. The level instrument on the catch tank was unreliable, and it was prone to false indications. It often broke when material was removed from the vessel, and frequently was not replaced. There was no reliable alternate method identified to indicate the level in the catch tank. I think I have a picture on this which helps to illustrate a little better what I am talking about.

As we have mentioned before, the material had to be extracted, had to be removed, the bolt. I'm sorry, I'm having to wade through this. When the material was extracted from the vessel, a probe was inserted into the vessel to measure the level. That probe would break off when the metal rack, along with the accumulated polymer, was withdrawn from the vessel. We are going to talk a little more about that particular operation in a minute. But when the probe was broken, it was not always replaced.

There were incidents in which the catch tank or reactor knockout pot were completely filled, which could render both the vent and relief lines inoperable. We have talked about the common cause failure there, where you defeat both your venting capabilities and also your relief capabilities.

The relief line on the catch tank and knockout pot were not shielded from process fluid with a rupture disk. As Steve pointed out, there was a rupture disk on the line from the reactor. There was no such rupture disk, which is basically a plate that rests under the relief device which is meant to protect it. Certainly in services where plugging and fouling are issues, good practice notes that it is desirable to have a rupture disk to protect your relief device.

Let me talk about the isolation capability for the vessels, which we found had some issues as well. There was a double-block and bleed line on both the inlet and vent lines of the vessel. Those were fouled by solidified plastic and would not close. As a point of review, double-block and bleed, basically, a way to isolate one piece of equipment from another.

You have valves that you close, and you have a bleed or a drain line between them that you open. So that if something comes from one area, it goes through the drain line rather than going into the other vessel. However, because of the service these were in, they were plugged with solidified plastic and would not close.

There were ram-type valves on the drain line of each vessel. Steve went into some detail on this. This was supposed to allow personnel to verify that the vessel was depressured, but these were also prone to polymer pluggage. There's no evidence that these were actually used on the day of the incident.

The practice of removing material from the vessels required that personnel had to manually remove the bolts on the manway and then attach a cable to the metal frame inside and actually use a forklift to extract the apparatus. This practice presented an occupational hazard to personnel in the area.

When personnel would remove the head, they would hook a cable to the internals of the vessel, and they would extract that from the vessel. This was recognized as a personnel hazard. However, at the time of the incident, no corrective action had been made.

I want to spend a little bit of time on the procedures for the safe opening of process equipment. We found that there was actually no standard practice among the workforce for ensuring the vessel was depressured prior to opening. A written guideline did exist, but it could not be followed due to the design issues that we previously noted. The drain valves, the pressure gauge, and the isolation valves could not be used for their intended purposes.

We also noted that the policy at the Augusta site did not advise the workforce when to suspend activities if problems occurred and safe equipment opening procedures could not be met. In this particular case, the procedures that could not be met were that the personnel could not positively verify that the vessel had been depressured. So, therefore, to open it in the absence of that assurance could and did lead to an incident.

We have previously discussed in some of our investigations the necessity, when safety requirements could not be met, to perhaps assemble a team and do a hazard review. No such review took place that we can tell this day.

I will now turn this back over to Lisa. She is going to talk about the system for analyzing the incidents at the facility and also regarding similar incidents. Thank you.

MS. LONG: Incidents and near-misses provide opportunities to learn lessons and understand hazards that weren't understood prior to the incidents occurring, and it is common practice for companies to have systems in place to investigate near-misses and incidents.

BP Amoco did have a program in place to do this. However, there were previous polymer reaction incidents and near-misses that presented an opportunity to recognize a reactive hazard, but they weren't investigated to level that they understood this hazard to be the cause.

For example, on the initial startup of the Amodel unit, they had accumulated lots of masses of polymer, waste polymer, that wasn't going to be used. These were accumulated in large chunks that were commonly referred to as pods. As you can imagine, on initial startup a lot of this waste material was accumulated and it was set out into the field. Several hours after it was set out into the field, the pods of polymer burst, and in some cases pieces of polymer flew as high as 30 feet.

This incident was investigated and

corrective action was taken. However, personnel attributed this incident solely to stress cracking, and they took action, including generating fewer of these pods, and moving them further away, and this did decrease the likelihood of this happening. So they thought that they had done the right thing.

Evidence later, after this incident, showed that the chemistry taking place inside these pods was similar to the chemistry that took place inside the polymer catch tank on the day of the incident. So had they gone further with this initial investigation, they may have discovered that there was a reactive hazard there that could have presented itself in other ways in the Amodel process.

Over the history of the Amodel process there were also numerous fires at the extruder. These were investigated; the causes of them were analyzed, however, not within enough depth to understand the source of the combustible material that was causing the fires. In some cases the source of the combustible material may have been decomposition that was generating these combustible gases, but this was not understood.

There were fires involving the catch tank and the material that was removed from it. Similar to the fires in the extruder, the sources of combustible material were not always understood, and, again, some of the sources of these could have been combustible materials generated as a result of decomposition.

Any one of these incidents alone, particularly the fires, may have been hard to understand. It may have been difficult to get to the root cause, but if there was a system in place to identify patterns and trends, one may have seen that there was something in common and they may have helped highlight the causes of some of these incidents and provide a better understanding of the hazard that existed. However, the BP Amoco didn't have a system to identify patterns in incidents.

When we looked at this incident, we also looked at other incidents that occurred even outside of BP Amoco to see if we saw any similarities. The Chemical Safety Board actually did an investigation of an incident at Equilon in Anacortes, Washington. This incident occurred in November 1998, and there were six people killed.

Hot petroleum liquid was being collected in a coke drum. Normally, this liquid was collected in the coke drum, the drum it was filled, it was cooled, and then opened and disposed of. While they were filling a drum a few days before the incident, there was a power outage which interrupted the process and prevented the drum from being filled completely. It also prevented the normal cooling process from taking place.

So a couple of days after this power outage, operations personnel, thinking this drum was cool, they attempted to open it. The situation here was similar to what happened at BP Amoco. It was cool on the outside, but inside it was very hot and there was a slow endothermic reaction taking place which generated some gases. When the operations personnel opened this drum, hot vapors and liquid escaped and ignited.

Again, some similarities between this and the BP Amoco incident: Both involved opening equipment where there were false or misunderstandings of the temperature or the pressure inside the core of the vessel. They both were examples of the slow endothermic decomposition reaction that produced gaseous byproducts, which we talked about before as maybe less understood of the hazards. They both were created by hazards of abnormal startup or shutdown, and they both involved manual opening of hot pressurized equipment.

With that, I am going to turn it back to Steve Selk, and he is going to review the root and contributing causes.

MR. SELK: This is a restatement of what we consider to be the important causes and contributing causes, and then we will take your questions.

First, Amoco, the developer of the Amodel process, did not adequately review the process design to identify chemical reaction hazards. Neither the Research and Development Department nor the Process Design Department had a systematic procedure specifically for identifying and controlling hazards from unintended or uncontrolled chemical reactions.

The technology for identifying these things has improved greatly in the last two decades. Sophisticated laboratory equipment is available that helps identify possible reactions. Together with specialized expertise, the hazards can be more readily identified. Organizations engaged in this type of commerce should focus on identifying these hazards early in the design process.

The Augusta facility did not have an adequate review process for correcting design deficiencies. Workers were unable to follow established company policies for lockout/tagout and equipment opening because the plug drains on the polymer catch tank prevented them from verifying the absence of pressure in the tank.

Recall that this was the first and only commercial implementation of a new process. It is predictable that a new process will have some design flaws. We suggest that management have a system for identifying and correcting those flaws promptly. Without such a concerted effort, plant personnel may take the approach that what they gave us has to be made to work, and they will make the best of it.

Example: Previous occurrences of overfilling and plastic entrainment in the connected piping indicated that the vessel was too small, that the level-indicating device was unreliable. On the day of the incident, operators had no direct indication of the level in the vessel.

The Augusta site system for investigating previous incidents and near-miss incidents did not adequately identify causes and hazards. This information was needed to correct design and operating deficiencies.

They did investigations, but the depth wasn't adequate. Accurate scientific theories were not developed to explain the spontaneous ignition of waste plastic that sometimes occurred or the phenomenon whereby lumps of waste plastic would burst.

Incidents and near-misses tend to be treated as isolated events. Management did not have a system to detect trends and patterns among the incidents. Taken together, lumps of plastic burst; sometimes they spontaneously ignite. There are fires at the extruder. If management was looking for patterns, it might have been able to understand that a chemical reaction was actually going on inside these masses of plastic.

The polymer catch tank had been overfilled and the vent lines plugged on other occasions. Effective countermeasures were not developed.

Contributing causes: Hazard analysis of Amodel process were inadequate and incomplete. Reactivity hazards such as unintended reactions were not examined in the design phase hazard analyses. The extruder operation, and its overall impact on the rest of the process, was not adequately reviewed during formal hazard analysis. Credible scenarios by which the polymer catch tank could become overfilled were not identified.

Documentation did not adequately describe the process. The operating principles behind the polymer catch tank weren't particularly well-described in the process safety information. That led to misunderstandings. The maximum fill level was not clearly specified. Warnings were not provided about the consequences of overfilling. Operations management did not update the documentation to reflect changes to procedures and practices.

Equipment opening procedures did not specify what actions to take when safety precautions could not be followed. On the day of the incident, and frequently during the life of the process, it was not possible to verify the absence of pressure inside the tank because the solid polymer plugged the drain valves. Had a policy been in place to stop work in such circumstances, the design of this vessel may have been reviewed in 1993, right after the process started up.

Revisions to operating procedures were not subject to management of change reviews to evaluate safety effects. This is not uncommon in industry. Flow was originally directed to the polymer catch tank for 30 minutes during startup. The time was later extended to 50 minutes, which increased the amount of material that had to be disposed of in the vessel.

Your questions we shall entertain.

DR. ROSENTHAL: You didn't say, "I'm finished."

(Laughter.)

MR. SELK: Well, I don't think we are. We have your questions.

DR. ROSENTHAL: Very excellent presentation. I think all the members of the team ought to feel very pleased with themselves. I mean, I don't know what the audience thought, but I thought it was good.

MS. TAYLOR: The audience is impressed.

MR. SELK: I have in New York for the last two weeks. So I make that excuse.

(Laughter.)

CHAIRPERSON POJE: Any questions?

DR. ROSENTHAL: Yes, I have some questions.

It may have been mentioned previously, but what was the temperature of the extruder? Do we know what --

MR. SELK: I think someone else can give it to you. It's in the order of 650 degrees Fahrenheit. We have someone who can tell us precisely in the audience, Art.

ART FROM AUDIENCE: At what time?

DR. ROSENTHAL: As the extruder was running, normal operations.

ART FROM AUDIENCE: Six fifty.

DR. ROSENTHAL: Six fifty?

MR. SELK: The Respondent was the Operations Manager for the Amodel unit at the time of the incident.

DR. ROSENTHAL: So 650 degrees, and you mentioned that there is an onset of decomposition when the polymer is held what, around 350 or something?

MR. SELK: Three thirty is my recollection, but Amodel decomposes anytime it is in the molten state. It's the rate of decomposition --

DR. ROSENTHAL: At what temperature does it melt?

MR. SELK: About 600 degrees Fahrenheit.

DR. ROSENTHAL: Okay, but decomposition starts -- that's why I asked you -- at 330 or so there is an onset of decomposition?

MR. SELK: That is my memory.

DR. ROSENTHAL: Okay.

MR. SELK: More rapid decomposition.

DR. ROSENTHAL: So certainly it takes place in the molten state?

MR. SELK: Yes.

DR. ROSENTHAL: Okay.

MR. SELK: Well, it begins slowly, as soon as the material becomes molten, and accelerates with the temperature.

DR. ROSENTHAL: All right.

MS. TAYLOR: Can I ask a question?

DR. ROSENTHAL: Go ahead.

MS. TAYLOR: Okay.

DR. ROSENTHAL: I will come back.

MS. TAYLOR: Okay. Go back to your diagram again of the extruder and the catch tank, because I had a question exactly, what gets to the extruder? I wanted to go back to that. You mentioned that there were numerous fires and that there were collections of material in the extruder. Exactly what is that in the extruder?

MR. SELK: The extruder is like a big pump. It is akin to a meat grinder. It has two counter-rotating screws typically. There are kneading blocks on the screws and conveying parts to the screws. The polymer is squeezed, sheared, and heated inside the extruder while it is pumped and pushed through a die, so that it can be stranded, made into strands.

So things don't accumulate there, but the extruder is vented. On occasions there were fires at the extruder that could be attributed to decomposition of the plastic.

MS. TAYLOR: Okay.

MR. SELK: And other fires of a more mechanical nature that, as we learned, could contribute to its not starting.

MS. TAYLOR: I see.

MR. SELK: We believe that air entered the extruder and burned plastic that was left inside and created that ash.

MS. TAYLOR: Okay. One of your other questions, in removing the polymer in the past, employees were removing the polymers from the catch tank how often?

MR. SELK: Oh, every couple of months.

MS. TAYLOR: Okay, and you mentioned that there had been an indication of buildup of the polymer in the vents that they recognized or --

MR. SELK: There had been previous incidents where so much polymer had been sent to the vessel that the vent lines became plugged.

MS. TAYLOR: And what was the response?

MR. SELK: Well, I think our observation is that it wasn't considered a hazard. They thought of it as benign, solid plastic that was more an inconvenience to be dealt with than a hazard.

MS. TAYLOR: Okay.

MR. SELK: And that is why we've focused on the No. 1 root cause, to look for the possibility of reactions.

CHAIRPERSON POJE: Steve, can you give us some characterization of the -- we are familiar as a Board, because of the events at the Morton incident with an exothermic reaction synthesis of a chemical as well as the exothermic reaction of the degradation of the product itself.

But in this instance you are dealing with an endothermic reaction. It is that a relatively infrequent event to be at the basis of a reactive incident?

MR. SELK: I think so. Most of us recognize that reactions that release energy are hazardous. This one actually absorbed energy, but it converted energy as well to pressure. So while when those reactions were occurring, it was actually cooling down the mass of plastic in the vessel, still 600 degrees in there, approximately, gases are being formed and they exert pressure. So we have an energy conversion, and it is insidious.

CHAIRPERSON POJE: And also what would be the failure to really document a vessel's role during important operations like startup, shutdown, or an unanticipated -- but the world doesn't work perfectly, so you have to expect some interruption because of a mishap.

MR. SELK: Well, let me field your question this way: I have worked in the industry for more than 25 years before coming here, and I have designed many processes. It is not unusual that documentation of how things work or how they were attended to work gets short shrift in the design process. The documentation they had I think is consistent with 1980s era technology, but we have to do better.

CHAIRPERSON POJE: Let me ask one more question in that domain. There was a PHA done first in 1990 during the design phase of the operation, and then a second one done in 1999, nine years later. Is that a common frequency rate for redoing a PHA?

MR. SELK: Well, I think the frequency could be greater. In processes that are regulated as highly hazardous the minimum time is five years. So one of the things that the investigation team considered along the way is, given that it was a new process and had never before been commercialized by this operator anyway, that they ought to have gone back a couple of years later and looked at, how's it going; how's it working out?

But the organization went through many structural changes. This particular plant seems to have been orphaned from the parent corporation due to substantial organizational change.

DR. ROSENTHAL: Why don't we come back again, Steve -- I think the comments made that regard exothermic reactions as being less serious, we pay less attention to them in the industry, in general, does this not represent perhaps a weakness in general industry guidance? I mean, on the sun Amodel would be a very unstable material, as would almost everything else.

What I am trying to say, in environments where heat is abundant, exothermic reactions are spontaneous. When we think of the normal exothermic reaction, it is the absence of energy. So has industry guidance sufficiently alerted us of this type of occurrence in this type of operation?

You mentioned Equilon. I would guess,

without looking at it, there must be lots of extruder incidents in which extruders go down, material is stuck in there, and the thing pops. Comment.

MR. SELK: I don't think that guidance is very good in the area of endothermic reactions. One thing that speaks to that is that we are fairly confident that no one in their organization had any conception that such a thing could even happen. After it happened, we all had to convince each other and ourselves that this is what occurred. So it is anything but obvious. It is one of those insidious hazards that requires further education.

DR. ROSENTHAL: You say, "insidious." Okay, I would say insidious only until you know it.

MR. SELK: Right.

DR. ROSENTHAL: It is no longer insidious to you now, right?

MR. SELK: Not to me, what about the rest of the people in this business? And to communicate it and get people aware of it reduces that --

MS. TAYLOR: I have one question. Well, I don't know if this is the appropriate place to ask this, but this is a very good report and it is also very technical. So the question that I would ask is, now we have to communicate this to the workforce who would actually be looking at what happens here. So what do we tell the workers about this process that will keep this from happening again?

MR. SELK: Well, Andrea, I would suggest that perhaps you might want to, after the meeting, ask others here, because we have covered a lot of technical ground. The information that I covered early on, I would suspect is not the most interesting information. How we can better communicate hazards and the need to identify those hazards in a briefer format is an area that I think requires work on our part.

We have published shorter documents, safety bulletins, case studies. Perhaps you could ask others. I am so close to it, I know it so well, that I don't have a feel for it, but I don't believe many people will read the whole report, no. It is lengthy and complicated.

MS. TAYLOR: Well, one of the concerns that I have is that we did have three deaths. So for workers in the plant, we do have to communicate what happened, yes, and how can you, as the employee who will try to open this cap, not knowing the endothermic reaction is happening on the inside, how can you know what to do the next time that that can happen?

MR. SELK: Well, perhaps we can focus on publishing some overview documents that contain the information in a brief enough package that people will read it.

DR. ROSENTHAL: Or to emphasize that if lockout/tagout doesn't work, don't do it.

MR. SELK: We have had a great challenge with the issue of lockout/tagout. There is a principle in this business that you don't open something that you haven't positively verified. That was a major design defect that should have been corrected, but in our hearts the investigators have concluded that a reasonable person armed with the knowledge they had about the nature of this material would have the next day gone out and opened this vessel anyway, because they thought of it as just containing a big block of ice.

But to speak to that, we don't want to build process equipment that is not verifiable. Early on, that defect should have been corrected. Don't build things that get plugged up.

CHAIRPERSON POJE: Steve, I want to just explore one other generalized area that you raised quite high through this investigation. It is one that sages like Dr. Rosenthal and Trevor Kletz have called to our attention. We don't learn the lessons of what has happened in the past, and we have a tendency, then, to repeat them or to allow a major catastrophic to occur.

You have looked at the incident and near-miss investigation profile for this facility. How common are near-miss investigation programs in facilities like the nylon-producing facilities or other plastics-producing facilities?

Also, the team emphasized that there was no system to identify the pattern of incidents. What would be your collective professional wisdom as a team about the expectations for such a system?

MR. SELK: Well, we can't fault people for missing a scientific concept in a single investigation. That would just be so unfair. But one way that you can avoid missing things is to collectively look at the incidents, gather them together every twelve months or every six months, and say, what has happened out here? Purposefully look for patterns, because then that might trigger in your mind that you haven't fully understood all the phenomenon. That is one of our key messages, Jerry. It is not easy to do, but if you don't try -- okay?

CHAIRPERSON POJE: Any other questions?

MS. TAYLOR: No, not for now.

CHAIRPERSON POJE: Okay. Well, thank you.

DR. ROSENTHAL: Thanks again to the team. You did an excellent job.

CHAIRPERSON POJE: Okay, the next portion of our agenda then is a brief update from Chris, as the Chief Operating Officer. Anything you want to add to your earlier comments?

MR. WARNER: As I stated before, we're moving very aggressively to implement all of the IG recommendations. We have sent to the IG today a final plan for finishing all the recommendations. We have implemented a good majority of them already, and we have plans implemented on finishing that task on time.

In that regard, I do have the final Board order and a final rule, pending your vote on that order.

DR. ROSENTHAL: We've finally succeeded in getting our proposed regulation on the Sunshine Act into The Federal Register. It issued on April 16th. I would like to propose a notation item in regard to adopting this notation item with regard to the Sunshine Act. So I will so propose to the other members that we execute the notation Item 183 in regard to the adoption of disciplinary action.

MS. TAYLOR: And I second that motion.

CHAIRPERSON POJE: Okay, having been so called for and seconded, and let me just restate for the Board what we are acting on here. A motion has been forwarded to adopt notation Item 183, which would provide for approval and Federal Register publication of a final rule establishing CSB regulations for implementing the Government-in-the-Sunshine Act, and also affirming that the Board's intent is to be bound by the provisions of the final rule, even while the date is pending for that to become finally effective.

So, Chris, do you have the items?

Is there any comment or discussion that the other Board members would want to have on this matter?

DR. ROSENTHAL: No, I think it is a very desirable move. It is something we have attempted to do in the past, but due to our state of less than optimal organization and overload, have not always been able to do, and I am looking forward to a much more regular pattern of meetings, open votings, and discussions in the future.

CHAIRPERSON POJE: Andrea?

MS. TAYLOR: No.

CHAIRPERSON POJE: Okay, so then, having

heard no additional discussion, if you could please execute your action on this matter, and I will pass it to Chris to be counted, and then I will record the vote.

DR. ROSENTHAL: Can he count that high?

(Laughter.)

CHAIRPERSON POJE: He's got an assistant with a calculator.

(Laughter.)

DR. ROSENTHAL: Do we have someone to supervise the counting of our vote?

CHAIRPERSON POJE: Let our General Counsel. Chris, take off your hat and put on the General Counsel hat and make sure we're legally binding here.

(Laughter.)

Okay, so the motion has been carried, three affirmative votes. This now means that we are in compliance with the Sunshine Act. We will proceed with publication of a final regulation. The anticipated schedule for this will be that, as of this afternoon, the Office of General Counsel will transmit this to the Office of Federal Register. It likely will be published in The Federal Register by next week, and we anticipate by a month's hence this will become a finally effective date for our final rule in compliance with the Government-in-the-Sunshine Act.

Okay, other business that we have before us today is just to identify the next public Board meetings. May 30th will be our next public meeting. It will not be in Washington, D.C. It will be in Paterson, New Jersey. This is to allow us to have a public hearing on the larger issue of reactive chemical management and its role in the persistence of catastrophic incidents. That will occur in Paterson, New Jersey. Any member of the public who wants to is hereby notified of that. It is available for anybody here today out on the table.

We also have anticipated a tentative date for our next meeting here, and that will be on June 4th. The focus of that meeting will primarily be on the Board's recommendations program, although I am urging Chris at this moment in time to work with Bill Hoyle and his staff to see whether we might also have an update on at least one of the more recent field investigations, just to introduce that subject to the Board as a whole.

(Whereupon, at 11:35 a.m., the Public Meeting was concluded.)