Comments to Docket No. 2011-17099

Public Comments on Draft Investigation Report--DuPont Belle;

Table of Contents

Comments from Terry Sigler 7.18.2011

I worked for DuPont during this time and was on plant when all the incidents occured. The problems you listed are true, not enough emergency response people that were available and maintenance problems. I was a shift mechanic and emergency responder on the day Danny was exposed to phosgene. I was interveiwed by the CSB but I don't think you are going far enough into the maintenance problems that were happening at the time. I am now retired but from what I hear from people still working not muuch has changed. There were not enough mechanics trained or allowed to change these phosgene hoses. DuPont entered into a maintenance planning and scheduling system that was ridiculous. Wilmington was trying to micro-manage the maintenance program. There was not and is not to date enough supervision that are experienced or care about what goes on in maintenance as long as they can run production. I have seen many jobs delayed for days and end up having to be done at night or weekends when ther are less response people available (run to failure). Shortages in on plant response people were addressed by the TERP team saying "call us if you don't have enough resources" which is hard to do in the middle of an incident. The whole maintenance planning and scheduling was a joke. Many jobs were scheduled multiple times after being completed. This gave the even the experienced mechanics and planners a lack of confidence in the system DuPont used for maintenance. DuPont corporate could have done a better job of handling Belle's maintenance program. From what I hear from active workers and saw before I retired they are spending a huge amount of money but not getting a lot of improvement for it. I would hope that OSHA and the CSB keeps a closer eye on the Belle plant. They are going thruogh a lot of transitions now especially with younger and less experienced operators, mechanics and most importantly, supervision that will listen to the experienced operators and mechanics.

Comments from Wallace Fu - 7.21.2011

Dear CSB officials: I like to comment on your description and your video of the DuPont phosgene fatal accident.

I worked at the manufacturing plant of Parke-Davis Holland, Michigan facility between 1986 and 2005. Phosgene was routinely used in large quantities very much like that described in the DuPont case. I was shocked to see that your video depicted an operator **walking so close** to the charging "pigs" **without the proper personal protection**. I certainly hope DuPont did not allow such careless practice routinely.
In the late 1980s, Parke-Davis (PD) ungraded the safety on handling large "pigs" of phosgene. An enclosed concrete phosgene shed was erected next to B42 (the area that used phosgene to make benzophenone, an intermediate for several pharmaceuticals). The procedure also required the operators to switch "pigs" when one was depleted. However, the safety practice was not entirely like that described in your video. The PD shed was isolated and equipped with redundant phosgene detectors. The "pigs" were staged onto weight cells and the valves were connected very much like the procedure done at DuPont. However, the operators were fully suited with self-contained breathing equipment and they did not enter the area until the absence of phosgene was confirmed. The valves on each pig were accessible via a pair of dedicated rubber gloves anchored to a wall of clear plexiglass. The safety built into the PD system was so successful that no exposure or injuries were reported during the manufacturing operation.

I recommend all large scale users of phosgene to have (1) built in barrier to isolate the cylinders from the operators and (2) separate the cylinder staging and reactor charging into two unit operation procedures and the operators must be fully suited with Scot Air packs during staging and hard hats, goggles, face shields and gloves during charging. (3) No one is to enter the phosgene shed during charging or when phosgene vapor is detected.

Sincerely,

Dr. Wallace Fu
Formerly at the Holland Parke-Davis (later acquired by Pfizer) plant

Comments from Mark George - 7.27.2011

- Page 9 - With such a reputation, the CSB was interested in examining the conditions at the Belle facility that led to a decline in adherence to the higher standard of performance that the corporation historically held.

Did you make that assumption "decline in adherence…" before you even got to the site? Kind of harsh.

- Page 21 - However, due to a lack of safety considerations during installation…"

Was the weep hole mentioned during the PHA for the unit? Seems pretty odd to have it in the building when they could have put a gooseneck outside?

- Page 24 - This connection was associated with a thermal oxidizer "vent stack," which, vents
  to the atmosphere on the roof of the building under normal operation

Not accurate - Under *normal operation* there is no vent to the atmosphere – flow goes to the oxidizer and the rupture disc is intact.

- Page 25 - The vent releases products of the reaction into the room only if the pressure inside the pipe is greater than the pressure in the room.

While a true statement you left out that the rupture disc must also be blown (need both – higher pressure and blown rupture disc) – but after thinking about it you probably just need the blown rupture disc

- Page 25 - which would have provided an outlet path for the methyl chloride vapor where it would have dissipated and dispersed without notice.

I doubt that a burst rupture disc spewing out contents that would have normally gone to the oxidizer would have allowed the contents of that line to be dissipated and dispersed without notice. You make it sound like a burst rupture disc is a normal process operation and it is not.

- Page 25 - Although an area within 12 inches of the weep hole for the rupture disc was checked for leaks with the device, it did not detect any VOCs.

Was the F3455 process in operation at this time? Pretty important fact to be left out – if it was not in operation there is no reason to suspect the leak detection would have found anything.

- Page 30 - burst sensor indicator was installed on the DCS

What the heck is a burst sensor indicator? This sounds like hardware but you are referring to software/DCS. Is it a calculation?

- Page 30 - Operators indicated they were not retrained to respond to the more reliable burst
  sensor alarm and still considered it a nuisance.

MOC documentation would show how/when operators were informed of this change – "not retrained" sounds kind rather weak. Did they even need to be retrained?

- Page 30 - the annual frequency was so infrequent

Isn't annual frequency done annually? Do you mean it was not done annually?

- Page 34 - This type of review did not go deep enough to confirm that false-positives could lead to a nuisance alarm. A nuisance alarm can create risk by desensitizing operators to a hazard and be more detrimental than the absence of the alarm. In the MOC section marked "Reason for this Type of Safety Review," the response by the MOC team leader was "Minor Change."

  The MOC package that converted the burst sensor from battery-powered to a supplied power device was also marked as a subtle change. Again, the MOC team leader recorded in the documentation that "a 'What If' review [was] appropriate for the afore-mentioned [sic] change." The MOC did not address the operators' non-battery related concerns for the burst sensor or how to re-train the board operator to no longer treat the burst sensor alarm as a false-positive.

  Because MOC packages deemed "subtle" are not given the same level of review as MOC-T packages, the subtle change MOC packages did not identify or prevent the potential causes of this incident.

I would take issue with all of the above. A "What-If" review seems perfectly reasonable for this change. What type of review/PHA are you suggesting would work better? Operators are present at all PHA's and could have asked about the training (or might have). You can't criticize this MOC process without suggesting what would have worked better. They still had the unit wide PHA for reference. – maybe that is where we might have looked – "more flow" or "other than flow" in the vent line. What type of PHA did they have for the unit? HAZOP?

- Page 38 – Key findings

Key findings and root causes noted here are not well defined. Root causes do not appear to be root causes. These findings might indicate a lack of understanding of chemical plant operations by the author/investigator.

- Page 46 – PM schedule revealed that the oversight occurred due to poor communication between DuPont and the contractors hired to perform the PM inspections.

Well maybe - I wonder what the contractor was actually told? You would expect the contractor to receive marked up P&I's from Dupont which specify the scope of work for their task. What was the scope of work for the task and how was it communicated (had to be P&I's). Probably (I guess) the sample line was not included as there is not normally process fluid in it (I am assuming they only use the sample line when they are sampling)

- Page 47 - An internal DuPont investigation report from a prior oleum leak recommended including all piping in a PM thickness monitoring program. The CSB found no evidence that the piping in the January 23, 2010, incident was included in the program.

Come on guys – nobody checks every inch of every piece of pipe. Representative sampling is done. Probably a reasonable assumption that sample piping is not required for this PM as it is not normally in use and corrosion is not as severe (I guess). But your inference that all piping should have been checked is totally inaccurate. That just is not done anywhere.

- Page 48 – Your root cause is not a root cause but a proximate or intermediate cause.

- Page 49 – A an actual picture of the shed would be worth a 1000 words – tough to comment. without one. (unless the animation is an accurate representation)

- Page 55 - The CSB could find no evidence that audible or visual alarms were in service in the phosgene shed when the release occurred..

What does this mean? Does this mean this monitoring system was not in use (locked out) or does this mean the alarms did not go off during the incident? Pretty important distinction and you should clarify. "*Alarms not in service*" can mean a bunch of things. Your next paragraph in the report refutes this statement.

- Page 67 - Had there been a system in place for operators to report near-miss incidents on weekends to supervisory staff, the near-miss investigation may have been properly initiated prior to the fatal release.

I do not believe that there is no way for Dupont personnel to report safety concerns – weekend, holiday, vacation or otherwise. Are there not supervisors working on Saturdays? Does Dupont discourage safety reporting on the weekends? I doubt it….it simply is not credible (to me) that operators cannot report safety concerns on weekends.

- Page 69 – Flex hose material of construction

There are a few questions which I don't think you answered

1. According to your report – monel has better corrosion resistance but is more susceptible to fatigue failure. So it is possible that the risk in using SS hoses (compared to monel) is comparible if the SS hoses are changed out more frequently. That might be the approach Dupont took (but of course they did not change out the hoses as planned). But the inference that monel is safer might not be true.
2. Also the corrosion might not have had anything to do with the incident. The phosgene section of piping that was left "liquid full" would have burst due to thermal expansion regardless of whether it was corroded or not. I am surprised that they did not have a ½" PSV on the system between block valves for just this scenario (what did the PHA say about "no flow" or " high pressure" – according to your report this was not addressed). That is exactly why the operators were supposed to blow the tubing down with N2. So while the corrosion is a good observation it did not lead to the incident (in my opinion). Liquid full pipes will fail due to thermal expansion regardless of what they are constructed of. This would discount your finding of SAP system failure as contributing as well.

- Page 80 - None of the SOPs for the SLM unit warned against blocking in liquid phosgene to prevent hose ruptures, making operators less aware of the thermal expansion hazards of phosgene.

It is not credible that operators in a chemical process facility are not aware of thermal expansion concerns. That is pretty basic stuff.

- Page 75+ - On-Site Phosgene Generation

There is a lot of text here about alternative ways to supply phosgene to the process. Much of it at a very high level. I don't think CSB has enough evidence to say that Dupont was not using the safest method possible (and I think that is the wrong message to send out). "Enclosing the phosgene plant" is easy to say but difficult to implement. Without a detailed Process Hazards Analysis (and risk assessment) on the design of the "enclosed facility" we just won't know. Can you imagine the confined space logistics just to change out, deliver and/or maintain the cylinders? Also there is nothing to say that this same incident would not have happened even if the system was enclosed. Inspection of the tubing might not require supplied breathing air even if the system was enclosed. It is possible that the detailed PHA would show that the enclosure was not practical and Dupont already had the best system in place (we just don't know)

In addition you make the comment

"DuPont made the decision to cancel plans for the enclosed phosgene generation unit, but the potential for offsite impact still remained a concern and was identified in SLM Unit PHAs years

later. In 2004, Belle Plant personnel conducted a PHA on the SLM Unit and identified the need for a shed enclosure with a scrubber to mitigate or prevent the release of phosgene offsite".

This indicates the enclosed scenario was for offsite concerns (which conflicts with Table 4). This would indicate that people in the vicinity of the cylinders (not working on them) would probably not use SCBA's and the same mishap would occur if the SS hose failed. This is somewhat confirmed on page 94 of the report

"Operators at the Mobile plant enter the phosgene cylinder area under the same PPE requirements as Belle for isolating and changing cylinders (hard hat, steel-toed shoes, safety glasses, and
phosgene dosimeter)"

****
****

MEMBER BRESLAND COMMENTS:

The CSB determined there were safer ways that DuPont could have run its phosgene operation…such as putting it in an enclosure equipped with a ventilation system. Documents we are releasing today show that DuPont considered building such an enclosure in 1988 but then decided against it. (See my comments above –without a detailed PHA of the enclosure CSB really can't make that assessment)

You will see in our findings that poor design and inadequate maintenance of a battery operated alarm system allowed for the methyl chloride release to go undetected for nearly five days (Well I think the poor design allowed for complacency – but it did not allow for the release). And, that a lack of preventive maintenance permitted corrosion in the oleum piping to go
undetected as a larger hole grew prior to the release of the oleum. (Disagree per my earlier comments – not likely sample piping would have been checked for corrosion)

INVESTIGATOR DAVID CHICCA

When the rupture disc burst earlier, an alarm was triggered. But our investigation found that due to a history of false alarms, operators came to view this alarm as a nuisance that could safely be ignored.

DuPont management had gone through what is called a Management of Change process in approving a design for the rupture disc alarm system. However, we found that the alarm system lacked sufficient reliability to advise operators of a flammable methyl chloride release. We found that in addition to the design review, another root cause of the continued release was that DuPont did not resolve the "nuisance alarm" condition in a timely manner despite various safety reviews.

INVESTIGATOR MARCH SAENZ COMMENTS

We found that DuPont had a previous oleum leak, resulting in a company recommendation to conduct regular maintenance inspections of all oleum piping. But the CSB found this was not done – due to ineffective communications between DuPont and its inspection contractors (disagree per my earlier comments – what was the contractor supposed to check? – not every inch of piping is checked).

TEAM LEAD INVESTIGATOR JOHNNIE BANKS

INVESTIGATOR BANKS CONTINUES:
The CSB found the permeability of the transfer hoses to phosgene was a key factor in the Accident (disagree per my earlier comments – hose would have failed due to thermal expansion corroded or otherwise).

During our investigation, we found that the Teflon-lined stainless steel hoses in use at the Belle plant are particularly susceptible to failure when using phosgene. That is because the phosgene can seep through the permeable Teflon lining and corrode the stainless steel.

DuPont officials realized the hazards of using the braided stainless steel hoses lined with Teflon, or PTFE. An expert employed at DuPont recommended the use of hoses made from Monel, a strong metal alloy used in highly corrosive conditions.
The DuPont official stated:
"Admittedly, the Monel hose will cost more than its stainless counterpart. However, with proper construction and design so that stresses are minimized…useful life should be much greater than 3 months. Costs will be less in the long run and safety will also be improved."
But the CSB found that the Belle plant never followed the recommendation to install the safer, Monel hoses. (maybe - see my earlier comments)

INVESTIGATOR TYLER COMMENTS:
The CSB determined there are safer ways that DuPont could have run its phosgene

Operation (disagree per my earlier comments). For example, phosgene cylinders should have been kept in an enclosure equipped with
a ventilation system and a scrubber. If the enclosure were designed for human entry, workers should have been required to wear fully encapsulated protective equipment.

Documents from 1988 show that DuPont considered building such an enclosure, but then decided against it. One DuPont official wrote, and I quote:
"It may be that in the present circumstances the business can afford $2 million for an enclosure; however, in the long run can we afford to take such action which has such a small impact on safety and yet sets a precedent for all highly toxic material activities?"
DuPont decided not to enclose the phosgene unit at that time, but the potential for a deadly release remained a concern. The danger was noted in a 2004 process hazard analysis which recommended constructing an enclosure equipped with a scrubber.
Originally the enclosure was scheduled to be completed by December 2005, but the deadline was extended four times and still had not been met in January 2010, when the fatal phosgene release occurred.

Without an enclosure around the phosgene operation, no barriers were present to prevent exposing operators or the community to deadly phosgene. (An enclosure may not have prevented this as well – depends on the design, Confined space requirements, PPE requirements, etc)

Additional Comment from Mark George 7.27.2011
One item that I wanted to add was that PHA Teams make recommendations based upon data that they have in front of them.
As such, not all recommendations are valid and many require further study. Any PHA team member will tell you that.
From reading the Dupont report, I think the author/investigators felt that recommendations made by PHA teams at Dupont should have been carried out to the letter.
That just is not how it works
(Just my opinion)

From: Belke.Jim@epamail.epa.gov
To: Cohen, Hillary
Cc: Banks, Johnnie
Subject: Fw: CSB Draft Report Comments
Date: Thursday, August 11, 2011 4:27:22 PM

Hillary,

Our Region 3 office reviewed the draft report on the 2010 Dupont accident and had the following comments.

Let me know if you have any questions.

Jim Belke

EPA
----- Forwarded by Jim Belke/DC/USEPA/US on 08/11/2011 04:16 PM -----

Fw: CSB Draft Report Comments

Joan Armstrong
to:
Jim Belke
08/11/2011 03:11 PM

Cc:
Mike Welsh, Karen Melvin

Jim,

As we spoke yesterday, we received the July 2011 CSB report on the Dupont Bell releases that occurred on January 22-23, 2010. The releases were of methyl chloride, oleum and phosgene. The phogene release resulted in a death of a Dupont worker.

We found out that a draft was out for public comment. My staff has reviewed the report and we have the following comments:

Section 1.3.3.1, Page 17 Early Process Safety Program - First paragraph mentions establishment of OSHA PSM and creation of the CSB (as part of the CAA Amendments of 1990) after the Bhopal incident; creation of EPA's Chemical Accident Prevention Program is not addressed.

Section 4.5.1, Page 74, The report states that it is a violation of the OSHA requirement if facility does not begin an incident investigation within 48 hours it is also an EPA requirement [40 CFR 68.81(b)]

Section 4.5.3, 2006 Page 80, Phosgene Committee Audit: This section mentions several times: "Where small amounts of phosgene are present, stainless steel lined with Teflon is commonly used." The connection hose is NOT stainless steel with PTFE (Teflon) lining (a continuous coating inside a stainless steel tube or pipe; it is a PTFE (Teflon) tube or hose wrapped with a jacket of braided stainless steel wires to provide abrasion resistance and flexibility.

Section 5.1.2.3, Page 96, states that "DuPont engineering standards require that drainage holes be placed upstream of the relief devices on vent lines to allow for drainage and prevent liquid from lodging in the discharge side of the rupture disc." Drainage holes should be placed downstream of the relief devices on vent lines.

Recommendation to E. I. DuPont de Nemours and Co., Inc. [2010-06-I-WV-R3] Page 107: Addition: A history of changes should be recorded with SAP's CMMS, MOC and other RMP databases to record names of users and/or modifiers to the data.

Recommendation to DuPont for Methyl Chloride and Phosgene Releases Page 110: Addition: Process alarms should provide audible and visible indication in vicinity of the alarm, not just in the control room.

The lead CSB inspector was Johnnie Banks. Other team members: David Chicca, Lucy Tyler, and Marc Saenz. In a press release on the release of the report for public comment, the following people were the contact people. For more information, contact CSB Communications Director Hillary Cohen, 202-446-8094 (cell), or Sandy Gilmour, 202-251-5496 (cell).

According to CSB's website the report was released 7/7/2011(45 days is August 22).

This is where we found the report and press release and indication of public comment period:
http://www.csb.gov/investigations/detail.aspx?SID=92

Comments from Tom Harvey – 8.21.2011

While I commend the investigative efforts by the CSB on the multiple incidents at the Dupont facility, I submit the following critical comments:

1. The delay in the issuance of the report is unfortunate and should be explained in the final report.

2. In keeping with terminology previous used in similar CSB investigative reports, Normalized Deviation should be included where appropriate to raise awareness of and highlight this phenomenon so that corrective measures can gain more momentum.

3. The CSB should report the OSHA Frequency Rates for the Dupont facility and for the corporation as a whole. I highly suspect extremely low (and false) rates will be reported which will once again substantiate previous findings by the CSB, specifically; "***BP focused on personal safety statistics but allowed catastrophic process safety risks to grow."*** Washington, DC, May 16, 2007 - U.S. Chemical Safety Board (CSB) Chairman Carolyn W. Merritt testimony before U.S. House of Representatives. Reinforcement of this issue will bolster OSHA's Recordkeeping NEP, and initiative that the CSP has stated is very much needed.

The CSB can more effectively meet its mission and use their bully pulpit if common themes are reiterated so that all stakeholders can gain better understanding of systemic breakdowns that increase the risk of harm to people, property, and the environment.

As an aside, on September 20, 2011 a separate Dupont business unit will host a workshop on**: Mechanical Integrity - Part of the Operational Risk Management Strategy** in Houston, TX. In the interest of sound business ethics and full disclosure, one would expect the related implications of these incidents to be fully covered. It would be most interesting to have Dupont explain the systemic failures of the Operational Risk Management Strategy in these incidents.

I will be glad to clarify any points I have made.

Sincerely,

Tom Harvey, CSP
803-622-6717
tom@alliedsafety.com
www.alliedsafety.com

Allied Safety Associates
Management • Consulting • Training

August 22, 2011

VIA EMAIL TO DUPONTCOMMENTS@CSB.GOV

Ms. Amy McCormick
Board Affairs Specialist
U.S. Chemical Safety Board
2175 K Street NW
Washington, DC 20037

Re: Draft Report, E.I. DuPont de Nemours & Co., Inc., Belle, West Virginia
CSB Report 2010-6-I-WV, July 2011
CSB Recommendations to the ACC Phosgene Panel

Dear Ms. McCormick:

The American Chemistry Council (ACC) Phosgene Panel (the Panel) appreciates the opportunity to provide comments to the Chemical Safety Board (CSB) regarding the DuPont Belle Plant Investigation Draft Report (Report) on the phosgene incident. The Panel would like to specifically respond to the two recommendations directed to the Panel. The Panel defers to the overarching ACC comments, provided under separate cover, related to the additional recommendations outlined in the report.

Since its inception in 1972, the Panel has been committed to the continuous evaluation of and improvements to safety and the protection of human health and the environment on issues related to the production, distribution, and use of phosgene. The Panel's organizational components, objectives and research are dedicated to the pursuit of improved worker and community safety. In fact, the Panel voluntarily developed the Phosgene Safe Practices Guidelines Manual (Manual) to serve as an extensive reference for companies nationally and internationally for information on the safe handling and use of phosgene.

The CSB makes the following draft recommendations to the Panel:

> *Revise the Phosgene Safe Practice Guidelines Manual to incorporate the following:*
>
> > *Advise against the use of hoses for phosgene transfer that are constructed from permeable cores and materials susceptible to chlorides corrosion.*
> >
> > *Include guidance for the immediate reporting and prompt investigation of all potential (near miss) releases of phosgene.*

The Panel has established an ongoing system for prioritized review of existing sections of the Manual and consideration of new topic development. The Panel plans to address the two CSB recommendations by conducting a comprehensive review of the Manual to determine whether any updates are warranted.

We look forward to the final report and continuing a dialogue with CSB on these important issues to the Panel. If you have any questions, please do not hesitate to contact me at (202) 249-6721 or Sahar_Osman-Sypher@americanchemistry.com.

Sincerely,

Sahar Osman-Sypher

Sahar Osman-Sypher
Phosgene Panel Manager

cc: Johnnie Banks, CSB

700 Second Street NE, Washington, DC 20002 | (202) 249-7000

WEST VIRGINIA MANUFACTURERS ASSOCIATION
2001 Quarrier Street, Charleston, WV 25311
Telephone: (304) 342-2123
FAX: (304) 342-4552
wvma@wvma.com

August 22, 2011

Ms. Amy McCormick, Board Affairs Specialist
U.S. Chemical Safety Board
2175 K Street, NW
Washington, DC 20037

Dear Ms. McCormick:

The WV Manufacturers Association (WVMA) does not support creation of a new, redundant, government oversight agency as described within the Bayer Crop Science Investigation Report (January 2011), and reaffirmed by CSB in the DuPont investigation report draft (July 2011), Report No. 2010-6-I-WV.

WVMA does not agree that the results cited by CSB in California can be attributed to the creation of the oversight committee given the execution of both OSHA's PSM program and the US EPA's RMP program within the same approximate time frame. Given the existing Federal agency oversight with mandated industry regulations, we contend the West Virginia environment is better served through effective execution and compliance oversight by the current agencies.

WVMA finds that the proposal uniquely singles out a small area within West Virginia and if, as CSB contends, additional oversight is appropriate, then suggests this be undertaken broadly at the federal level in a manner congruent with the mandates of the existing agencies and covering all states.

WVMA disagrees that an imposed oversight agency will improve safety as this agency will not be an expert in the process details of the regulated industry and, by their very presence, are likely to constrain open communication among the industrial work force in a manner which contradicts the intended outcome of the agency's very charter.

Therefore, WVMA recommends the removal of the reference to the Bayer Crop Science recommendation from the DuPont report and further suggests the CSB amend the Bayer report to remove it from the recommendations to the Kanawha County.

Karen S. Price

Karen S. Price
President

Board of Directors

A, C & S, Inc.
Allegheny Energy Co.
Alliant Techsystems, Inc.
Allied Processing Services
Armstrong World Industries
Bayer CropScience
Bayer MaterialScience, LLC
Chemtura Corporation
Criterion Catalysts Technologies, LP
Dow Chemical Company
DuPont
Eagle Manufacturing Company
ERGON, WV, Inc.
Essroc
Georgia-Pacific Corporation
ICL-IP Clearon
Kanawha Manufacturing Co.
King Pharmaceuticals
Kingsford Manufacturing Co.
Marathon Petroleum Co.
Marble King, Inc.
Momentive Performance Materials
Phillips Machine Service, Inc.
PPG Industries, Inc.
Toyota Motor Manufacturing, WV, Inc.
Tri-State Roofing & Sheet Metal Co.
U.S. Silica Company
Wheeling-Nisshin, Inc.

VIA E-MAIL TO DUPONTCOMMENTS@CSB.GOV

August 22, 2011

Ms. Amy McCormick, Board Affairs Specialist
U.S. Chemical Safety Board
2175 K Street, NW
Washington, DC 20037

RE: Comments
Draft Report, E. I. DuPont de Nemours & Co., Inc., Belle, West Virginia
CSB Report 2010-6-I-WV, July 2011

Dear Ms. McCormick:

The American Chemistry Council is pleased to submit the attached comments on the U. S. Chemical Safety and Hazard Investigation Board's (CSB) above-mentioned report (the Report). The American Chemistry Council (ACC) represents the leading companies engaged in the business of chemistry. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure.

ACC appreciates the opportunity to comment on this report. Please contact me if you have any questions or concerns about our comments. I can be reached by phone at (202) 249-6426 or by e-mail at patricia_haederle@americanchemistry.com.

Sincerely,

Patricia A. Haederle
Director
Regulatory and Technical Affairs

Attachment

August 22, 2011
Comments of the
American Chemistry Council on
The U. S. Chemical Safety and Hazard Investigation Board's
Draft Report 2010-6-I-WV
E. I. DuPont de Nemours & Co., Inc., Belle, West Virginia
July 2011

The American Chemistry Council (ACC) is pleased to submit comments on the U. S. Chemical Safety and Hazard Investigation Board (CSB) above-mentioned report (the Report). ACC represents the leading companies engaged in the business of chemistry. ACC members apply the science of chemistry to make innovative products and services that make people's lives better, healthier and safer. ACC is committed to improved environmental, health and safety performance through Responsible Care®, common sense advocacy designed to address major public policy issues, and health and environmental research and product testing. The business of chemistry is a $720 billion enterprise and a key element of the nation's economy. It is one of the nation's largest exporters, accounting for ten cents out of every dollar in U.S. exports. Chemistry companies are among the largest investors in research and development. Safety and security have always been primary concerns of ACC members, and they have intensified their efforts, working closely with government agencies to improve security and to defend against any threat to the nation's critical infrastructure. ACC comments on the Report are as follows:

1. **The CSB Report should focus on the incident that initiated the investigation.**

The CSB investigation team investigated three incidents (methyl chloride, oleum and phosgene) at the E. I. DuPont de Nemours & Co., Inc. (DuPont) Belle plant which were related only to the extent that they occurred within the same thirty-three hour period. Because neither the methyl chloride nor oleum releases were determined to be causative events leading to the phosgene release, and because neither led to a fatality, serious injury or substantial property damage, ACC believes it is appropriate to focus the Report solely on the phosgene release. Further, investigation and reporting of these events diverts attention from the lessons learned in the phosgene event, potentially diluting their effectiveness.

The Report also included a discussion of additional unrelated incidents which occurred eight or more months following the three events at DuPont's Belle, WV and Tonawanda, NY plants, involving different procedures and processes.

ACC believes the inclusion of the additional unrelated events subsequent to the phosgene release has no bearing on the event or its investigation by CSB, and thus should be excluded from the Report.

Recommendation: Revise the Report to include only those investigative results and recommendations directly relevant and applicable to the phosgene event, and remove all others.

2. **CSB relied on a simplistic atmospheric dispersion model.**

As noted in Appendix D, page 127 of the Report, in the section entitled "Vapor Cloud Dispersion Modeling", the CSB states:

"The CSB used the ALOHA® (Area Locations of Hazardous Atmospheres) 5.4.1 program to model the phosgene release based on the characteristics of the release and atmospheric conditions on the afternoon of January 23, 2010. The National Oceanic and Atmospheric Administration (NOAA) and the U.S. EPA developed ALOHA to estimate the threat zones associated with hazardous chemical releases from toxic plumes, fires, and explosions. The user inputs chemical property and weather information and the program generates a user-defined release scenario that shows the concentration of toxic gases within a radius of the release source."

ALOHA is, as stated, a useful tool for emergency response planning, but it is a simplified model intended to give general guidance, run on almost any computer, and be able to be used by non-expert users. As such, ALOHA may not accurately simulate conditions during a release event, especially those locations, such as West Virginia, where the terrain is relatively complex.

Recommendation: CSB should acquire, and become proficient in the use of, one of the commercially available dispersion modeling software packages (such as Phast® or SAFER®) to help improve the quality of their investigative work.

3. **Establishing state hazardous chemical release prevention programs are redundant.**

The Report references recommendations CSB made as part of its Bayer CropScience Investigation Report (January 2011), for the local health department in cooperation with state Departments of Health & Human Services and Environmental Protection, to establish a Hazardous Chemical Release Prevention Program. ACC does not support the establishment of county or state-based governmental organizations to audit and oversee process safety at industrial facilities as proposed by CSB in both the Bayer CropScience and DuPont investigation Reports.

Existing federal agencies (such as OSHA and USEPA) currently have direct regulatory authority for process safety compliance and enforcement; establishing additional such

authorities would create unnecessary redundancies, as well as the imposition of additional economic burdens on local industries, communities and state governments. We believe that collaboration between companies and community advisory panels or similar "near neighbor" stakeholders is a more effective and sustainable approach to strengthen communications, participation, and transparency involving process safety performance.

Recommendation 1: Reconsider and close the Bayer CropScience recommendation.

Recommendation 2: Remove the related discussion from the DuPont Report.

4. OSHA's general industry standard for compressed gases should be amended independent of consensus standards.

ACC concurs with CSB's recommendation 2010-06-I-WV-R1 to revise 29 CFR 1910.101, General Industry Standard for Compressed Gases, to include elements such as those enumerated (e.g., enclosures, ventilation and treatment systems, interlocked failsafe shutdown valves, gas detection and alarm systems, and piping system components) where necessary to improve worker safety. We do not, however, recommend that National Fire Protection Association (NFPA) voluntary consensus standards (such as NFPA 55, Compressed Gases and Cryogenic Fluids Code) be wholly or in part referenced in 29 CFR 1910.101. ACC recommends that OSHA promulgate stand-alone compressed gas standards using these consensus standards as a basis for a proposed regulation and allow for public input following formal rulemaking procedures.

ACC further believes that should the above recommendation be adopted, the subsequent implementation of recommendation 2010-06-WV-R2 (revision of 29 CFR 1910.119, Process Safety Management of Highly Hazardous Chemicals), would result in redundancy. ACC suggests that OSHA could instead accomplish the desired effect by using appropriate elements of consensus standards cited by CSB in recommendation 2010-06-I-WV-R2 (e.g., Compressed Gas Association's P-1 and E-9, Safe Handling of Compressed Gases in Containers and Standard for Flexible, PTFE-lined Pigtails for Compressed Gas Service; and American Society of Mechanical Engineers B31.3, Process Piping), in addition to NFPA 55, as a basis for revisions to 29 CFR 1910.101 in a notice and comment rulemaking.

Recommendation: Change recommendation 2010-06-I-WV-R1 to revise 29 CFR 1910.101, General Industry Standard for Compressed Gases, to incorporate applicable elements from NFPA, CGA and ASME standards by formal rulemaking process, but do not wholly incorporate these consensus standards by reference. Remove the recommendation to revise 29 CFR 1910.119, as it is unnecessary if complying with 29 CRF 1910.101.

5. **With one exception, ACC supports the CSB recommendations to revise phosgene handling safeguards.**

ACC concurs with the five CSB safeguard recommendations that follow:

- 2010-06-I-WV-R4 (facility emergency response protocol)
- 2010-06-I-WV-R5 (near-miss reporting and investigation)
- 2010-06-I-WV-R6 (phosgene handling safeguards)
- 2010-06-I-WV-R7 (review of phosgene handling and production units)
- 2010-06-I-WV-R8 (risk assessment),

However, ACC does not agree with recommendation 2010-06-I-WV-R3. We believe that this recommendation (to change the maintenance management program) would create redundancies. The SAP software program is designed to ensure tracking of maintenance, and DuPont already has this program in place. Instead of recommending supplemental tracking controls and Management of Change reviews, ACC recommends that software programs be modified to issue automatic work orders and safeguards such that work orders cannot be eliminated accidentally from the work stream.

Recommendation: Revise recommendation 2010-06-I-WV-R3 to require corrective changes to existing software programs to ensure that automatic work orders are issued and not inadvertently eliminated from the work stream.

6. **ACC concurs with CSB recommendations to the Compressed Gas Association.**

CSB recommendations 2010-06-I-WV-R9 and 2010-06-I-WV-R10, to revise CGA P-1 (Safe Handling of Compressed Gases in Containers) by incorporating requirements from NFPA 55 and CGA E-9, would likely increase worker safety, therefore ACC supports these recommendations.

Recommendation: Retain recommendations 2010-06-I-WV-R9 and 2010-06-I-WV-R10.

7. **ACC defers to its Phosgene Panel for comment on Recommendation 2010-06-IWV-R11.**

ACC's Phosgene Panel has provided, under separate cover, comments on this CSB recommendation. ACC supports and reiterates those comments.

SHE and Sustainable Growth Center
1007 Market Street
Wilmington, DE 19898

August 22, 2011

VIA E-Mail to dupontcomments@csb.gov

Ms. Amy McCormick, Board Affairs Specialist
U.S. Chemical Safety and Hazards Investigation Board
2175 K Street, NW, Suite 400
Washington, DC 20037

Subject: Comments - Draft CSB Report on Incidents at Belle, West Virginia Plant, January 2010 (CSB Report 2010-6-I-WV, July 2011)

Dear Ms. McCormick:

E.I. DuPont de Nemours & Co., Inc. ("DuPont") appreciates the opportunity to provide additional comments on the draft Chemical Safety Board ("CSB") investigation report issued July 7, 2011, regarding the DuPont Belle, West Virginia plant.

As the CSB has recognized, safety is a core value at DuPont and our most important priority. We are fully committed to operating our facilities safely, including our goal of zero -- meaning we believe all safety and environmental-related incidents are preventable.

In June 2010, DuPont completed its own investigations of the January 2010 incidents. The purpose of those investigations was to identify every key and contributing causal factor of the incidents, and develop recommendations that fully address each factor to ensure that the incidents can never occur again. We have already implemented all the recommendations resulting from our own investigations. We provided the CSB with a copy of these reports at that time, and we are pleased to see that several of the recommendations in the CSB report are aligned with recommendations in our reports.

In addition to implementing these recommendations specific to the January 2010 incidents, the Belle Plant has also undertaken broader actions to further improve safety across the site. These actions exceed any regulatory requirements and include:

- Performing a comprehensive and intensive operations safety review at each unit in addition to all the normal safety processes, programs, and audits.
- Expanding the process hazards review system to strengthen and improve employee participation.
- Initiating a new best practice for alarm management

Two of the manufacturing processes involved in the January 2010 incidents at Belle, phosgene processing at the Small Lots Manufacturing unit and the Sulfuric Acid Recovery unit, are permanently shut down. Phosgene is no longer used at the Belle plant.

Pertaining to the report's broad-brushed comments about the DuPont Company as a whole, DuPont is widely recognized around the world for its innovative workplace safety practices, culture and leadership, starting at its inception 209 years ago. At the news conference accompanying the release of the draft report, the CSB stated that DuPont "could benefit from an extensive examination of all facets of the safety culture." Following the incidents at Belle in early 2010, DuPont did exactly that. A year and a half later, DuPont is now at an all-time record low for total recordable injury and illness rates throughout the company. Never satisfied, we will continue to work to be even better and reach our goal of zero.

We will also continue to cooperate fully with the CSB to pursue our shared interests in safety. In that spirit, we offer detailed technical comments on the CSB's draft investigation report as provided on the following pages 3 through 12.

Sincerely,

David E. Cummings
Global Process Safety Management Competency Leader
The DuPont Company

Technical Comments of E.I. DuPont Nemours & Co., Inc.
on Chemical Safety Board
July 2011 Draft Investigation Report regarding the DuPont Belle Plant

Phosgene Incident	
CSB Draft Language	**Actual Facts**
Proposed On-Site Phosgene Generation Unit	
Report includes section on "On-Site Phosgene Generation" and quotes from May 19, 1988 memo, which recommended against enclosing an on-site phosgene generation plant that would have been marginally safer but cost an additional $2 million (p. 75, 76, appendix E)	The 1988 memo is irrelevant to the 2010 incident. The discussion is about a unit (phosgene generation unit) that was never built. There is no phosgene generation unit at Belle and there never has been. Thus, the $2 million reference is to a possible alternate configuration for a unit that was never built. Moreover, the method of risk analysis reflected in the 1980 memo stopped being used by DuPont many years before the phosgene incident and had no bearing on the phosgene incident. DuPont believes that the acceptable number of accidents at Belle or any of its facilities is zero.
Post – Incident Operations	
Page 79 – last para in 4.5.2 -- "DuPont announced that it would idle the storage and use of phosgene at the Belle site, but did not state intentions for phosgene usage beyond 2011."	The Small Lots Manufacturing unit (SLM) and all phosgene operations were shut down immediately after the 1/23/10 incident and were never restarted. All phosgene handling operations at the Belle site have since been permanently shut down, the facilities are being dismantled, and this has been communicated to site personnel and the local community. Statements in the CSB draft report about the safety of phosgene operations at the plant following the 1/23/10 incident (p. 79) are not germane and unwarranted due to the elimination of all hazards by way of process de-inventory and permanent shutdown.

Dispersion Modeling	
Appendix D, pages 127-129 -- the CSB draft report states (p.129) "The ALOHA threat zone overlay in Figure 19 displays a model of the worst case release conditions indicating IDLH concentrations of phosgene could have been present on the Kanawha River shortly after the release and lower concentrations could have traveled across the river. There were no reports of odors or exposure symptoms from the community on the afternoon of the phosgene release incident."	The ALOHA Users Manual specifically states that it was designed with first responders in mind. It is a simplified model that tends to be biased high because it is intended to be used by emergency response personnel who do not have a background in dispersion modeling. Use of other more technical and sophisticated dispersion modeling software such as but not limited to PHAST (a commercial software product owned by Det Norske Veritas) using the same modeling parameters assigned by the CSB in Appendix D (pages 127- 128) would result in much shorter threat zones for the three user selected phosgene concentrations. The ALOHA is a worst case example of the modeling results not using actual conditions and impacts which occurred on site on 1/23/10. At a minimum, the CSB should qualify this appendix and associated statements to indicate that the ALOHA model overstates the relevant threat zones when compared to more sophisticated dispersion modeling tools and software that is currently available and used within industry to conduct consequence analyses as part of Process Hazards Analyses.
Manufacturer Label on Phosgene Flexible Hose	
Pages 60-61, Sections 4.3.1 and 4.3.2 -- The report refers four (4) separate times to the manufacturer's tag taped closely around the phosgene hoses as "<u>clear</u> plastic adhesive tape" (pp. 60-61) and in Section 4.3.6 as "the <u>clear</u> adhesive ID tag" (p. 66) (emphasis added). Page 66, 4.3.6, 3rd sentence – "when the hose was removed from the water, the <u>clear</u> adhesive ID tag had fallen off revealing a broken stainless steel braid" (emphasis added).	The plastic (clear) adhesive tape was installed on the hose by the manufacturer over a solid manufacturer's label wrapped tightly all the way around the hose (as depicted in Fig 16 on page 71 for a new hose). The solid label around the hose prevented any visual observation and detection of the localized corrosion on the stainless steel braid under the label. By repeatedly referring only to the <u>clear</u> adhesive tag, the CSB report fails to clearly describe fundamental issues with the hose tags and their contribution to the incident. The solid labels hid the localized corrosion while the hoses were

Page 73, Section 4.4, last para, last line – "the slowly developing corrosion on the hose was not visible due to the location of the clear plastic adhesive tape…" (emphasis added).	in service, when the SLM operators removed the hillside hose and inserted it in a bucket of water for decontamination, and when operators visually checked the riverside hose status later in the morning after the corrosion on the hillside hose was first recognized (because the manufacturer's label had fallen off of the hillside hose in the water bucket). The solid label ID tag AND the clear adhesive tape both combined to create a micro-environment for localized corrosion on the hose braid directly beneath the tags which was not visible to area personnel. The CSB draft report does not clearly indicate that the solid label was the cause of this lack of visibility. This factual inaccuracy and lack of clarity in the draft could contribute to inadequate assessment and prevention activities by other hose users within industry.
Page 86, 3rd para: Section 4.6.5 of the draft report includes a discussion of CGA Standards for PTFE-lined hoses, including that the hose manufacturer's practice of affixing adhesive tape on the hose itself did not align with the requirements of CGA E-9 and enhanced the corrosion of the metal braid. Section 7, page 106 indicates that the CSB makes recommendations to parties that can effect change to prevent future incidents including companies involved and other organizations responsible for developing good practice guidelines	The draft report cites Section 5.2 of CGA Standard E-9 (Identification), which includes general requirements that state "All pigtails shall be permanently marked…. The markings shall be made on the end fitting, collar, separate band, or other permanent location." This does not prohibit the use of adhesive labels or markings on the hoses themselves, which resulted in the enhanced corrosion of the metal braid at Belle. The CSB should consider recommendations to both the CGA and to the hose manufacturer and supplier industry to prohibit the use of tight fitting adhesive labels (both solid and clear) on flexible chemical hoses which may be subject to these corrosion phenomena as additional means for communications and broad based prevention efforts.
Use of PTFE-Core Stainless Steel-Braided Flexible Hoses	
Root Cause #5: "The Belle Plant did not use the construction materials recommended by a corporate expert, the P3H standard, CGA or the HTM manual for phosgene hoses, even though the 2006 second-party HTM audit recorded it as an observation." (p. 85)	In the 1987-timeframe, Belle personnel considered replacements for the ¼" copper tubing (pigtails) used to connect the phosgene cylinders to the process equipment. Different types of hoses were discussed as upgrades, although each had pros and cons. The DuPont engineer quoted by CSB (pp. 69, 70) preferred Monel-

	braided hoses. Engineers at DuPont's LaPorte facility preferred stainless steel-braided hoses because Monel was susceptible to failure from fatigue and bending stresses (pp. 69-70). A technical team from Belle looking for an alternative to the copper pigtails visited VanDeMark, the manufacturer of the phosgene used at Belle. The team determined that VanDeMark used the stainless steel-braided PTFE-core ¼" hoses that Belle adopted. The documents attached to the CSB's draft report on the original selection of the hoses are incomplete but show that Belle employed a detailed process for examining the alternative hoses. The incomplete documentation available from 1987 does not indicate who made the final decision or the specific reasons why. However, the 1987 documentation reflects that the quoted excerpts in the draft report represented only a single view that was part of a broader technical discussion with varying viewpoints. The phosgene hose's long history of successful use at Belle supported its continued use at the facility. As the Belle root cause investigation team found, "During [the] subsequent 23 years of use of these hoses at Belle, there has been no history of hose failures or leaks from the hoses." (Belle S.H.E. Incident Investigation Form at 7 of 24) Moreover, the corporate standards on hoses for phosgene service are only recommendations. As the Belle investigation team found, there were specific reasons for Belle rejecting them: "P3H was written mainly for larger diameter hoses and did not consider phosgene cylinder unloading. The P3H recommended hoses for phosgene service were not and are not available in ¼-inch diameter as used at Belle. Also, the H2 and H7 hoses in P3H required welds for fittings, and DuPont Engineering Standard SW45S requires full penetration welds in accordance with American Society of Mechanical Engineers B31.3 and British Standard 6501, Part 1. Full penetration welds are less susceptible to failures in the weld such as pinhole leaks, fatigue cracking, or corrosion. It is difficult to make full penetration welds in small

	diameters, such as ¼-inch, required by the Corporate Standard. Unlike the H2 and H7 hoses in P3H, the phosgene cylinder hoses used at Belle do not use welds." (Belle S.H.E. Incident Investigation Form at 7 of 24)
Page 74 – 1st sentence states that "Phosgene permeation through PTFE resulted in leaks at Belle in the past...."	There is no evidence of any instances of leaks resulting from phosgene permeation through PTFE at Belle before the 1/23/10 incident.
Pages 85-86, Section 4.6.5 -- The draft CSB report discusses the revised Compressed Gas Association (CGA) Standard E-9, 4th Edition (2010) which indicates PTFE lined pigtails (hoses) are not suitable for toxic gas service including phosgene. In paragraph 3 of this section, the draft CSB report states, "However, had DuPont followed this standard, they should have considered another non-permeable hose material as CGA prohibits the use of PTFE lined hoses with materials such as phosgene."	CGA Standard E-9 (4th edition) was updated and publicly issued on 1/29/2010, AFTER the Belle incident occurred. Therefore, it is factually inaccurate to criticize DuPont for not considering a CGA standard that did not exist at or before the time of the Belle incident which occurred on 1/23/10. Moreover, if managed properly, PTFE-lined hoses are suitable for phosgene use; during 23 years of use of these phosgene hoses at Belle, there was no history of hose failures or leaks from the hoses. (Belle S.H.E. Incident Investigation Form at 7 of 24) The statement in paragraph 3 in Section 4.6.5 that DuPont should have considered the CGA standard should be deleted. Root Cause # 5 on page 88 should be modified to delete reference to the CGA standard.
Near Miss Incident Reporting	
On January 23, when the hillside hose was removed from a water bath, the "clear adhesive ID tag" had fallen off, revealing that the stainless steel braid under it had corroded away. However "this discovery was not captured as a near-miss, since supervisors were not made aware of the issue" (p. 66). "[S]upervising staff does not work on weekends," and there was no "system in place for operators to report near-miss incidents on weekends to supervisory staff" (p. 67).	The draft CSB report is factually inaccurate. First, site supervising staff does work on weekends. For example, there is a site shift supervisor at work at all times (24/7). Line management is always available on site. Second, Belle supervisors and technical support staff are available when needed at any time day or night and on any day of the week, and operators and other personnel are not reluctant to call supervisors and technical staff who are not on site whenever an issue is identified. Third, the reason supervisors were not contacted in this case was not because there was no system to report near misses or no supervisors at work on Saturdays, as the draft report mistakenly concludes, but because the operators did not believe there was a problem needing immediate elevation to a supervisor. After the

	hillside hose was removed from the water bath and the corrosion on the hose became visible, the operators visually inspected the riverside hose and observed no problem. They did not realize that localized corrosion on the riverside hose was hidden by the manufacturer's label. They believed they had corrected the problem by replacing the corroded hillside hose.
Pages 74-75, Section 4.5.1 – CSB draft discusses in detail the timely initiation of incident investigations including OSHA' s requirement in the PSM rule to start and communicate the incident investigation within 48 hours (Belle site local practice was shorter and more restrictive than OSHA @ 24 hrs).	Had the operators who found the corrosion on the hillside hose waited until Monday morning January 25 to inform their area supervisor in SLM, the plant would still have been in full compliance with OSHA's 48 hour requirement in the PSM standard involving timely incident reporting and investigating. There were only a few hours that elapsed between when the hillside hose braid corrosion was recognized and when the riverside hose failure occurred.
General Comments on Phosgene	
Page 56, section 4.2, 1st para, lines 5-6 -- "He was sprayed across the chest and face with liquid phosgene remaining in the hillside hose from a previous transfer operation."	The phosgene exposure source was the riverside hose.
Page 69, footnote 43 states that DuPont uses phosgene at 5 facilities including one at LaPorte, TX	The DuPont LaPorte site does not currently use phosgene (LaPorte used phosgene many years ago). The footnote should eliminate any reference to LaPorte and indicate four facilities.
Fence line analyzers indicated "that phosgene concentrations had traveled offsite toward the Kanawha River" (p. 60) and CSB's Vapor Cloud Dispersion Modeling shows a 2 ppm plume on the river and lower concentrations across the river (Appendix D, p. 128)	CSB relies on ALOHA modeling to show offsite dispersion, but the actual data is supplied by the three analyzers at the fence line closest to the unit and do not support any significant offsite dispersion. One analyzer recorded no phosgene. One peaked at 0.27 ppm for 2 seconds and dropped to 0.05 ppm for one hour. The third analyzer peaked at 0.15 ppm for 2 seconds and then returned to zero. These data show that the concentrations at the facility's fence line created no serious health risks. The ERPG-2 value for phosgene is 0.20 ppm, at which "all could be exposed for up to one hour without experiencing or developing irreversible or other serious health effects or symptoms." (p.60 fn 39.)
Page 128 – the second bullet indicates that 0.5 ppm phosgene is odor threshold and the phosgene alarm set point.	Page 55 2nd para correctly indicates phosgene alarm set points were 0.05 ppm for medium high and 0.1 ppm for high high alarm.

Page 62, Figure 14 uses the word Cellophane (embedded in the picture).	Cellophane is a specific trade name product and there is no evidence this is correct.
Section 4.3.5, 2nd para, page 65 -- "No back up layer of protection ensured that hoses were changed at the pre-determined frequency, such as a weekly critical equipment maintenance check sheet or inspection tag" Root cause # 2 page 87 – DuPont did not have a backup method to ensure timely change out of hoses Recommendation 2010-06-I-WV-R3, first bullet, page 107 -- "Improve the existing maintenance management system by supplementing the computerized system with sufficient redundancy to ensure tracking and timely scheduling of preventive maintenance for all PSM critical equipment."	Belle uses an SAP automated maintenance system to manage its PM program. SAP is designed to provide a strong and reliable system for performance and tracking of preventive maintenance. Belle already implemented, following the January incidents, additional steps to strengthen systems to ensure that SAP is issuing all work orders in accordance with PM maintenance plans. While adoption of redundant systems may provide a helpful improvement for certain selected pieces of critical equipment such as flexible hoses with tags which may be audited with field check sheets, the blanket recommendation to create redundant systems for all pieces of critical components is unnecessary and counterproductive as it fails to take into account differences in equipment or problems that can arise from operating under duplicative systems. Unlike flexible hoses, it may not be feasible to use check sheets or tags for many types of PSM critical equipment components that are not easily accessible or readily observable in the field.
Methyl Chloride Incident	
CSB Draft Language	**Actual Facts**
There was a 0.5" weep hole on the vent line inside the building, and methyl chloride vapor escaped into the operation building for "nearly 5 days" (p.21)	Methyl chloride did not escape into the building for five days but only for a short period on January 22, 2010, the fifth day of the incident. Operators walked past the weep hole repeatedly during the prior four days and detected no leak from the vent line. Contractors conducted routine leak detection (LDAR) inspections in this area on the previous day (January 21) and did not identify any vapors inside the facility. Release of the gases from the weep hole activated the sensor, which occurred only on January 22, not on any prior days. Belle's root cause investigation team believes that solids may have previously deposited in the weep hole and plugged it. The chemical reaction between HCL in the vent pipe and the solids

	which plugged the weep hole caused the plug to open on the fifth day when the sensor alarmed. (Belle S.H.E. Incident Investigation Form at 8 of 10) Since the plug in the weep hole was intact until the day the sensor activated, methyl chloride vapors were not escaping into the building the previous 4 days.
• Key Finding #4: "Despite repeated incidents of rupture discs bursting, DuPont did not adequately address the cause to prevent recurrence." (p.38)	The methyl chloride incident occurred during the F3455 process. Belle did not experience repeated rupture disc bursts during the F3455 process. Rupture disc bursting events related to the AECP process – solids formation and pulsation in the system. The bursting of rupture discs during a different manufacturing process had no bearing whatsoever on the methyl chloride incident.
• Root Cause #2: "DuPont did not resolve the 'nuisance alarm' condition in a timely manner." (p.38)	The nuisance alarms were caused by a power supply problem. As the Belle root cause investigation team found, "The power supply problem was corrected on August 3, 2009" (Belle S.H.E. Incident Investigation Form at 7 of 10). Specifically, an E&I Engineer in the Hex Unit fixed the false alarm issue in August 2009 by removing all of the wireless components from the sensor alarm. He completed a MOC for this fix. "On 8/3/2009, Management of Change #09-33 was implemented and to redesign 1124PA [building scrubber rupture disc burst sensor] to eliminate the battery due to a history of false alarms due to poor battery life." (Belle S.H.E. Incident Investigation Form at 6 of 10). Thus, the problem was fixed approximately 6 months before the methyl chloride release occurred in January 2010.
"Operators . . . were not retrained to respond to the more reliable burst sensor alarm" (p. 30)	In this case, retraining occurred when documentation of the change was made available to the operators and, pursuant to established procedures, each operator read the documentation. Documentation of the change was contained in the control room notebook binder for the operators. DuPont has copies of the operator communication sheets dated 8/3/09 where each shift operator in F3455 received and acknowledged the MOC

	information related to burst sensor upgrades for electrical power supply. As the Belle root cause investigation team found, "The change was communicated in the Communication log book on 8/3/2009." (Belle S.H.E. Incident Investigation Form at 6 of 10)
Oleum Incident	
CSB Draft Language	**Actual Facts**
Executive Summary, page 8, para 3 states that the plant fire brigade stopped the oleum leak in about one hour after it was discovered. Other places in the draft report list different times for the leak recognition, response and stoppage. For example page 12 lists 7:55 am ,with stoppage at 8:26 am; page 39 says leak was reported at 7:40 am, page 41 says leak was stopped at 8:09 am	The duration of leak from initial reporting to stoppage was less than 30 minutes, not one hour. Inconsistencies in times described by CSB in three sections are factual inaccuracies and should be reconciled. A contractor who was working in the immediate area first identified the leak at 7:40 am and the leak was stopped at 8:09 am when a valve was turned (29 minutes total).
The "sample line involved in the January 2010 incident was not included in the PM schedule." (p. 46; see also key finding #1 at p. 47)	This small 1" diameter sample pipe was overlooked when the PM schedule was created. But, as CSB acknowledges, it is unlikely that this made any difference: "Due to the small size of this pitting, it is unlikely that routine non-destruction examination (NDE) techniques would have identified this defect." (p. 45) There were no other issues for a PM program to have caught: as CSB reports, the sample line was made of the correct material of construction, and was well within the normal life expectancy for this type of pipe in oleum service (p.46).
Page 47. Section 3.3.5, last para states "DuPont failed to address the corrosion issues associated with acid service."	This statement is false and misleading to the extent it may suggest a general failure on the part of DuPont as a result of the omission by the Belle plant's MI program of this one small section of pipe.
CSB report refers to a "large hole" on pages 43 and 44.	There was no large hole. The photos of the hole on pages 43 and 44 are both magnifications, plus the size of the hole grew after the release of oleum because the pipe continued to corrode after removal since it was not decontaminated for several days at the government's direction.

General Comments on the Full Draft Report	
CSB report includes inconsistent Key Findings and Root Causes regarding DuPont or the DuPont Belle Site in several sections as described in the following excerpts: Page 38, Section 2.4 Key Findings #2 – DuPont ran the equipment with an unreliable battery powered transmitter…" Page 38 Section 2.5 – Root Cause # 2 "DuPont did not resolve the nuisance alarm condition in a timely manner" Page 47, Section 3.4 – Key Findings #1 "An internal DuPont investigation report from a prior oleum leak…." Page 86, Section 4.7 – Key Findings #2 "DuPont did not follow its own standards…." Page 87, Section 4.8 – Root Causes #1 and #2 "DuPont relied on a maintenance software program…" and "DuPont did not provide a back-up method to ensure timely change-out…."	Responsibilities should be clearly and consistently identified throughout the draft report to differentiate actions and decisions made at the DuPont Belle site versus the DuPont company. This should be consistent so the findings are aligned with the appropriate organization Each of the listed sections in the left column should refer to the "DuPont Belle Site"

Comments on DuPont Phosgene Accident Report

I am an employee at the Department of Energy, National Nuclear Security Administration. I find the Chemical Safety Board investigation reports often have valuable lessons-learned for my agency, where we operate a number of facilities which use hazardous chemicals in combination with nuclear materials or separately; and process safety management techniques are integral to their safe and reliable operation. Thank you for making the draft report on the DuPont phosgene accident available for public comment. I think the draft report is very good. I offer the following comments for your consideration. These comments are strictly my own as a private citizen and do not represent an official position by DOE or NNSA.

The report describes latent errors, normalization of deviation, lack of conservatism in safety decisions affecting the lives of workers, and insufficient accountability of management; all of which indicate a weak safety culture at the plant. I think it might be useful for readers of the report if it included information answering the following questions.

After the fatal phosgene accident, did the plant continue to operate the front end SLM process using phosgene in production of five intermediate isocyanate products? If so, did the plant continue to use stainless steel transfer hoses or did it replace the stainless steel hoses with one of the materials, such as Monel, specified in the DuPont standard? It might be of interest to give a rough cost comparison between Monel and stainless hoses.

The plant used stainless steel for the transfer hoses even though the DuPont standard did not recommend them. The report contains correspondence from a plant engineer attempting to justify the use of stainless steel, even after a DuPont corporate expert recommended against it (normalization of deviation). Who (if anyone) in management approved the decision to deviate from the company standard? Did plant management know about the stainless steel hoses? Does DuPont have a policy regarding mandatory use of its own standards? Maybe the plant or the entire company should perform an extent-of-condition review to see how many other deviations from company standards exist.

Who is accountable for accepting safety risk at the plant, and is there any kind of a formal process for management to approve the safety of operations and any changes impacting safety? These questions relate to whether management at the plant explicitly accepted additional risk for decisions like using stainless steel hoses and delaying the shed enclosure project, or whether they were ignorant of actions and decisions which were compromising safety.

Did the workers know they were being exposed to extra risk because stainless steel was used for the transfer hoses? If they were simply required to wear chemical PPE suits whenever entering the phosgene shed a worker might not have lost his life. Defense-in-depth was absent.

Plant management delayed the project to enclose the shed five times for a delay of approximately six years from the original plan, although a PHA recommended it to prevent fatalities from a

release of stored phosgene. Delaying a project which protects the lives of workers and the public five separate times indicates complacency and a culture that accepts normalization of deviation. Four of the five project extensions were written on or near the projected completion date, again indicating complacency and even raising questions about whether the plant ever really intended to do the project.

Did DuPont make any management changes at the plant as a result of the accidents?

Even before the SAP software changes, required monthly change out of the stainless steel hoses were barely completed half the time, another indicator of complacency.

I think the root causes discussed in Section 4.8 are more appropriately contributing causes. The root causes appear to be management complacency and a failed safety culture.

I just wanted to share my thoughts after reading the draft. I think the CSB did a thorough, high quality investigation.

Michael Zamorski
Senior Advisor

To: U.S. Chemical Safety and Hazard Investigation Board (dupontcomments@csb.gov)

From: Joe Danowsky (danowsky@temple.edu, forwards to SunstoneSeminars@aol.com)

Date: August 22, 2011

Subject: Comments on CSB Staff Draft Investigation Report **2010-6-1-WV**, regarding January 2010 hazardous chemical releases at the DuPont plant in Belle, WV

This memo is in response to your invitation for public comments on the July 2011 draft report. These comments focus on the **phosgene**-release incident. General comments may apply equally to other incidents covered in the report.

Disclosure

To put my comments in proper perspective, here is some relevant personal background:

- I have no connection with any of the parties involved.
- I have no expertise in the technical aspects of chemical plant processing.
- I do have extensive work experience in creating standards and procedures, and in communicating them clearly. I am currently developing a consultancy on procedures.
- I also teach a technical communication course at Temple University College of Engineering.

Comments on technical and procedural factors

The staff report is well written and helpfully illustrated, making it admirably understandable even to a nonspecialist. That said, I offer the following suggestions for further fact-finding, causal analysis, and possible CSB recommendations:

1. The report cites thermal expansion of phosgene gas within the hose as the immediate cause of the fatal rupture. This bears explanation, since the accident occurred during one of the coldest months of the year in a shed that was only semi-enclosed. The report notes on p. 48 that liquid phosgene boils at 8 degrees Centigrade (47 degrees Fahrenheit), but it does not estimate the local temperature of the hose contents at the time of the rupture.
2. The report states that the victim evidently did not shower after the exposure, and concludes from this and other evidence that the shed workers were inadequately trained to react to a phosgene release. But did DuPont's procedures even call for use of the shed's safety shower (see Figure 12 on p. 50)? It may also be the case that use of the shower was precluded by concerns about phosgene inhalation. If so, perhaps the report should add a recommendation that an additional safety shower be provided at some remove from the facility. (This idea might have broader application to other scenarios in which a chemical spill poses both a contact hazard and an inhalation hazard.)

3. The DuPont expert quoted on p. 70 expressed surprise that hoses with PTFE Teflon® inner cores were being used, since (as noted throughout the report) Teflon is permeable by phosgene. That implies that at least one non-permeable alternative was available. But the report says nothing about the permeability of the alternative inner core materials listed in Table 3 on p. 68: corrugated Monel® 400 and corrugated Hastelloy® C276. Are those available alternatives in fact less permeable than Teflon?
4. Given that cost factors seemed to weigh so heavily in managerial decisions, it seems odd that moving from a two-month change-out interval for hoses to the SAP module's default 30-day interval went unchallenged. That change presumably doubled the cost of hoses when the SAP module was working. Then, after the SAP notices stopped being issued, change-outs were sometimes skipped for several additional months. Is there no record of discussions on these wide shifts?
5. Why did the supplier of the hose that burst affix the hose tag with cellophane tape instead of the usual methods noted in the report? Was this just a new supplier who labeled all hoses that way? Was some functional advantage expected? Or was this perhaps done to lower cost? If DuPont uses multiple suppliers to create downward price pressure (vs. just to avert supply disruption), then there may need to be a tighter linkage between DuPont's MOC safety reviews and that of vendors.
6. The user interface of the SAP software module for generating PM reminders includes a *misleadingly named* "Confirmation" option that non-intuitively led to suspension of reminder scheduling. This calls for a recommendation to SAP to name the option less confusingly (e.g., "Schedule next PM only after confirmation"), plus better training for users of the PM module.
7. OSHA's Compressed Gas Regulation incorporated by reference a 1965 version of a CGA standard, rather than the current version of that standard, which has been updated 10 times since 1965. The report explains that the OSHA regulation, if properly updated, would have required an engineering safety solution rather than the procedural approach being relied on by the Belle plant (pp. 99–100). The report recommends that OSHA and other groups update their standards. But since OSHA's delay verges on causal, it would be worth inquiring why that agency let its standard get so seriously out of date.
8. The report's recommendation that phosgene hazard awareness training be conducted annually for all employees (p. 108) seems too weak. At minimum, it should be made clear that new employees (see hiring plans on p. 93) must be trained before entering service, and that each employee must receive refresher training at no more than 12-month intervals. But if CSB wants DuPont to reinvigorate its safety culture, safety briefings should occur on much shorter intervals.

Comments on managerial factors

The report also documents a whole series of causative links involving managerial safety failings at the Belle plant. Root causes for those failings should therefore be sought, just as for technical and procedural causes. Without improvements in management commitment, technical recommendations could be in vain. Examples of managerial failings include the following:

9. The phosgene shed *routinely* operated without any management presence on weekends. Why was that considered acceptable?
10. Management resisted the generally recognized Hierarchy of Control principle (P. 93), which specifies that engineering solutions to eliminate hazards are far preferable to administrative controls or reliance on personal protective equipment. In particular, DuPont repeatedly postponed implementation of previously mandated hazard-elimination technology (enclosure and air scrubber) that would have prevented this fatality.
11. The report's allusions to community impact (e.g., p. 60, p. 91), together with the provided historical DuPont memos on risk criteria (p. 144 ff.), suggest that Belle plant management gave short shrift to the potential public harm from a chemical release. This attitude seems especially evident from plant management's multi-year foot-dragging in implementing a shed enclosure that was mandated by its own SLM Unit PHA team to avert potential off-site consequences.

On a related note:

12. The report's discussion of violations found in post-incident OSHA inspections (pp. 100–101) suggests one possible factor in the decline of the plant's safety culture amongst cost-conscious managers: for a company the size of DuPont, the fines imposed were extraordinarily low relative to the cost of compliance.

The purpose of investigating causes for mismanagement is not to assign "shame and blame." As with inquiries into technical causation, the purpose is instead to ensure that proposed improvements are causally relevant. For example, consider how corrective actions might sharply differ depending on which of the following were found to explain an instance of management inaction on a safety issue:

- Manager A is paralyzed into indecision by technical alternatives that are hard to compare due to uncertainties. *Provide tools and training in decision making.*
- Manager B is reluctant to make any expensive investment because his job security or bonus depends heavily on showing cost reductions. *Avoid perverse incentives.*
- Manager C kicks the can down the road to her successor because she's about to retire. *Adjust incentives for short-timers.*
- Manager D has an overly optimistic risk-taker personality profile and simply doesn't take the hazards seriously. Manager F doesn't take the hazards seriously either, but in his

case it's because he is deficient in empathy. Manager E is a follower and does not want to be the one who sets a precedent. *Improve hiring criteria and training for managers.*

Information on the thinking that went into management decisions can be difficult to come by, of course, but it pays to make the attempt. The draft report leaves the reader to guess why DuPont declined to provide information on various topics, and also to guess whether the CSB exerted any pressure for DuPont to be more forthcoming.

Comment on logic tree diagrams

The report's logic tree diagrams have some value but also the following shortcomings:

- Fitting text into many small boxes on a report page results in challengingly tiny print and terse writing without transitions.
- Even at a reduced size, tree branches often continue onto another page, so the reader needs to follow connector symbols and hold the earlier flow in short-term memory.
- The connecting lines in the diagrams all look the same, but they don't really all have the same meaning.
- Combining three different incidents into one diagram further increases the diagram's complexity without any corresponding yield of new insights.

To remedy these shortcomings, I recommend supplementing and perhaps replacing the logic tree diagrams with tabular explanations along the lines sketched in Table 1. Note that this table

- Is illustrative and covers only part of the overall logic tree
- Omits branches that ended with "Normal," since those do not provide causal explanations
- Refers to the burst phosgene hose simply as an *output* hose (vs. "riverside")
- Reflects some of my preceding substantive suggestions

Conclusion

I hope at least some of the preceding comments prove useful to the CSB staff, and will look forward to reading the final report.

I'll welcome any questions or feedback you may have on these suggestions.

Table 1. Phosgene release at DuPont plant in Belle, WV (Jan. 24, 2010)

Incident summary: A phosgene tank's output hose failed catastrophically, releasing approximately two pounds of phosgene that had remained locked in the hose between shutoff valves. A plant employee directly struck by the spray died later that day from the exposure.

A. Factors contributing to hose failure		
FACTOR	**EXPLANATION**	**RECOMMENDATION**
Some phosgene liquid routinely remained in output hose, between the shutoff valves.	Process design fails to evacuate the hose after use.	**Redesign process to ensure hose is empty after use.**
Phosgene left in the hose gradually yielded hydrochloric acid (HCL), which then attacked the metal hose cover.	The PTFE (Teflon®) hose liner is slightly permeable to phosgene. Phosgene that leaks through the liner reacts with ambient humidity to form HCL, which reacts with susceptible hose braiding as it passes through to the surrounding atmosphere.	**Seek a less permeable hose liner.**
The #304 stainless steel hose braiding was susceptible to corrosion from HCL.	Belle management rejected use of the Monel® cover material recommended by an outside expert. They instead relied on other DuPont staff, who had mistaken a harmless green patina on the Monel® for corrosion.	**Use Monel® for the cover braiding instead of #304 stainless steel.**
HCL corrosion was exacerbated by a cellophane tape label surrounding part of the hose.	By completely surrounding several inches of the hose, the label slowed release of HCL diffusion into atmosphere. The new labeling system was implemented without use of a management of change (MOC) procedure by either the assembler or DuPont	**Improve plant's communication with supplier, and apply MOC process.**
Hose was long overdue for change-out, due to sporadic periodic maintenance (PM)	a. Reminders to change the hoses every 30 days were supposed to be issued automatically by the SAP PM module, but an unauthorized and undocumented change to a program setting caused the notices to be suspended. b. The unauthorized setting change was to "require confirmation" that the change-out was done. If the programmer actually made that change intentionally, s/he may not have realized that this would completely suspend further notices unless the SAP module received confirmations. But the hose change procedure said nothing about confirmations, so notifications just stopped. c. There was no backup reminder system or method for detecting missed notices.	**a. Improve MOC process for software** **b. Improve SAP user training (and SAP user interface if possible).** **c. Implement backup method.**

Comments from Jean-Francois Leblanc – 8.22.2011

Good day,

In response of the investigation performed by the CSB on the Dupont Belle fatality, I am providing the following comments. I am a safety Director that work for an international pulp and paper company and my division has 17 business units in North America with 10 locations in the US. I am french speaking and I apologize in advance for the english mistakes I could be doing.

First, I would like to congratulate the CSB work overall and the professionalism demonstrated in all the investigations you do, including this one from Dupont fatality. There are many courses on accident investigation available in the world or US and many people, safety managers and companies do accident investigation reports but very few reach the level of details and root cause analysis viewed in your reports. In Quebec, every fatalities are analyzed by the governmental regulators (CSST) with a fault tree technic, very similar to what we can see at page 115 of the report. Unfortunately, this does not seem to be standard practice for OSHA and very often you will get from them an overview of the facts and of course, some citations. I wish the level of details we see in your reports would be reached in all fatalities that OSHA investigates.

Second, here are general and specific comments for the Dupont fatality report:

- Considering that a fatality happened at this facility, it was shocking to realize that "no planned inspections took place from 1993 to 2010"... None... Considering the level of risk at this facility, this is unacceptable. OSHA should have been more present;
- It is shocking to realize that only couple of citations and 43 000$ in penalties resulted from this fatality;
- As a safety Director, I realize with time that even all the good marketing Dupont has put in their safety programs, including the Stop Program, none of their program is a universal one size fits all solutions. Implementing any program requires discipline, leadership and resources, three criteria that seem to be getting lost today in this troubled economy even at their own Belle facility;
- I was very surprised to read the low level of employee participation in accident investigations and near miss reporting procedure at the facility. Employee involvement is at the core of this kind of program and a company such as Dupont should have had this already in place;
- The "Hierarchy of controls" seem to be more and more forgotten in the last years with all this emphasis on individual behaviors in safety. Both are required to manage risk;
- Considering the low OSHA rate Dupont has had and has been recognized for in the past, it is time that we challenge the strategy based on Heinrich model and that working on lowering injuries and incidents will by the same time lower the risk of a more major or fatality incident. Dupont has based many of their safety efforts and program on that premise and that is somehow wrong. Strategies to manage risks for severe/fatalities are different and they require thorough safety programs, leadership and discipline, resources and accountability. If these are not present, something bad will happen even if the OSHA rate is low;

- Hopefully, this will be a lesson learned for all companies and more specifically Dupont. We have used many of the recommendations in this report and trying to implement them in the company I work for;

Thank you to consider those comments,

Jean-Francois Leblanc

Comments from Roger Patrick 7.12.2011

In reading the report I was surprised by the lack of any recommendation about the medical care at the hospital. As I read on Phosgene poisoning it appears that there isn't a standard "best" practice on how to treat massive exposures. I would think there should be a recommendation to some group to research what the best practice medical program should be for all toxics that have delayed action but produce acid in the lungs. Should the person have been immediately placed on a lung machine, given some sort of neutralizing gas lung flush, hyperbaric oxygen, etc ? I am not in the medical field and don't know all the options but I think some group should be assigned the task of defining a recommended treatment. The statement that the emergency room physician was considering sending him home was extremely chilling in revealing the lack of knowledge about what was going to happen and what should have been done.

The report also seemed to imply that no safety shower was utilized in the field. I don't know if this would have made a difference but it should be a standard practice and I don't recall a recommendation addressing this issue. Nor do I know what the recommendation would be other than follow your emergency training.

My final comment concerns the recommendation to forbid a certain type of hose construction for Phosgene. This recommendation should be made more general so that this type of hose construction is forbidden for any toxic material (not just phosgene) that can break down to cause cracking of the outer material.

Roger Patrick