Lessons from the Past / Learnings for the Future
The Significance of “Lessons Learned” Sharing Processes

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Mary Kay O’Connor Process Safety Center
International Symposium
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Lessons from the Past/Learnings for the Future
Desired Outcome & Agenda

Desired Outcomes:

- Recognize the Value of Lessons Learned from Past Events
- Understand the Basics of LyondellBasell’s High Learning Value Events (HLVE) Process
- Become a Champion of Sharing and Learning from Other’s Event Learnings

Agenda:

- Lessons Learned – Case Histories
- LyondellBasell High Learning Value Events Process
- Becoming a Lessons Learned Champion
The Value of Lessons Learned – Mike Korst

Auto Refrigeration Accident - Olefins Unit Startup September 1989

- Acetylene Converter Section of Unit
- Exchanger Flange Gas Leak upon Introduction of Feed
- Distillation Column Overhead Pressure Control Valve Isolation
- Bypassed Exchanger
- Reintroduced Feed Forward
"Failure is success if we learn from it."

-Malcolm Stevenson Forbes
Lessons Not Learned – Repeated Events
The Value of Lessons Learned

Why Do We Have Repeat Occurrences of Significant Consequence Events that have Occurred Previously in our Industry?

- Inadequate Knowledge of the Involved
- Forgotten Knowledge
- Loss of Skills (Turnover)
- Organizations that Don’t Promote Reporting and Learning
- Reduced Sharing of Event Learnings
"Most discoveries are made regularly every fifteen years."

George Bernard Shaw
_The Doctors Dilemma, 1906_
BP - Texas City, Texas

Description of Event:

- March 23, 2005, ISOM Unit startup
- Raffinate splitter tower overfilled and overpressured
- Relief valves discharged flammable liquid to an atmospheric blowdown drum
- Atmospheric blowdown drum overflowed resulting in flammable vapor cloud, explosion, and fire
- 15 fatalities, 180 injuries, extensive on-site and off-site damage
Texas City Explosion and Fire

U.S. Chemical Safety and Hazard Investigation Board (CSB)

“BP had not implemented an effective incident investigation management system to capture appropriate lessons learned and implement needed changes.”

• Eight serious ISOM blowdown drum incidents from 1994 to 2004:
  – Two resulted in fires
  – Six flammable hydrocarbon vapor releases with vapor cloud at or near ground level
    • 1994 Deisohexanizer tower overfill
    • 2004 Ultracracker unit liquid pressure relief valves
  – Three of the eight ISOM blowdown drum incidents were investigated by BP or Amoco
Texas City Explosion and Fire

U.S. Chemical Safety and Hazard Investigation Board (CSB)

- BP Texas City lacked a reporting and learning culture.
- Effective Safety Cultures:
  - avoid incidents by being informed
  - communicate lessons and knowledge of hazards
  - include two essential elements: reporting and learning (Reason, 1997).
Texas City Explosion and Fire

BP failed to act on learnings of three significant incidents at its Grangemouth, Scotland, refinery in 2000

• Investigated by U.K. Health and Safety Effective Safety Executive – major report issued in 2003

• 2004 article by three senior BP Process Safety Engineers:
  – Focus on Process Safety Management over and above conventional Safety Management
  – Develop Key Performance Indicators for major hazards
  – “Traditional indicators such as ‘days away from work’ do not provide a good indication of process safety performance.”

Baker Panel Report:
“In its response to Grangemouth, BP missed an opportunity to make and sustain company-wide changes that would have resulted in safer workplaces”
Texas City Explosion and Fire

CSB Recommendation for BP Board of Directors

• Ensure and monitor that senior executives implement an incident reporting program throughout your refinery organization that:

  a. encourages the reporting of incidents without fear of retaliation;

  b. requires prompt corrective actions based on incident reports and recommendations, and tracks closure of action items at the refinery where the incident occurred and other affected facilities;

  c. requires communication of key lessons learned to management and hourly employees as well as to the industry.
"Those who do not remember the past are condemned to repeat it."

-George Santayana
High Learning Value Events Process

An Incident and Near Miss “Lessons Learned” Sharing Process that Ensures Significant Learnings are Incorporated into the company’s Organizational Memory, Acted Upon, and Periodically Revisited.
High Learning Value Event Definition

An Incident, Near Miss, Finding, Occurrence, or Event that May Occur either Internally, or Externally, and which is, or has the Potential to be, a Significant Incident. Also, a HLVE Offers a Learning to the Company which Needs to be Incorporated into LyondellBasell’s Organizational Memory, Acted Upon, and Periodically Revisited.
Significant Incidents Examples

- Overnight hospital admission.
- Fire or explosion requiring fire fighting or outside assistance.
- Release that poses potential public health or safety threat.
- Release that causes on-site out-of-unit threat causing shutdown or evacuation.
- Major compliance issues.
- Incidents with community impact – mitigation, clean-up, or complaints.
- Significant media interest – regional network or print, multiple day local print coverage.
- Business interruption or property damage >$5MM
LYONDELLBASEL HIGH LEARNING VALUE EVENT (HLVE) PROCESS WORKFLOW

- **Impact Entry**: Site/Org Point of Contact Assessment
  - **Pass**: Screen by HLVE Engineer
    - **Corporate Assessment Team (CAT) Approves?**
      - **Yes**: Corporate Owner Identifies and Assigns to HLVE
        - Corporate Owner Defines/Assigns Finding & Action Items to Site/Org Owners
      - **No**: HLVE Engineer Issues Initial Communication of Approved HLVE
  - **No**: HLVE wildcard entry

- **No Further Action or Communicate as Appropriate**
- **Not an HLVE**: Determine Appropriate Further Action
- **Phase 2 of HLVE**: Institutionalize Learning, Develop Process for Training, Communication Awareness
- **Entry into Impact HLVE Database**
- **Site/Org Owners Close HLVE Findings Upon Completion of Action Items**
- **Corporate HLVE Owner Closes HLVE Upon Completion of All HLVE Findings**
HLVE Corporate Assessment Team (CAT)

Seven Senior Managers
Meet as Required (Typically Minimum Quarterly):

• *Review, Assess, Approve HLVE Candidates*
• *Determine Applicability*
• *Define/Approve Corrective Actions*
• *Determine Need for Periodic Verification of Controls*
• *Assess & Facilitate Resources for Mitigation*
LYONDELLBASELL HIGH LEARNING VALUE EVENT (HLVE) PROCESS WORKFLOW

1. HLVE WILDCARD ENTRY
   - Pass Site/Org Point of Contact Assessment
     - Y: Pass Screen by HLVE Engineer
       - Y: Corporate Assessment Team (CAT) Approves
         - Y: Corporate Owner Identified and Assigned to HLVE
           - Corporate Owner Defines/Assigns Finding & Action Items to Site/Org Owners
             - Site/Org Owners Close HLVE Findings Upon Completion of Action Items
           - Phases of HLVE:
             - Site/Org Closing
               - Corporate HLVE Owner Closes HLVE Upon Completion of All HLVE Findings
             - Phase 2 of HLVE:
               - Institutionalize Learning
                 - Develop Process for Training, Communication Awareness
     - N: NO FURTHER ACTION OR COMMUNICATE AS APPROPRIATE
High Learning Value Events Process Products

**HLVE**
- Defined Criteria
  - Consequence, Learning, Applicability, Actionable
- Review & Approval Process
- Identification, Assignment, & Communication of Required Action
- Institutionalization of Learnings
- <4/Year

**Incident Advisory**
- Improve Performance thru Sharing of Learnings from Investigations
- Developed by Site/Org & HLVE Coordinator
- Discretionary Action – No Report-back
- Archive Advisories
- 10 – 20/Year
Learnings Sharing Heirarchy

HLVE – Learnings with unacceptable unmitigated risk. <4/Year

Incident Advisory – Focused sharing of learnings for improved hazard awareness and recognition. ~15 – 20/Year

Knowledge Xchange – Broad institutionalized sharing of events and learnings

Site Incident Reporting & Sharing

Strong Incident Reporting & Learnings Sharing Culture
Dropped Halon Cylinder Becomes Projectile

**INCIDENT SUMMARY**

Many distributed control systems, mainframe computers, and telecommunication electronic equipment installations are protected by automated, fixed fire protection systems. Some typical extinguishing agents used in these systems include: Halon, FM-200, inert gas, and Carbon Dioxide. At one LyondellBasell facility, a fixed fire protection system utilizing Halon (a halogenated gas extinguishing agent) was being inspected by a contract service provider. As part of the scope of the biannual system inspection, the contract employees were moving a Halon cylinder to be weighed on a portable scale located outside of a control room building. The cylinder was dropped and its top valve hit a concrete platform (Figures 1 and 2). The impact of the cylinder's valve on the concrete caused the valve to fail, which resulted in a complete separation of the valve from the cylinder (Figure 3). The cylinder's internal pressure was 600 psi. The combination of the pressure and size of the cylinder's valve caused the cylinder to discharge its contents rapidly, resulting in the cylinder becoming airborne. The cylinder flew approximately 400 yards, over a tank farm and across two roads, before hitting a chain link fence (Figure 4). Fortunately, there were no injuries, significant equipment damage, or process releases as a result of this incident.

**CAUSAL FACTORS**

- The root cause of this incident was the loss of control of the Halon cylinder in the process of moving it to be weighed.
- A contributing factor was cylinder design deficiency. Fire protection system cylinders are designed to fit fire extinguisher standards, but have no provisions for installing a protective cap over the top valve assembly when handling or moving them.

**KEY LEARNINGS**

The potential consequences of any compressed gas cylinder failing and knocking off the top valve can be catastrophic. In addition to the potential for cylinders to become airborne, other potential consequences include catastrophic failure or uncontrolled spinning of cylinders, flammable or hazardous gas release, and personnel injury from a falling cylinder. While the general hazards are not well understood, the following additional learnings were gained from this event:

- Fire protection system cylinders do not have provisions for protective top valve covers.
- Fire protection system cylinders and other high flow rate cylinders, including liquefied gases like propylene used for torch cutting, require larger flow openings than most compressed gas cylinder valves. Because of the larger openings, these high flow rate cylinders have greater thrust potential than standard compressed gas cylinders.

**WHAT CAN YOU DO?**

- Treat every cylinder as capable of becoming a projectile if dropped and the top valve sheared off. Follow compressed gas cylinder safety handling requirements that include securing cylinders from falling and installing protective top valve caps, where they exist, for all cylinders when not in use.
- The inspection and maintenance of Halon, and other fixed fire protection systems is typically provided by qualified service providers. This incident is being shared with all LyondellBasell contract fire protection system service providers and cylinder safety governing agencies. Sites should require contractors to identify how they intend to handle the cylinders safely.
- A team of LyondellBasell personnel is working with contract fire protection system service providers and cylinder safety governing agencies to evaluate designing protective top valve guards on these cylinders. Details of a protective guard design will be communicated if determined to be feasible.

For additional information on this incident see IMPACT incident #50615, or contact Mike Korst, Coordinator of High Learning Value Events, 815-842-7635 – mike.korst@lyondellbasell.com

This summary provides information about an incident that recently occurred within LyondellBasell. The information is for LyondellBasell internal use only.
HIGH LEARNING VALUE EVENTS (HLVE),
HLVE-01 DIRECTIVE

Prevention of Accidental Collisions When
Loading or Unloading Railcars

Date: April 25, 2008

Issued by: Mike Korst – Coordinator of High Learning Value Events

REQUIRED ASSESSMENT AND RESPONSE FROM:
List of Sites and Respective Plant Managers

APPROVED BY: HLVE Corporate Assessment Team 3/28/08

RESPONSE COORDINATION AND QUESTIONS TO:
Name of the Respective HLVE Corporate Owner

RESPONSE DUE DATES: As noted in the Required Action section

REFERENCES:
List of Company, Regulatory, and Industry Standards, Guidelines, Documents

SUMMARY:
Event description including the actual and/or potential consequences and the learnings which are being highlighted and acted upon through this HLVE.

REQUIRED ACTION
A list of required actions and target completion dates

DISCUSSION
Incident identification number for personnel to access event documents (investigation report) in electronic incident report and tracking system. Additional discussion of incident details, learnings, or actions as appropriate.

cc: Broad Company Distribution List
Becoming a Lessons Learned Champion

• Seek out case histories to share the Lessons Learned with other members of your Group/Organization (especially less experienced)
• Evaluate shared event communications to identify key learnings and assess how they apply to your organization
• Revisit and ensure that lessons learned have been institutionalized in your organization
• Achieve excellence in preventive processes
Lessons Learned Resources

WWW
- U.S. Chemical Safety and Hazard Investigation Board www.csb.gov
  - Completed Investigations
  - Investigation Digests
  - Safety Publications
  - Video Room
  - Process Safety Beacon

Books
- Incidents that Define Process Safety CCPS
- Author Trevor Kletz
  - Lessons from Disaster - Why Organisations Have No Memory and Accident Recur
  - What Went Wrong
  - Still Going Wrong
  - Learning from Accidents
Presentation References

Refinery Explosion and Fire – BP Texas City, Texas
U.S. Chemical Safety and Hazard Investigation Board
http://www.csb.gov/safety_publications/docs/SB-Nitrogen-6-11-03.pdf

Lessons from the Past/Learnings for the Future & High Learning Value Events (HLVE) Process

- Value of Lessons Learned from Past Events
- Basics of LyondellBasell’s High Learning Value Events (HLVE) Process
- Become a Champion of Sharing, and Learning from Other’s Events
"It should not be necessary for each generation to rediscover the principles of process safety which the generation before discovered. We must learn from the experience of others rather than learn the hard way. We must pass on to the next generation a record of what we have learned."

Jesse C. Docommun
V-P Manufacturing American Oil Company 1961