

CE 400 / CE 500

Process Safety Management

Lecture 17 Process Hazards Analysis I

Instructor: David Courtemanche



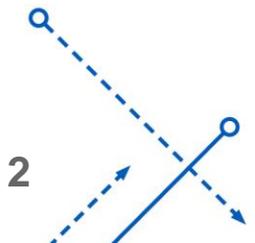
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What is a Process Hazards Analysis?

- A thorough, orderly, systematic approach for identifying, evaluating, and controlling the hazards of processes involving highly hazardous chemicals*
- Often when you say you are going to perform a PHA, someone will say, “Oh, you’re doing a HAZOP” **
 - HAZOP is **one** method of doing **one** step of a PHA!
- If your process falls under OSHA Standard 1910.119 you are **REQUIRED BY LAW** to perform a PHA **before** commencing operation and to perform an update **every** 5 years

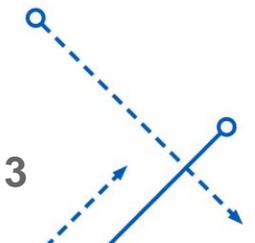
* <https://www.osha.gov/Publications/osha3132.html#pha>

** personal pet peeve of the instructor



What Does a PHA Consist of?

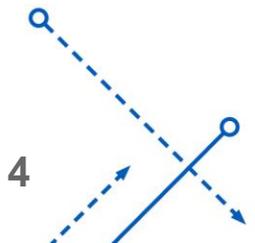
- As indicated by OSHA the PHA must include the following:
 - i. The hazards of the process
 - ii. The identification of any previous incident that had a potential for catastrophic consequences in the workplace
 - iii. Engineering and administrative controls applicable to the hazards and their interrelationships, such as appropriate application of detection methodologies to provide early warning of releases. Acceptable detection methods might include process monitoring and control instrumentation with alarms, and detection hardware such as hydrocarbon sensors
 - iv. Consequences of failure of engineering and administrative controls
 - v. Facility siting
 - vi. Human factors
 - vii. A qualitative evaluation of a range of the possible safety and health effects on employees in the workplace if there is a failure of controls
- A company will create their own format and requirements but they must meet all of the requirements of this standard



Facility Siting

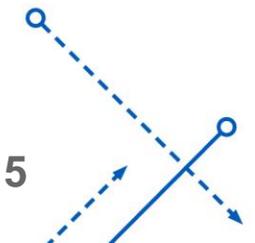
- Facility Siting looks at where you have personnel located on your site
- There are operators and maintenance personnel whose work necessitates that they are stationed close to the actual unit operations
- There are also many personnel whose work could be performed far away from the process
- There are many examples of major catastrophes where a large number of injured or killed personnel really did not need to be located within the range of hazardous effects
 - BP Texas City incident
- It is imperative that you operate your process with an acceptable risk level for ALL personnel
 - But if you can relocate “non-essential”* personnel out of hazard zones you should do so

* non-essential personnel are those that do not need to be located in the actual operating areas of the plant in order to perform their jobs



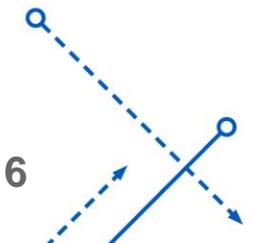
Human Factors

- There are many causes of incidents
 - Equipment failure
 - Process control failures
 - Contamination of materials
 - etc
- Human Factors looks specifically at incidents that can be caused by operator error
 - Focus is on looking for flaws in equipment design or operating procedures that make operator errors more likely to occur



What Are the Different Kinds of PHA?

- New Processes
 - You are building a new process and want to make sure it will be safe
 - Initial Screening and intermediate PHAs
 - Final
- Cyclic
 - Required every 5 years
- Management of Change
 - Will the modification to your process be safe
- Mothballing
 - You are not going to use the process for an extended time – does this introduce hazards
- Decommissioning
 - You are dismantling your process – what hazards does that represent?

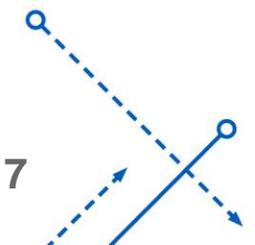


Hazards Identification

- From the OSHA standard:

The employer must use one or more of the following methods, as appropriate, to determine and evaluate the hazards of the process being analyzed:

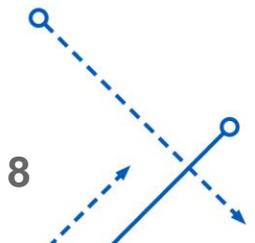
- What-if,
 - Checklist,
 - What-if/checklist,
 - Hazard and operability study (HAZOP),
 - Failure mode and effects analysis (FMEA),
 - Fault tree analysis, or
 - An appropriate equivalent methodology
- We will cover these in another lecture
 - These methods also, in my experience, can be used to answer points i, iii, iv, and identify scenarios for point vii
 - Point i is actually begun to be dealt with before entering into the methods above



Preparation for Conducting PHA

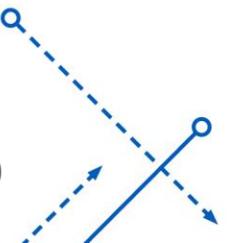
- Charter
 - Define scope of study
 - You won't be doing entire plant in one report
 - You need explicit and clear definition of what process units are included in this report
 - You need to make sure that there are not any parts of the plant that get missed
 - Can actually specify specific valves on specific P&ID*
 - Select Team Members
 - OSHA does not giving mandatory requirement, only suggestions
 - Need someone trained in the evaluation methods
 - Need operators and mechanics who are experienced in the specific process being studied
 - Really should have a chemist
 - Select Due Date (**absolutely** must be before OSHA deadline)

* Process and Instrumentation Drawing



Preparation for Conducting PHA

- Collect Documentation of Serious Incident Reports
 - Needed for point ii of OSHA requirements
 - Very important because learnings from incident may not have been applied to the rest of the process beyond the immediate location of the incident
- Collect Documentation of Management of Change Documentation
 - Process hazards implication of change should have been addressed in original MOC documentation
 - It is good to make sure this change was considered for its effect on entire process
- Collect and Field Check Process and Instrumentation Drawings
 - You are going to be using these extensively and if they are not accurate then your conclusions are suspect
- Confirm that Technical Standards are up to date – also need to be accurate 9



Preparation for Conducting PHA

- Collect Documentation of the hazards of your raw materials
 - Consult Safety Data Sheets (SDS) for the raw materials, intermediates, waste products, side products, and final products
 - Consult with chemists about possible reactions that could occur
 - Are there other possible reactions besides the intended ones
- Search for incidents involving similar processes and/or chemicals at other plants
- These steps can be useful for generating ideas on what hazards to be looking for

