Revalidation
Process Hazard Analysis

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Overview

- Legal requirements and need for revalidation PHA
- Objective of revalidation PHA
- Frequency of revalidation PHA
- Approach methodology for revalidation PHA
- Challenges of revalidation PHA

Legal Requirements For Revalidation Process Hazard Analysis

- **What does OSHA mention about revalidation?**

OSHA Process Safety Management (PSM) Standard (29 CFR 1910.119) and EPA Risk Management Program (RMP) Rule (40 CFR Part 68) provide requirements for revalidation and specifies that revalidation be conducted at least **every five years** by a team which meets the requirements of 1910.119(e)(4).

Legal Requirements For Revalidation Process Hazard Analysis

- **What does API RP 750, Management of Process Hazards say about this?**

PHA should be reviewed and updated periodically with typical review intervals ranging between **3 and 10 years**. The frequency depends on risk categoraization.

"Facilities not covered by the OSHA or EPA regulations should establish their own, appropriate revalidation frequencies".

Need For Revalidation Process Hazard Analysis

- The revalidation identifies the cumulative changes of risk over time and improves the understanding of risk.
- The changes of risk over time could be due to several reasons like;
  - Process or system changes introduced through management of change procedure;
  - Changes in the occupancy pattern (Onsite and Offsite);
  - New available knowledge which reveals more serious consequences than previously understood;

Need For Revalidation Process Hazard Analysis

- New regulation which imposes additional safeguards due to recent accidents in similar processes where existing safeguards were found inadequate;
- The current safeguards were found inadequate based on past experience and accidents;
- Meteorological changes over time;
- Decommissioning of process equipment.

Need For Revalidation Process Hazard Analysis

Process or System Changes:-

- Addition / deletion of equipment, Control or safety system changes, unit throughput increases or decreases, Siting, Changes in operation procedures, External events etc.,
- Revalidation evaluates integrated cumulative (and potentially synergistic) impact of all of these changes, both controlled and uncontrolled.

"There were 400 MOCs in an upstream Oil processing over a period of 3 years with significant cumulative impact which can be identified only through revalidation"

Need For Revalidation Process Hazard Analysis

Changes in the Occupancy Pattern (Offsite and Onsite):-

- There can be changes in occupancy patterns / location of personnel work areas;
- There are also instances when the offsite risk has increased due to developments over a period of time near the site.

"One of the regulatory recommendation after a major hazardous site fire: Make it mandatory to institute process of consultation between the major industries and the land planning authorities (both state and local). This will ensure that vulnerable sections of society are kept at a safe distance from the installation"

Need For Revalidation Process Hazard Analysis

New available knowledge which reveals more serious consequences than previously understood:-

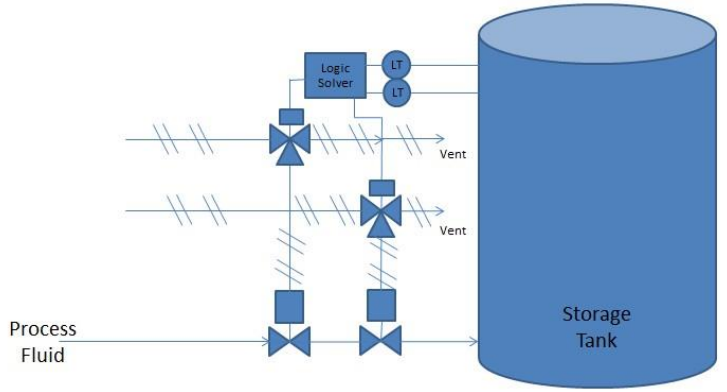
- Revalidation teams may have access to information that the prior PHA team members did not have. Such information might come from new company research, from work done by others and reported in the industry literature, or from learnings from incident investigations.

"UK HSE report mentions regarding Bunce field incident (Sunday 11th December 2005) ; The industries responsible for filling tanks, will be in a position to agree on a reliable method to determine the character of the vapour cloud generated in the event of an overfill. This will allow appropriate consideration of the overfill scenario i.e. fluid type, tank size, fill rate etc. to be taken into account in hazard assessments for land use planning and emergency planning purposes"

Need For Revalidation Process Hazard Analysis

New regulation which imposes additional safeguards with Retrospective effect:-

"UK HSE Process Safety Leadership Group (PSLG) Report on the Bunce field Incident provided guidance to operators to help them re-evaluate the risks associated with overfilling a large petrol storage tank and understand where further automatic protection systems should be installed".



Need For Revalidation Process Hazard Analysis

The current safeguards were found inadequate based on past experience and incidents:-

- Major disasters are often preceded by a series of smaller accidents, near-misses, or accident precursors.
- The adequacy of current safeguards based on past incidents should be analyzed during revalidation.

" An operator added chemicals to a batch resin process at too high a rate. Other alert operators noted the procedural deviation, and were able to prevent an accident. The company investigated the incident and disciplined the first operator. No other action taken. A serious accident resulted"

Need For Revalidation Process Hazard Analysis

Inadequacy of safeguards - Safety precedence sequence:-

- Inherent Safe Design,
- Install Safety Devices,
- Control With Procedures / Administrative Controls,
- Personnel Action by Training, Awareness & Knowledge,
- Accepted Risk.

"If a safety management system relies on properly trained operators to take correct action as the only line of defense against a major disaster, then a facility that employs such a system is asking for trouble in the long run, because humans make mistakes "

Need For Revalidation Process Hazard Analysis

Meteorological changes over time:-

- Fire at the Arkema chemical plant in Crosby, Texas due to *Hurricane Harvey*, which caused equipment to flood and fail. Extensive flooding caused by heavy rainfall exceeded the equipment design elevations.
- Chemicals stored at the plant decomposed and burned, releasing fumes and smoke Into the air. 200 residents were evacuated and 21 sought medical attention.
- During *Hurricane Harvey*, on August 27, 2017 a gauge station recorded about 21.5 inches of rainfall, exceeding both the 12-hour and 24-hour 500-year rainfall criteria by more than two inches.

"There are significant changes in weather pattern recently and wind speed , rainfall , offshore current and tide are much beyond design. Seismic classification has also changed in some parts of the world"

Need For Revalidation Process Hazard Analysis

Decommissioning of process equipment:-

- There are many deletion / replacement and decommissioning of equipment involved during plant life,
- Decommissioning a process equipment in the chemical, pharmaceutical, hydrocarbon processing etc., may involve explosive, toxic and in other ways harmful chemicals to people and the environment. The decontamination, disposal of waste and dismantling pose new challenges,

"The processes of equipment decontamination are not routine processes. The risk involved and complexity of equipment being decommissioned will likely dictate the need for a new PHA in lieu of a revalidation ".

Revalidation Process Hazard Analysis – Objective

- The primary objective of revalidation PHA is to ensure adequate safeguards are available for the process as they are **currently understood.**
- The process changes might have introduced new hazards or accentuated existing hazards. It might have also removed some hazards identified in the earlier PHA.
- Safeguards previously credited might have been compromised, discredited or removed.
- Ageing equipment's, plant life extension programs, thin workforce also accentuate or introduce new hazards.
- The secondary objective is that revalidation to be accomplished with maximum effectiveness at minimal cost.

Planning For Revalidation Process Hazard Analysis

Revalidation has to include the following apart from others:

- Evaluations of existing PHAs for accuracy and completeness using the criteria set forth in 1910.119(e)(3);
- MOC / PSI / Procedures (operating, mechanical integrity, emergency response, etc.),
- Investigation reports required by 1910.119(m) are implemented and documented.

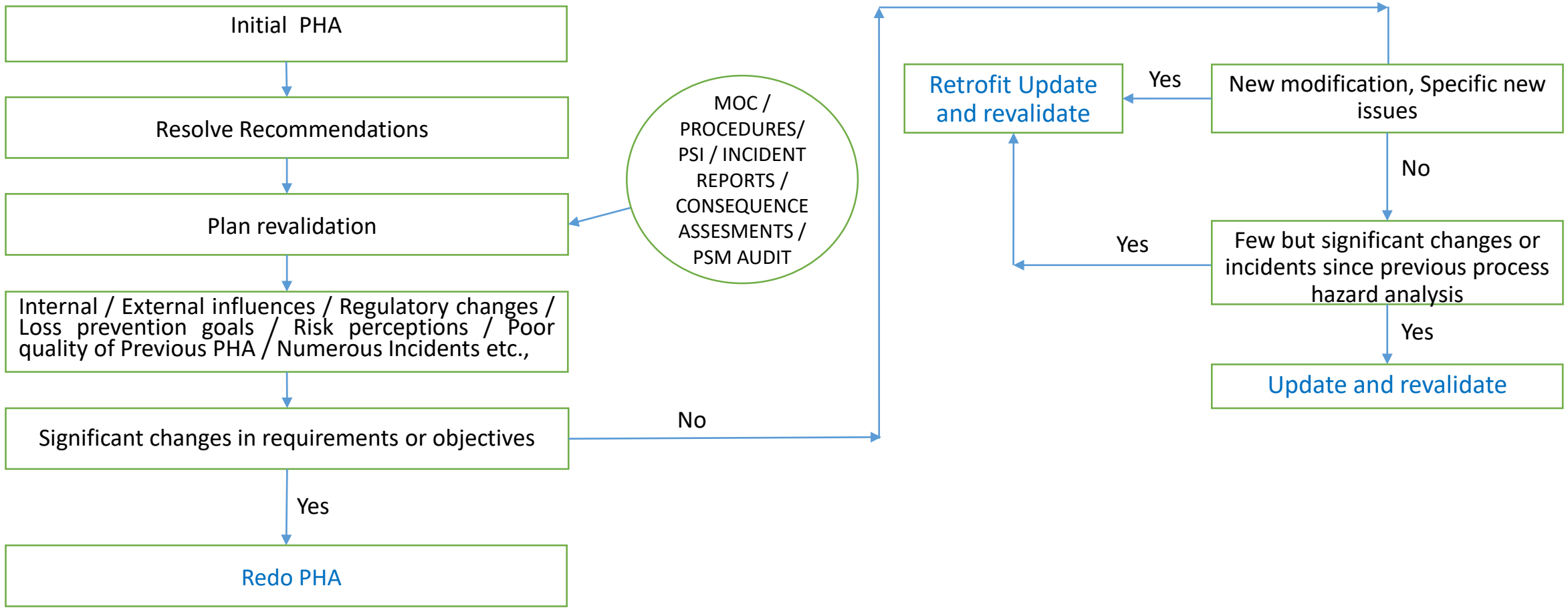
"The input documents for revalidation PHA is different from design FEED or design PHA"

Revalidation Study Concept

There are three possible courses of action for Revalidation:

- OSHA does **NOT** intend that the requirement to update and revalidate PHAs at least every five years mean that an employer must conduct all new and complete PHAs.
- Revalidation PHA can be (i) Redone or (ii) Retrofit, Update and revalidate or (iii) update and revalidate.
- The most expensive option is completely redoing the PHA

Revalidation Logic Flow Chart



Revalidation Process Hazard Analysis – Frequency

OSHA justifies the 5-year revalidation frequency based upon the belief that MOC and PSSR would control change and guard against degradation of process safety.

Companies may decide on more frequent than OSHA revalidation due to:-

- To be more consistent with their loss prevention goals.
- A significant or unfavourable incident trend.
- Following merger or acquisition.
- Plant near populated areas.

Revalidation Process Hazard Analysis – Frequency

Companies may decide on more frequent than OSHA revalidation due to:-

- During a major process or equipment revision, some companies may wish to consider triggering a revalidation based upon the cumulative number of changes.
- For “high” risk processes, revalidation is sometimes more frequent than every 5 years. This type of approach is consistent with API Recommended Practice 750, Management of Process Hazards.

Revalidation Process Hazard Analysis – Approach Methodology

Approach Methodology - Different from FEED or Design PHA:-

- Revalidation involves plant production personnel which requires long term planning to mobilize. Customize the attendance in a particular session to meet the particular topic of the session.
- Exhaustive preparation to collect all plant information will save time during PHA session.
- Optimal resource planning and need based training will make PHA session productive.

"The PHA consultant should work in coordination with the operating company at initial planning stage itself to meet the legal requirements and hazard analysis objectives".

Revalidation Process Hazard Analysis – Challenges

Challenges for Revalidation PHA:-

- Budgetary constraints;

  PHA is a time and resource consuming exercise. Cost benefit analysis should be favorable.

- Unavailability of documents and Incidents reports etc., They may not be current or easily retrievable;

  Prior document preparation / updating saves time during the session.

- Lack of training or knowledge gap about hazard analysis;

  Identifying and reducing skill gap is necessary and this saves considerable time and cost later.

Revalidation Process Hazard Analysis – Challenges

- Mobilization – Currently the workforces are generally getting smaller;

  The schedule should be optimized in conjunction with the operating company. Too long a schedule running for several weeks or months may not be acceptable.

- Implementation of PHA Recommendation:

  While risk reduction is the final objective, modification in the running plant may involve hot work, and some recommendation may need plant shut down.

Thank you!

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