What is a Process Hazard Analysis?

There are fewer activities that one can participate in at an industrial facility that are more important to the health and safety of personnel at the facility and to the surrounding community and environment than a Process Hazard Analysis (PHA).

A hazard analysis is a systematic approach to identifying risks inherent to a process in development or a running process, identifying the safeguards in place to protect against these risks, and determining if the remaining risk is tolerable or not. In addition to evaluating new processes or modifications, the Occupational Safety and Health Administration (OSHA) requires existing processes to be revalidated every five (5) years. In the United States, OSHA requires an analysis if a site handles certain high-risk chemicals or flammable gasses or liquids in quantities at or above 10,000 lbs.; however, OSHA doesn't specify what type of hazard analysis needs to be performed. There are several types of hazard analyses, but in practice, they are not interchangeable. Each one has strengths and weaknesses that make them more applicable to different types of processes.

Process Hazard Analysis

Review Type	Time Requirements	Process Complexity	Experience Level	Special Use Cases
Checklist	Short	Simple	Low	Code Study (NFPA Compliance)
What-if?	Short	Simple	High	Procedure Reviews
HazID	Medium	Simple to Mid	Low - Medium	Conceptual Engineering Phase, non-PSM covered processes
HazOP	Long	Complex	High	N/A
LOPA	Long	Complex	High	Evaluation of High Risk Scenarios

Commonly Used PHAs

Checklists
- Used for simple processes to evaluate small, low-complexity modifications to an existing process (during the MOC process) or to verify compliance with regulatory codes like NFPA.
- Suitable for personnel with little experience involved in hazard analysis methodologies

Hazard Identification Analysis (HazID)
- Provides a 10,000 foot view of the process, its hazards, and the safeguards to protect against these hazards.
- Helpful for low to mid-complexity or generally low hazard processes.
- Useful for early design phases of a project where detailed information is not available.
- Helps identify risks early on in a design inherent to the process but doesn't focus on the causes.

What-If Review
- Helpful to review smaller, simpler processes, particularly if they are manual processes, operated mostly through experience and procedures and not heavily automated.
- Requires personnel very knowledgeable with the process being reviewed.
- Useful in analyzing procedures, especially if combined with a checklist format.

Hazard and Operability (HazOP)
- Most common type of hazard review.
- A systematic review of a process, identifying cause / consequence pairs to uncover risks.
- During this type of review, it is common to find multiple causes for a single consequence.
- Suited for high complexity processes
- Requires a significant amount of experience to conduct as this type of review is best for uncovering the subtleties and nuances of process hazards that may be latent in the design.
- More time consuming to carry out but are typically a more thorough review than other types of reviews.

Layers of Protection Analysis (LOPA)
- Can be performed on its own, but is typically paired with a HazOP.
- Is a more quantitative approach to the risk analysis & is helpful for evaluating particular high-risk scenarios whose consequences are deemed intolerable for the facility being evaluated.
- While a HazOP is a more qualitative approach, the LOPA applies statistical data to make the analysis semi-quantitative.
- Used to separate safeguards from Independent Protection Layers (IPLs)
- Requires a high level of expertise, particularly by the facilitator in the application of mitigating factors & assignment of IPLs.