Process or Non Process Risk Analysis

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TheSafetyMaster

1. Process or Non Process Risk Analysis

1.1. Risk Analysis

The aim of the risk assessment process is to evaluate hazards, then remove that hazard or minimize the level of its risk by adding control measures, as necessary. By doing so, you have created a safer and healthier workplace

Risk analysis attempts to estimate the extent of the impact that will be made if the event happens

Risk analysis is often both an art and a science.

To carry out a Risk Analysis, you must first identify the possible threats that you face, then estimate their likely impacts if they were to happen, and finally estimate the likelihood that these threats will materialize

1.2. HAZOP (Hazard and Operability)

A HAZOP is a systematic assessment tool used to identify and address potential hazards in industrial processes before an incident occurs that could affect the Safety of people.
HAZOP studies are typically performed while new facilities are being designed and constructed, when new processes are added or when processes change.
The HAZOP assessment is typically performed by a small team that breaks each step of a process down for individual review to identify potential deviations from the original process design.

HAZOP: Methodology

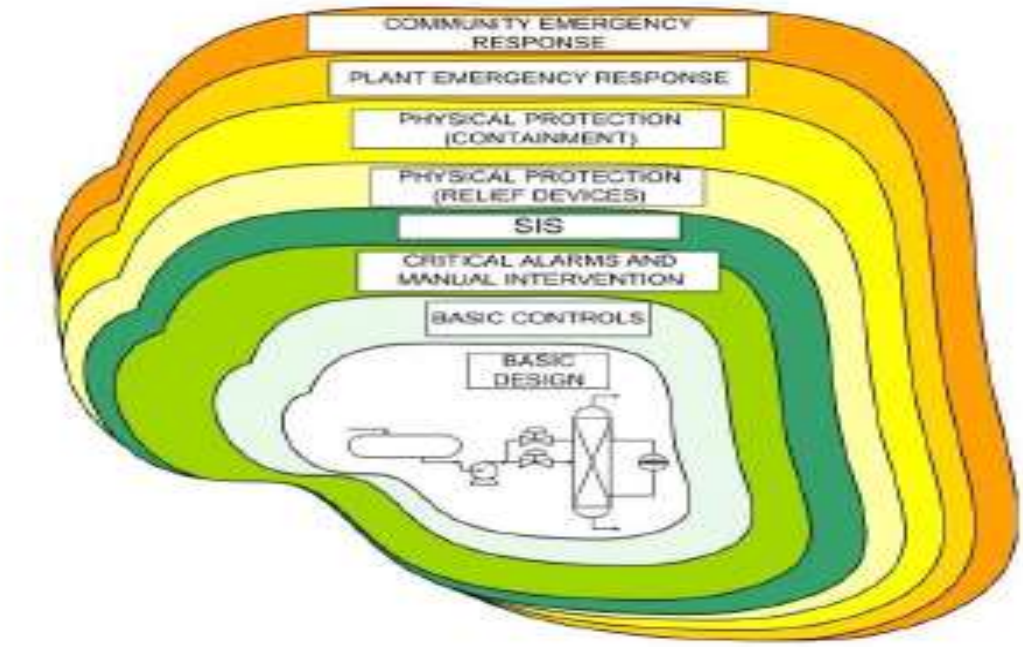
1. Divide the facility into NODEs
2. Select NODE
3. Choose DEVIATION or GUIDWORD + PARAMETER
4. Identify CAUSES
5. Identify associate CONSEQUENCES
6. Identify applicable existing SAFE GUARDS
7. Agree on recommendations
8. Move on to next DEVIATION or NODE

1.3. LOPA (Layer of Protection Analysis)

Layer of Protection Analysis (LOPA) is a risk management technique commonly used in the chemical process industry that can provide a more detailed, semi-quantitative assessment of the risks and layers of protection associated with hazard scenarios. LOPA allows the safety review team an opportunity to discover weaknesses and strengths in the safety systems used to protect employees, the plant, and the public.

LOPA is a means to identify the scenarios that present the most significant risk and determine if the consequences could be reduced by the application of inherently safer design principles. LOPA can also be used to identify the need for safety instrumented systems (SIS) or other protection layers to improve process safety

Safety protection of a facility or chemical plant is broken down into layers. Seven layers are shown in Fig.



1.4. SIL (Safety Integrity Level)

SIL stands for Safety Integrity Level. A SIL is a measure of safety system performance, in terms of probability of failure on demand (PFD). This convention was chosen based on the numbers: it is easier to express the probability of failure rather than that of proper performance

There are four discrete integrity levels associated with SIL = SIL 1, SIL 2, SIL 3, and SIL 4.

The higher the SIL level, the higher the associated safety level, and the lower probability that a system will fail to perform properly. As the SIL level increases, typically the installation and maintenance costs and complexity of the system also increase

1.5. PHA (Process Hazard Analysis)

PHA (Process Hazard Analysis) is a thorough, step-by-step review of chemical and manufacturing plant operating procedures. The goal is to identify potential causes and evaluate the consequences of hazardous chemical releases. The process helps organizations identify a range of risks from equipment failures to human factors to improving safety, preventing downtime and protecting the surrounding environment.

The following steps in conducting the PHA process:

1. Set a priority order for analyses.

2. Conduct analyses according to a required schedule.

3. Use an appropriate method to determine and evaluate process hazards

4. Address process hazards, previous incidents, engineering and administrative controls applicable to the hazards, consequences of failure of controls.

5. Perform the PHA using a team with expertise in:
   - engineering and process operations,
   - the process being evaluated, and
   - the PHA methods used

6. Establish formal procedures to: promptly address findings and recommendations

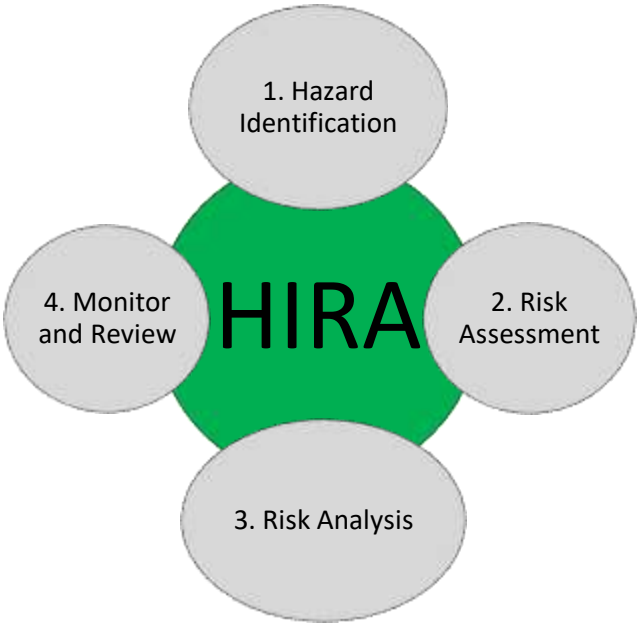
7. Update and revalidate PHAs at least every 5 years

1.6. HIRA (Hazard Identification and Risk Assessment)

A HIRA is a risk assessment tool that can be used to assess which hazards pose the greatest risk in terms of how likely they are to occur and how great their potential impact may be. It is not intended to be used as a prediction tool to determine which hazard will cause the next emergency.

There are four steps to create and maintain a HIRA:

1. This requires a review of all hazards and their causes to determine whether they may be a threat to your community.



2. The level of risk for each hazard is examined. This may involve speaking with hazard experts, researching past occurrences and possible scenarios. The likelihood of the hazard occurring and the potential impacts of the hazard on people, property, the environment, business and finance and critical infrastructure should be examined.

3. The information collected in the risk assessment step will be analyzed in this step. The desired outcome of the risk analysis is the ranking of the hazards

4. - It is important to remember that a HIRA is an ongoing process and hazards and their associated risks must be monitored and reviewed.

1.8. What if analysis

A What-if Analysis consists of structured brainstorming to determine what can go wrong in a given scenario; then judge the likelihood and consequences that things will go wrong.

Steps to Conduct What-if Analysis:

1. Make a Team

- Make an excellent team of potential people. The team members should not assume anything in advance so that at the time of brainstorming, they can see the reality or previous data as it is and make their decisions.

2. Develop what-if questions

- The questions should be related to the problem, and it should have the potential to determine the advantages, disadvantages and the risks of the project.

3. Calculation of risks

- We should observe all the questions deeply and assess all the possible risks by making different scenarios.

4. Recommendations

- If the team concludes there's a need for corrective action, a recommendation is recorded

5. Evaluation

- Evaluate whether what we choose is working according to our assumption or not. If it is working what we assume, then it's okay. Otherwise, we have to select another scenario

1.9 FMEA/ETA

FMEA stands for FAILURE MODE AND EFFECTS ANALYSIS

- **"Failure modes"** means the ways, or modes, in which something might fail. Failures are any errors or defects, especially ones that affect the customer, and can be potential or actual.
- **"Effects analysis"** refers to studying the consequences of those failure

The purpose of the FMEA is to take actions to eliminate or reduce failures, starting with the highest-priority ones.

Failure modes and effects analysis also documents current knowledge and actions about the risks of failures, for use in continuous improvement. FMEA is used during design to prevent failures. Later it's used for control, before and during ongoing operation of the process. Ideally, FMEA begins during the earliest conceptual stages of design and continues throughout the life of the product or service.

ETA stands for EVENT TREE ANALYSIS

Event tree analysis (ETA) is an analytical technique used to evaluate process and events leading to a possible accident. It is a causal analytical technique. It is based on an analysis of a sequence of actions and events that have led up to an accident.

The initiating event in an event tree will usually fall into one of the following four categories:

- Failures or unsafe conditions in individual items of equipment;
- Human error;
- Utility failures; and
- External events (such as hurricanes or earthquakes).

1.10 QRA (Qualitative risk analysis)

Qualitative risk analysis is a technique used to quantify risk associated with a particular hazard.

Risk assessment is used for uncertain events that could have many outcomes and for which there could be significant consequences.

A QRA includes potential releases of hazardous material, the consequences and the frequency of occurrence. Identifying hazards is only the first step in a comprehensive safety plan. Evaluating the safety risk is an important part of managing these hazards objectively. QRA evaluates both the likelihood and impact of an unplanned event and allows a business decision to be made on the most cost-effective risk-reduction solutions.