

## Quantitative Risk Assessment Issue

Methods,  
Tools, and  
Resources

## Designing an Effective Risk Matrix

### Introduction

Risk assessment is an effective means of identifying process safety risks and determining the most cost-effective means to reduce risk. Many organizations recognize the need for risk assessment, but most do not have the tools, experience and resources to assess risk quantitatively. Therefore, these organizations use qualitative or semi-quantitative risk assessment tools, such as risk ranking.

Although risk matrices are easy to use, unless they are designed properly, they can create liability issues and



## Upcoming Training

### May 23, 2023 | Virtual **PHA/HAZOP Leader Course**

Gain a thorough understanding of the essentials of leading PHAs using industry methodologies such as HAZOP, FMEA, What If, Checklist, and more.

► [View the Agenda](#)

### June 8, 2023 | Houston, TX **Intermediate PRFS Training**

Building on fundamental knowledge, gain a better understanding of contemporary, proven best practices and methodologies for pressure relief and flare system (PRFS) design.

► [View the Agenda](#)

### July 11, 2023 | Houston, TX **Beginner PRFS Training**

Learn about the fundamentals of pressure relief and flare system (PRFS) design, as well as contemporary assessment practices, including RAGAGEP.

► [View the Agenda](#)

*Without adequate consideration of risk tolerability, a risk matrix can be developed that implies a level of risk tolerability much higher than the organization actually desires.*

give a false sense of security. An effective risk ranking matrix should have the following characteristics:

- Be simple to use and understand
- Not require extensive knowledge of quantitative risk analysis to use
- Have clear guidance on applicability
- Have consistent likelihood ranges that cover the full spectrum of potential scenarios
- Have detailed descriptions of the consequences of concern for each consequence range
- Have clearly defined tolerable and intolerable risk levels
- Show how scenarios that are at an intolerable risk level can be mitigated to a tolerable risk level on the matrix
- Provide clear guidance on what action is necessary to mitigate scenarios with intolerable risk levels

Risk ranking uses a matrix that has ranges of consequence and likelihood as the axes. The combination of a consequence and likelihood range gives an estimate of risk or a risk ranking. Although there are many risk matrices that have been developed and published, the development and application of risk matrices present their own challenges.

Construction of a risk matrix starts by first establishing how the matrix is intended to be used. Some typical uses for risk ranking are process hazard analyses, facility siting studies, and safety audits. A key initial decision that has to be made is to define the risk acceptability or tolerability criteria for the organization using the matrix. Without adequate consideration of risk tolerability, a risk matrix can be developed that implies a level of risk tolerability much higher than the organization actually desires. Another key

[Click Here To Download the Full White Paper](#)



Source: CSB

## West Fertilizer Explosion and Fire

On April 17, 2013, a fire and explosion occurred at the West Fertilizer Company (WFC), a fertilizer blending, retail, and distribution facility in West, Texas. The violent detonation fatally injured 12 emergency responders and three members of the public. Local hospitals treated more than 260 injured victims, many of whom required hospital admission. The blast completely destroyed the WFC facility and caused widespread damage to more than 150 offsite buildings. The explosion is one of the most destructive incidents ever investigated by the U.S. Chemical Safety and Hazard Investigation Board (CSB). Following the explosion, WFC filed for bankruptcy.

The CSB's investigation found several factors that contributed to the severity of the explosion, including poor hazard awareness and the fact that nearby homes and business were built in close proximity over the years prior to the accident.

[Read the Incident Report](#)

## Operational Risk Management Tools

Risk management in the petrochemical industry includes a wide variety of activities, one of which is quantitative risk assessment. The quality of a QRA study is highly dependent on the effectiveness of the hazard identification stage — it is essential that all applicable hazards...

[▶ Download the Publication](#)

## Quantitative Risk Assessment for a Chemical Facility

A client needed to update a prior QRA study from 2015 of their plant with more equipment and buildings. OSHA 29 CFR 1910.119 Process Safety Management (PSM) requires, under the Process Hazard Analysis (PHA) element, that employers conduct a facility siting study to verify that the location and occupancy of buildings, control rooms and trailers have been properly evaluated.

[▶ Read the Case Study](#)

## Hazard Identification and Risk Analysis

Research indicates there are still too many at-risk behaviors occurring daily at plants and not all risks and hazards are being properly identified. Watch this PStv® Safety Moment video to discover lessons learned from a lack of hazard identification.

[Click Here To Watch](#)

