



The role of Probabilistic Risk Assessment in physical Risk Management

Probabilistic Risk Assessment (PRA) is a method commonly used by Risk Engineers and Risk Surveyors to assess and quantify risk. It relies heavily on statistics to estimate the likelihood of certain events occurring and to calculate the frequency with which those events could occur. PRA is frequently utilised by heavy industries, insurance and reinsurance companies and is a crucial component of risk management. Below, Trust Re provides a perspective on the role of PRA in the risk management process.

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Qualitative vs. Quantitative Risk Assessment

There are two approaches to risk assessment on which physical risk management is based: qualitative and quantitative. Qualitative risk assessment is the subjective evaluation of the quality of a risk. It involves identifying both the inherent hazards of the risk and the mitigation systems in place. Experience is a key factor when performing a qualitative assessment. There is also a technical aspect; this involves comparing the risk in question with available codes, standards and best engineering practices. Quantitative risk management is a more objective oriented technique; it uses specific methods to quantify risk in monetary terms and is generally modeled on envisaging the maximum credible loss scenario or worst-case scenario.

[Probabilistic Risk Assessment](#) (PRA) is one of the methods used in quantitative risk management. It is used to numerically evaluate the risk associated with a given industrial unit or operation. It is primarily used by public authorities, as well as safety and risk engineers connected to the insurance and reinsurance industry. It is also used internally by vulnerable industries as a risk management tool.

Which industries use PRA?

Businesses in the [nuclear](#), oil and gas, petrochemicals, aerospace and logistics industries regularly conduct PRA as part of their risk management strategies. These businesses may hire risk engineers to perform the job internally, or rely on third party risk surveyors. They are also likely to be evaluated by insurance companies when looking to purchase insurance. The insurer will conduct a comprehensive risk

assessment [to determine](#) whether the risk is acceptable and how much premium should be charged.

In order to decide whether the risk is acceptable, the underwriter must have an understanding of how prone the operation is to damage and business interruption. PRA is crucial in determining the likelihood of damage or adverse outcomes occurring, as well as estimating the magnitude of damage that could be incurred. For example, the use of natural gas-based turbines in a power plant would create the possibility of a fire or explosion occurring at the facility. In this situation, PRA could be used to estimate how likely a gas leak would occur and how much damage would be caused in the event that it did.

What factors are considered when conducting PRA?

There are [numerous factors](#) to consider when using PRA to assess risk. Those factors are usually specific to the industrial unit or facility being assessed. When assessing a power plant, the risk engineer considers factors such as plant and system design, operating data, maintenance practices and procedures, emergency response procedures as well as the quality of manpower available.

In order to conduct the assessment, the risk engineer must first identify the hazards; by definition, a hazard is a threat or any potential source of damage. After identifying the hazards, the initiators, or initiating events must then be identified. An initiator is an event that would turn potential damage into actual damage. A gas leak at a power plant would be an example of an initiating event. The risk engineer must then estimate how often each initiating event is expected to occur. Finally, the various consequences and outcomes that could arise following the occurrence of an initiating event must be identified.

After the risk engineer has gone through each of these steps, the probability of each outcome can be calculated. A calculation known as [Probable Maximum Loss \(PML\)](#) is estimated by the risk engineers to help the risk underwriters to provide an idea of the maximum possible amount of damage that is likely to occur given a particular outcome or consequence, which in turn would help underwriters to manage their exposure.

Analysing results and providing recommendations

Based on the results of their calculations, risk engineers often provide clients or policyholders with recommendations on how to reduce risk and improve the safety of the facility or operation being surveyed. Consequently, safety standards and regulations need to be improved with two broad goals in mind: reducing the likelihood of an adverse outcome occurring and reducing the severity of damage incurred.

The risk engineers' recommendations seek to benefit the policyholder in more ways than one. First and foremost, the recommendations aim to reduce the risk to which

the policyholder is exposed and the potential damage that their businesses and facilities could incur. Depending on the business, these recommendations could include improving the facility's resistance to fires and natural disasters, upgrading emergency response procedures and providing staff with essential emergency training to reduce the likelihood of human error resulting in an initiating event.

By implementing the risk engineer's recommendations, policyholders are also likely to get better treatment while buying insurance. This is due to the fact that insurance companies are likely to charge higher premiums for riskier businesses. By adhering to the risk's engineer's recommendations, policyholders are mitigating the risks to which their businesses are exposed, and ultimately reducing the likelihood and severity of incurring damages. This gives insurers incentive to charge a lower premium.

Therefore, whether the goal is to improve the overall safety standards of a business, or to reduce the premiums charged by insurers, implementing the risk engineers' recommendations is the best course of action for any industrial business or operation looking to manage and mitigate their risk. Probabilistic Risk Assessment plays a major role in identifying and quantifying those risks, as well as providing a numerical approach to Risk Management.

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