





Quantified Risk Assessment

A Powerful Decision Tool for Risk Management

BUSINESS CHALLENGE

Companies building or managing an industrial plant must comply with risk criteria established by local licensing authorities. Risks must be identified in order to protect plant workers, the people in the surrounding area, the environment and the plant itself. This requires a Quantified Risk Assessment to demonstrate that risk levels are within the defined criteria and are tolerable.



SOLUTION

What is Quantified Risk Assessment?

Quantified Risk Assessment (QRA) is a structured approach to identifying and understanding the risks associated with hazardous activities such as the operation of an industrial plant. The assessment starts by taking inventory of potential hazards, their likelihood, and consequences. The quantified risks are then assessed by comparison against defined criteria.

Quantified Risk Assessment provides valuable insights into the features of the industrial plant, highlighting those aspects where failures may result in harm to operators, members of the public, the environment and or the asset itself. QRA provides a basis for decision-making in the design and operation of the plant, and may also be required to legally show "fitness to operate".

What are the key benefits?

QRA provides input on safety issues during the design, operation and regulation of hazardous activities.

In addition, QRA provides a rational basis for monitoring risks and providing specific decision-making guidance:

- Act as decision aid regarding whether the risks need to be reduced;
- Propose targets for risk reduction measures;
- Design basis for fire and blast protection as well as emergency planning and training;
- Aid in the selection of the most appropriate design concept;
- Find the most cost-effective ways to reduce risk;
- Assist with As Low As Reasonably Practicable (ALARP) demonstrations;
- Identify safety-critical procedures and equipment.

WHY CHOOSE BUREAU VERITAS?

- With a worldwide network of offices, Bureau Veritas can provide QRA across the globe. Bureau Veritas engineers have access to advanced technology via technical centers, which enables them to analyze problem situations and develop appropriate solutions.
- QRA is data-intensive and Bureau Veritas incorporates data from its own intranet to ensure that all studies are delivered using consistent data and assumptions. QRA uses advanced technical methods for analysis and Bureau Veritas' QRA specialists are trained to use analysis software tools when needed.

RELATED SERVICES

- HAZOP / HAZID
- Process hazard analysis
- Safety systems design review
- Independent technical analysis
- Fire and explosion assessment
- Emergency response studies
- Cost-benefit analysis
- Safety case services



OUR APPROACH

By carrying out a QRA, Bureau Veritas quantifies the risks associated with major accident hazards typically identified during HAZID or HAZOP sessions.

The assessment includes:

- Review of safety documents (fire fighting and safety layout drawings, F&G detection studies, escape, evacuation and rescue (EER) analysis and design stage studies, etc.);
- Process hazard analysis;
- Scenario development;
- Likelihood / frequency analysis;
- Consequence analysis (such as fire and explosion modeling);
- Impact assessment;
- Risk assessment:
- Recommendations for risk reduction measures;
- Reporting and documentation.



FAQ

What is ALARP?

Many regulatory authorities require that risks should be within acceptable limits and As Low As Reasonably Practicable (ALARP). To demonstrate that risks are ALARP, one must show that enough has been done to reduce risks. In cases where the risks are well-defined, it is sufficient to show that recognized "good practices" have been implemented. In more complex situations, i.e., where the technology is new, to demonstrate risks are ALARP, one should show that all reasonably practicable risk reduction measures have been implemented, and that all other measures that could be implemented are shown to be unjustified.

WWhat risk criteria should I use?

Risk criteria may be defined by national regulations, corporate guidance and well-established industry standards. Bureau Veritas can help clients select existing criteria particular to their situations. In cases where criteria are not already defined, Bureau Veritas can provide assistance to develop appropriate risk criteria.

CASE STUDY •

LPG Loading Station Risk Analysis Petrobras, Betim Terminal (TEBET),

BR PETROBRAS Distributor required a

risk analysis to be performed in connection with the installation license for its planned LPG loading station at their Betim Terminal, a facility designed to comprise two vessels, each having a capacity of 90 tons. Bureau Veritas successfully identified the hazards and evaluated the risks for LPG's storage and loading operations. Bureau Veritas used plant hazard analysis techniques supported by specialized analysis tools to define and study relevant accident scenarios. In addition, a number of safety recommendations were made aimed at preventing or minimizing damage caused by potential disasters at the loading station. Findings were presented in the form of individual and company risk reports with conclusions based on the risk tolerability. Petrobras used the findings in their

license application to FEAM, the Environmental State Agency of Minas Gerais, and successfully obtained the necessary permission to carry out the loading station development.