



# QRA Quantitative Risk Assessment

Manage your  
process risks, improve  
your safety performance.

 **DEKRA**

## DEKRA Process Safety

### Expertise, People, Global presence

The width and depth of expertise in process safety makes us globally recognized specialists and trusted advisors.

We help our customers to **understand and evaluate their risks**, and work together to develop pragmatic solutions. Our value-adding and practical approach integrates specialist process safety management, engineering and testing. We seek to educate and grow customer's competences to provide sustainable performance improvement. Partnering with our customers we combine technical expertise with a passion for life preservation, risk reduction and asset protection.

We are a service unit of DEKRA, a global leader in safety since 1925 with over 44.000 employees in 60 countries. As a part of the world's leading expert organization DEKRA, we are the **global partner for a safe world**.

## Why using QRA

### A numeric risk assessment is essential

To successfully manage process hazards, both **identification of the hazards and assessment of the risks** arising from them are required. In some cases, it is sufficient to carry out qualitative risk assessments using simple techniques such as calibrated risk matrices. However, in the following circumstances qualitative assessments may be too generic:

- if the risk is judged to be high
- if the potential on and offsite consequences are severe
- where the system is very complex
- where there is a regulatory requirement e.g. Seveso III
- where there are potential domino effects, i.e. a fire or explosion that can escalate to involve other hazardous installations
- where risk-based decision making is required

In these cases, it is necessary to evaluate the risks numerically using QRA.

In Europe, following the Seveso II directive, QRA has been selected in countries such as the Netherlands or some regions of Spain as the best tool for risk management and land use planning, and the adoption in other countries is being seriously considered at this time.

Worldwide, several major Oil & Gas multinational companies already use QRA in the decision-making process of new projects and there are various countries which are including progressively in their national legislations the need of a QRA for process industries (USA, Australia, Switzerland, Hong Kong etc.).



## What is the Output of QRA

### Risk quantification and risk tolerability

QRA allows a site operator to quantify and therefore determine the acceptability of risks arising from major process hazards on an industrial site by quantifying:

- the severity of the final events derived from a failure (fire, explosion, toxic dispersion)
- the frequency of occurrence of the failure scenario and their related final events

The results of a QRA can be presented at least in two different ways: individual risk (IR) or societal risk (SR). The most usual representations are the Location Specific Individual Risk (LSIR) contours for IR and the FN curves for SR. The risk obtained by a QRA can then be compared against established risk tolerability criteria or, when looking at options, by benchmarking risks against each other. Reassessment of the risk can then be considered if more accurate and realistic assumptions and data can be used.

#### The results from QRA can be used to:

- identify cost-effective measures for risk reduction
- compare the relative risks of different options e.g., the transport of materials by pipeline vs. road transport
- establish risk-based inspection and maintenance programs
- define the safe layout of storage/production units, occupied buildings, etc.
- define safe on-site manning number and locations
- optimize semi-quantitative HAZOP or SIL determination reviews (since lots of quantitative consequence and frequency data is obtained)
- draft the Predictive Aspects sections of Seveso III safety reports, and as a risk assessment record to meet other legislation (ATEX, CAD etc.)

- ensure site risks meet international, national, local, industry and/or company standards for risk tolerability and acceptability
- land use planning and compatibility assessment between existing industrial sites and anthropized areas
- improve the company's reputation

## Our Approach

### Right definition and risk identification

The way we deliver this service is proportionate to your needs and operations. We can adapt to the different approaches of QRA:

#### >>> Definition of scenarios

- Corporate methodologies
- Purple Book / BEVI guideline or isolatable sections + parts count + OGP database for generic scenarios
- HAZOP, Process Hazard Review or other Hazard Identification techniques for specific scenarios

#### >>> Risk target

- Off-site population only
- On-site population only
- Both on-site and off-site population

### A generic QRA consists on the following steps

- ✦ Process safety information gathering and analysis
- ✦ Kick-off meeting at the site
- ✦ Scenario and assumptions workshops as needed
- ✦ Calculations to obtain the raw IR/SR results are performed by our experts at our offices
- ✦ ALARP workshop at the site where results are presented and risk reduction measures for further assessment are identified
- ✦ Back in our offices the risk is reassessed if required and the final report issued



## Our Experience and Strengths

### Unrivalled capability on the market

Our global team of consultants has a vast amount of experience in QRA for corporate requirements, Seveso III Safety Reports and for Occupied Buildings Risk Assessment (OBRA). They also have experience in carrying out process safety reviews/audits, particularly in explosion prevention and protection.

They are generally former process engineers with a strong chemical industry background complemented by a genuine expertise in process safety.

Our consultants are also used to work with different types of failure frequency databases, perform Fault Tree Analysis (FTA) and have extensive experience in the most common packages used for QRA:

- Consequence calculations: EFFECTS, Phast, etc.
- Risk recomposition: RISKCURVES, Phast Risk

Through our **Process Safety Training**, our consultants also educate and build competency in QRA for a range of process industry companies and regulators worldwide, using their internal guidelines if required.





## PREVENT YOUR RISK, EMPOWER YOUR BUSINESS.

Less incidents. Fewer injuries. Saved lives.

**Expertise | Team | Global Presence**

### Discover our integrated solutions



### DEKRA Process Safety

The breadth and depth of expertise in process safety makes us globally recognized specialists and trusted advisors. We help our clients to understand and evaluate their risks, and work together to develop pragmatic solutions. Our value-adding and practical approach integrates specialist process safety management, engineering and testing. We seek to educate and grow client competence to provide sustainable performance improvement. Partnering with our clients, we combine technical expertise with a passion for life preservation, harm reduction and asset protection. As a part of the world's leading expert organization DEKRA, we are the global partner for a safe world.