

Datasheet  
**Auditing of Layers  
of Protection – An  
Essential Tool to Improve  
Your Process Safety  
Performance**

## Why Auditing Layers of Protection?

Layers of protection encompass all the safeguards you rely on to prevent process safety events from occurring – the different slices of the Swiss Cheese model. They are hopefully diverse and complementary and designed to warrant a so-called risk reduction factor.

Auditing them on the field should be seen as an essential part of any process safety performance improvement programme as it provides management with an oversight on the performance of these safety critical elements. It helps to assess if the connection between Design & Operations/Maintenance is working properly, ultimately a part of the robustness of your PSM programme.

Auditing layers of protection should be seen also as a complementary activity to process safety metrics or indicators. Challenging or activating layers of

protection is usually seen or even systematically reported as a leading indicator for undesirable process safety events but what about those that are never challenged? How can you ensure they will work as intended when you will need them?

In some parts of the world, auditing layers of protection is becoming a regulatory requirement or best practice for major hazards industries. It is for instance a 2013 focus area for the French administration under the Seveso national implementation, known as Moyens de Maitrise des Risques (MMR) for all barriers preventing scenarios that have a potential consequence outside the site limits.

## How We Deliver this Service?

The way we deliver this service is proportioned to your needs and operations.

We can focus on one specific layer of protection, generally a critical one that is covering several major incident scenarios or on several critical barriers, ranging from human interventions, emergency relief systems and vents to safety instrumented systems.

We can also do multi-site assessments to measure & benchmark the process safety performance of your sites.

By spending one to several days on your sites observing, inspecting, checking, reviewing process safety information and documentation, interviewing staff, we collect detailed plant data on each barrier under the scope to answer the three following key questions:

- Are they well designed?
- Are they well implemented?
- Are they effective and reliable?

## What Is the Output?

These data are then processed to produce a comprehensive report structured in the following three main sections:

- a. Diagnosis (design, implementation, reliability)
- b. Prioritised findings
- c. Areas & Roadmap for improvement.

To provide a meaningful diagnosis, we use whatever tool (FMEA, Fault Tree Analysis, ...), literature and standards (API521, IEC61508/61511, NFPA, ...) which are appropriate to demonstrate and justify the level of risk reduction given from the layer of protection under question.

Our findings are various & diverse. They usually include technical aspects (e.g. PSV not suited for the sizing case or closing valve not present) but also human factors (e.g. high level alarm used to regulate tank level) and organisational aspects around the management of safety critical elements.

The roadmap provides management with an operational tool for improvement of the safety critical elements under review and orientation of focus for addressing gaps between what was thought (the desired risk reduction factor) and what is really happening at the plant (the achieved risk reduction factor).

### Example 1

We were recently hired to assess the effectiveness of a toxic gas scrubber, and the main basis of safety of this particular plant. This scrubber, installed downstream of all pressure safety valves, is ultimately the critical safeguard to prevent several major lethal toxic release scenarios. The scrubber was rated for a risk reduction factor of 100, value communicated to the authority, and we could demonstrate via a detailed FTA that the installed factor was closer to 10.

### Example 2

We were hired to audit and establish all the pressure relief systems of a chemical plant (PSV, Explosion Vents, etc.). This included more than 100 items. While most of them were generally well installed, inspected & managed, more than 30% were not designed adequately e.g. undersized.

These findings also underline a more fundamental learning about relying & never challenging or revisiting safety critical data (often produced by an external engineering company 10 or 20 years ago) which are part of the basis of safety for catastrophic event prevention.

## Our Experience and Strengths

Our global team of consultants has a vast amount of experience on plant **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. CVs are available on request.

Since publication of IEC61511, standard for safety instrumented systems, they have also accumulated a strong track record in its implementation; particularly in **LOPA** leadership and definition of safeguards & other layer of protections from design to implementation to site acceptance tests.

Through our **Process Safety Academy**, we also educate and build competency around layers of protection (emergency relief systems, functional safety, ...) for a large number process industry companies worldwide, using their internal corporate guidelines, if required. We also deliver open-courses at various locations worldwide in local language.



## Our References

- **Oil & Gas**  
Exxon Mobil, Shell, Repsol, Total, Conoco Phillips, Reliance, Maersk, BP, Amerada Hess, NPCC
- **Energy**  
GDF-Suez, Eon, EDF, Alstom, Scottish Southern Power
- **Chemistry**  
BASF, Bayer, Ineos, Dupont, Arkema, PPG, Clariant, Chemtura, Huber Corp., SNF, United Phosphorus, Solvay, Arizona Chemicals
- **Pharmaceuticals**  
GSK, Teva, Merck, Roche, BMS, Sanofi, Boehringer-Ingelheim, Covidien, J&J, Pfizer, Merck, UCB Pharma, Astellas, Dr Reddy
- **Cosmetics & Household**  
L'Oreal, P&G, Diversey, Reckitt Benckiser, Henkel
- **Food industry**  
Unilever, Cargill, IFF, Conagra, Kraft, Nestle, Pepsico, Sensient, Firmenich, British Sugar, Premier Foods...
- **Engineering & Procurement**  
Foster-Wheeler, Saipem, Technip, SNC Lavalin, Bechtel, Tecnimont, Tetrapak, Bocard...
- **Other sectors**  
Siemens, Areva, BMW, ABB, EADS, TATA, Vedanta, BHP Billiton, Lafarge, Danieli, Imperial Tobacco

# DEKRA Organisational & Process Safety Contact

DEKRA Organisational and Process Safety are a behavioural change and process safety consultancy company. Working in collaboration with our clients, our approach is to assess the process safety and influence the safety culture with the aim of making a difference.

In terms of behavioural change, we deliver the skills, methods, and motivation to change leadership attitudes, behaviours, and decision-making among employees. Supporting our clients in creating a culture of care and measurable sustainable improvement of safety outcomes is our goal.

The breadth and depth of expertise in process safety makes us globally recognised specialists and trusted advisors. We help our clients understand and evaluate their risks, and we work together to develop pragmatic solutions. Our value-adding and practical approach integrate specialist process safety management, engineering, and testing. We seek to educate and grow client competence in order to provide sustainable performance improvement. Partnering with our clients, we combine technical expertise with a passion for life preservation, harm reduction and asset protection.

We are a service unit of DEKRA SE, a global leader in safety since 1925 with over 48,000 employees in 60 countries and five continents. As a part of the world's leading expert organisation DEKRA, we are the global partner for a safe world.

We have offices throughout North America, Europe, and Asia.

For more information visit  
[www.dekra-uk.co.uk](http://www.dekra-uk.co.uk)

Would you like more information?

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