



DATA SHEET

# 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

They trust us:

- > Chemistry: BASF, Bayer, Ineos, Sabic, Dupont, Huntsman, Evonik, Arkema, PPG, Clariant, Purac, Kerima, Chemtura, Croda, Stepan, Huber corp., SNF, United Phosphorus, Solvay, Lubrizol, Valspar, Arizona Chemicals...
- > Pharmaceuticals: GSK, TEVA, Merck, Roche, BMS, Sanofi, Boehringer-Ingelheim, Covidien, J&J, Pfizer, Sandoz, UCB Pharma, Astellas, Dr Reddy...
- > Oil & Gas: Exxon Mobil, Shell, Repsol, Total, Cepsa, Tupras, Conoco Phillips, Reliance, Maersk, BP, Amerada Hess, NPCC...
- > Energy: GDF-Suez, EON, EDF, Alstom, Scottish Southern Power ...
- > Cosmetics & Household: L'Oréal, P&G, Diversey, Reckitt Benckiser, Henkel
- > Food & drink: Unilever, Cargill, IFF, Conagra, Kraft, Givaudan, Nestlé, Pepsico, Sensient, Firmenich, British Sugar, Premier Foods...
- > Engineering & Procurement: Foster-Wheeler, Saipem, Technip, SNC Lavalin, Technicas Reunidas, Bechtel, Sener, Technimont, Tetrapak, Bocard, Technoedif...

## DEKRA Process Safety

The breadth and depth of expertise in process safety makes us globally recognised 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 organisation DEKRA, we are the global partner for a safe world.

### Process Safety Management (PSM) Programmes

- > Design and creation of relevant PSM Programmes
- > Support the implementation, monitoring, and sustainability of PSM Programmes
- > Audit existing PSM Programmes, comparing with best practices around the world
- > Correct and improve deficient Programmes

### Process Safety Information/Data (Laboratory Testing)

- > Flammability/combustibility properties of dusts, gases, vapours, mists, and hybrid atmospheres
- > Chemical reaction hazards and chemical process optimisation (reaction and adiabatic calorimetry RC1, ARC, VSP, Dewar)
- > Thermal instability (DSC, DTA, and powder specific tests)
- > Energetic materials, explosives, propellants, pyrotechnics to DOT, UN, etc. protocols
- > Regulatory testing: REACH, UN, CLP, ADR, OSHA, DOT
- > Electrostatic testing for powders, liquids, process equipment, liners, shoes, FIBCs

### Specialist Consulting (Technical/Engineering)

- > Dust, gas, and vapour flash fire and explosion hazards
- > Electrostatic hazards, problems, and applications
- > Reactive chemical, self-heating, and thermal instability hazards
- > Hazardous area classification
- > Mechanical equipment ignition risk assessment
- > Transport & classification of dangerous goods

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

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

To contact us: [process-safety-uk@dekra.com](mailto:process-safety-uk@dekra.com)

Would you like to get more information?

Contact Us