

Industrial services

# HAZOP & LOPA leadership

The Global Experts  
in Explosion & Process Safety



## HAZOP leadership for the process industry.

DEKRA provides expert Hazard and Operability (HAZOP) and Layers of Protection Analysis (LOPA) leadership services to the process industries worldwide.

### » Why using HAZOP?

The Hazard and Operability (HAZOP) analysis methodology is a systematic team-based Process Hazards Analysis (PHA) technique that can be used to effectively identify and analyse the risks of potentially hazardous process operations. The HAZOP methodology is the most widely used PHA technique in the chemical, pharmaceutical, oil & gas and nuclear industries worldwide. It is used during the design stages of a new process or project, for major process modifications and for periodic review of existing operations.

The U.S. Occupational Safety and Health Administration (OSHA) recognise the HAZOP technique as an acceptable methodology for conducting PHA's of processes covered by the OSHA Process Safety Management (PSM) standard (Title 29, CFR Part 1910.119). Other regulators around the world also accept the HAZOP methodology as appropriate for analysing the existing and potential hazards of a complex process that involves a highly hazardous substance.

In practice, the quality of a HAZOP based PHA is influenced by the ability of the

HAZOP Leader to ask the appropriate questions to ensure the team identifies all the hazards of the process being studied, not just the most obvious hazards. This ability is based on the Leader's experience, both with the HAZOP technique and the process being analysed.

### » Our approach

Our approach is to use a semi-quantitative HAZOP that incorporates Layers of Protection Analysis (LOPA) to assess the reliability and number of risk reduction measures (safeguards). Our emphasis is to prevent the release of hazardous materials; followed by mitigation of the consequences should a release occur.

#### consequences

- A review of the available Process Safety Information (PSI) and identification of missing PSI required, identifying all process hazards. PSI includes, amongst others:
- Hazardous materials properties
- Process operation, including procedures
- Process & instrumentation drawings (P&IDs),



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- » • Equipment design specifications
- Pressure relief systems specifications
- A review of the Risk Ranking Methodology that will be used, including failure frequencies, conditional probabilities, and Safeguard Probability of Failure on Demand (PFD).

During the PHA Sessions, The team uses the PSI to evaluate the consequences of process deviations from normal operation, assuming existing safeguards do not operate as intended.

Consequences can be further evaluated using our expertise in consequence modelling with specialist software such as Phast® and Effects®.

Once the consequences are evaluated, a risk ranking is performed to determine what safeguards are required to reduce the likelihood to a level that is acceptable to the operating company. Examples of safeguards include both engineered devices, such as safety instrumented functions (SIFs, or "interlocks"), and administrative controls such as alarms and procedures.

Recommendations can also include further evaluation of the SIFs using ISA 84.01 and IEC 61508/11 standards for conducting Safety Integrity Level (SIL) assessments using, preferably, LOPA.

The LOPA methodology involves analyzing separate initiating event frequencies and known reliabilities, including documented failure frequencies; probability of Failure on Demand of a processes existing safeguards and then comparing them to risk tolerance criteria that have been established by the operating company.

After the team-based HAZOP or LOPA sessions are concluded, a comprehensive

study report can be prepared to serve as a record of the completed analysis, including of the potential risks of a process with existing safeguards and recommendations for additional safeguards

» **Our experience, our tools and strengths**

Our large team of HAZOP leaders have facilitated hundreds of HAZOP based PHA's worldwide, in all sectors of the process industry. Our leaders are generally former process engineers with a strong chemical industry background complemented by an expertise in process safety. CVs are available on request.

We can facilitate HAZOP, or more largely any PHA, in a large variety of languages: English, Spanish, French, German, Portuguese, Italian, Arabic, Hindi... Our wide local presence also ensures intimate knowledge of local codes, standards and cultures. Combined with our intimate knowledge of process safety engineering and process safety data, this provides a capability unrivalled in our market.

Although we can offer the classical HAZOP leader and secretary facilitation if required, we tend to lead HAZOPs using dedicated software to minimize the costs of the study, simplify reporting and focus on the process safety risks. The software also facilitates ease of tracking and action allocation.

Through our Process Safety Academy, we also train and qualify large numbers of internal HAZOP & LOPA leaders of process industry companies worldwide, using their internal corporate guidelines if required. We also deliver HAZOP/PHA Leadership 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, SABIC, DUPONT, HUNTSMAN, EVONIK, ARKEMA, PPG, CLARIANT, KEMIRA, 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, 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, BOCCARD...
- **Other sectors:** SIEMENS, AREVA, BMW, ABB, EADS, TATA, VEDANTA, BHP BILLITON, LAFARGE, DANIELI, IMPERIAL TOBACCO...

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