Getting the foundation right

Why chemicals management is the key for robust process safety

Esther de Jong & Peter Walraven
30 April 2026

Outline

- Who are we?
- Introduction REACH, CLP and chemicals management
- The role of chemicals management in Process Safety/SEVESO
- Problems that can occur when chemicals management and Process Safety are not matched
- How can chemicals management be improved?
- Conclusions/Q&A

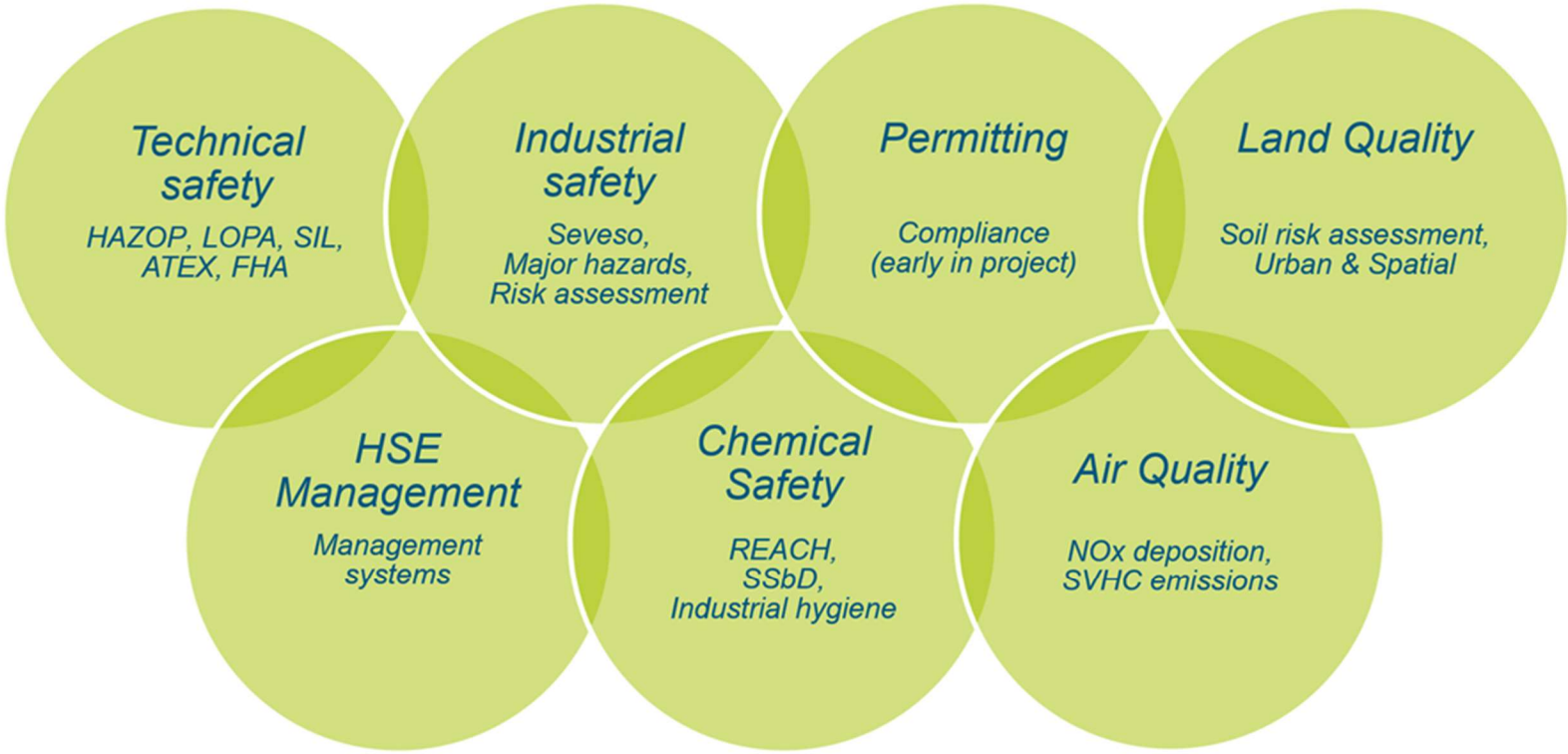
Who are we?

Founded in
1881
Royal since
1981

We are independent international consulting engineers

Who are we?

We offer a wide range of HSE-related services



Who are we?

Esther de Jong

- Training: Toxicology
- Experience: 15 years, mainly within governmental institutes and consultancy
- Current role: Consultant Toxicology and Chemicals management
- Focus area: Chemicals based industry

Peter Walraven

- Training: Engineering physicist
- Experience: 14 years in consultancy
- Current role: Major hazard control specialist
- Focus area: Seveso companies

Who is joining this meeting

- What is your background?
- Are you familiar with the following topics of this webinar?
- What do you hope to learn from this webinar?

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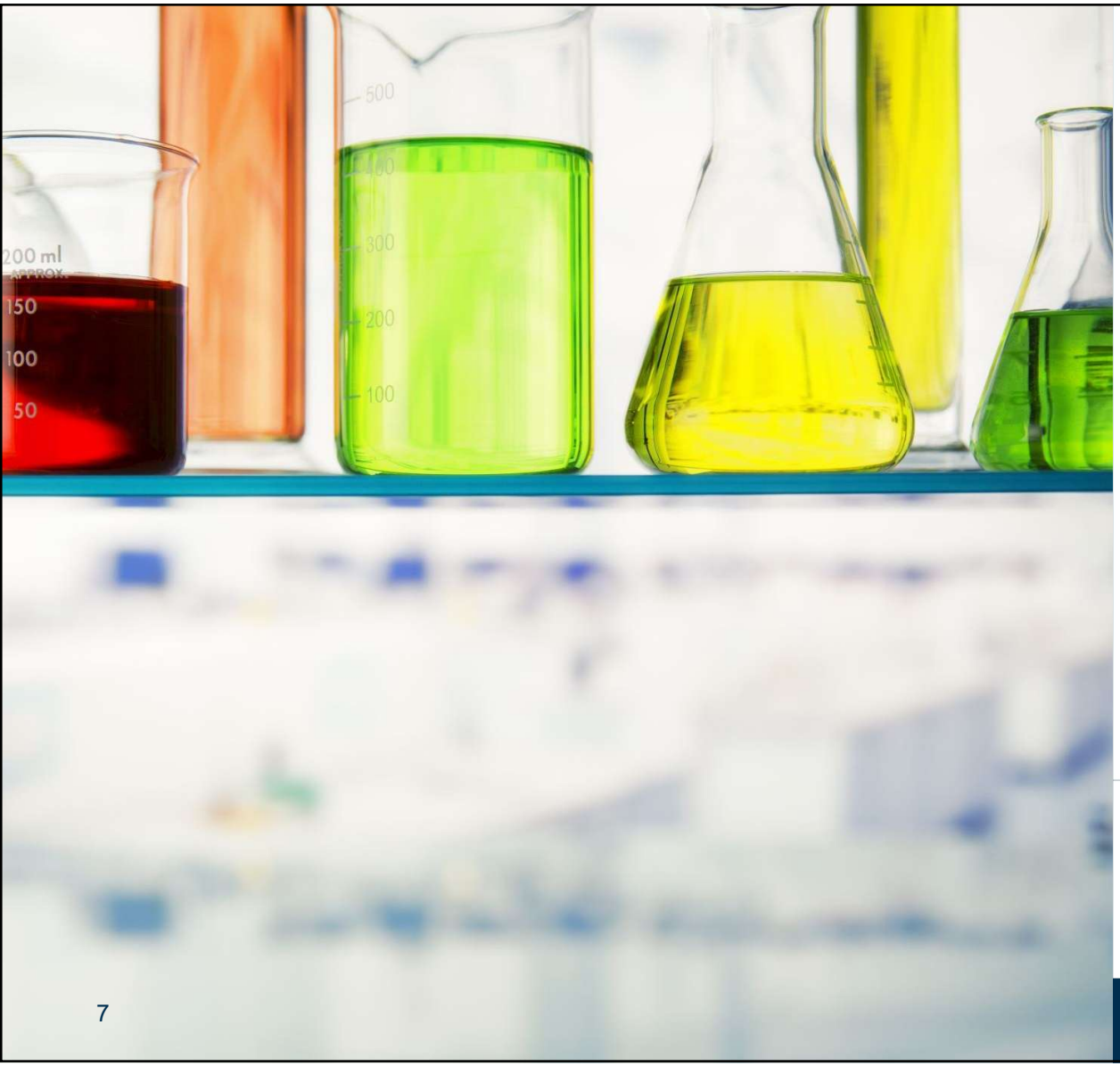


Introduction REACH and CLP Legislation

What is the REACH legislation?

REACH stands for Registration, Evaluation, Authorisation, and Restriction of Chemicals

Industry Responsibility Shift

REACH shifts responsibility from authorities to companies to register and provide safety data for chemicals.

Promoting Safety and Innovation

REACH enhances chemical safety, transparency, and innovation while protecting health and the environment.

What is the REACH legislation?

Substances of Very High Concern (SVHC)

CMR (carcinogenic, mutagenic, reprotoxic), PBT (persistent, bioaccumulative, toxic), vPvB (very persistent, very bioaccumulative).

Candidate list

Publicly available and updated by ECHA, identifies substances subject to authorisation.

Authorisation obligations

Authorisation needs to be granted at use level.

Substitution plan needs to be in place. Exposure needs to be minimized.

What is the CLP legislation?

CLP Regulation No. 1272/2008

CLP is the EU legal framework for chemical Classification, Labelling and Packing to ensure adequate hazard communication. It applies to substances and mixture.

Alignment with GHS

CLP aligns with the UN Globally Harmonized System to support international trade and consistent hazard communication

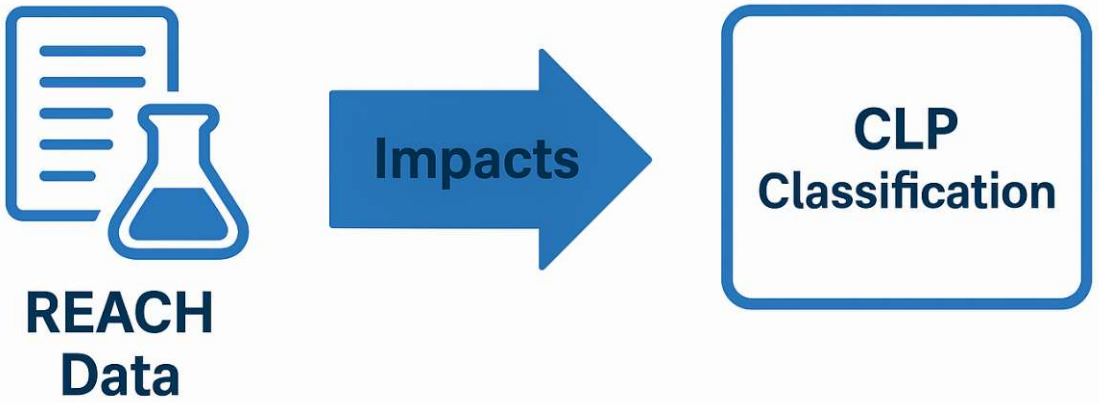
Purpose and Impact

Protect human health and the environment. Ensure consistent hazard communication. Safe handling, transport and use of chemicals

Regulatory consistency in EU

CLP ensure uniform chemical safety rules across the EU, supporting free movement of goods and fair trade

REACH vs CLP



Determination of physical chemical, stability, toxicological and ecotoxicological properties

Classification based on data on hazardous properties

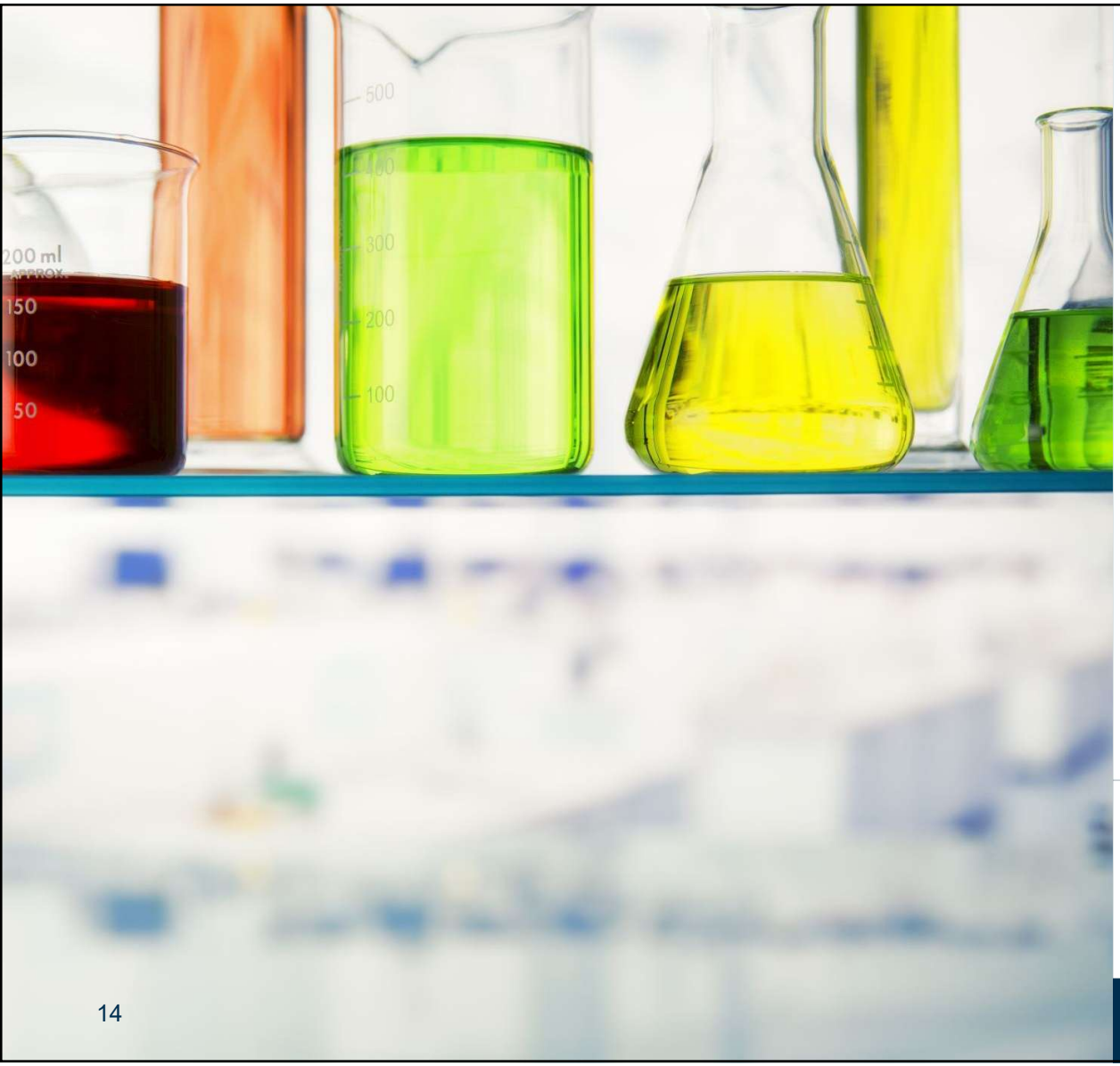
Outcome REACH&CLP

REACH results in 3 main clusters of substances:

- Non hazardous substances (green);
- All hazardous substances,
  not meeting SVHC classification (orange);
- Substances of Very High Concern (red);

SDS management

Safety data sheet (SDS)	Extended safety data sheet (eSDS)
Required for all hazardous, PBT, vPvB and candidate list (SVHC) substances	Required for substances registered ≥10 t/year under REACH and classified as hazardous
No exposure scenarios	Extensive exposure scenarios
Describes hazard and **general** risk management measure	Use-specific exposure scenarios, incl. operational conditions & risk management measures
CLP-focused	CLP+REACH exposure assessment



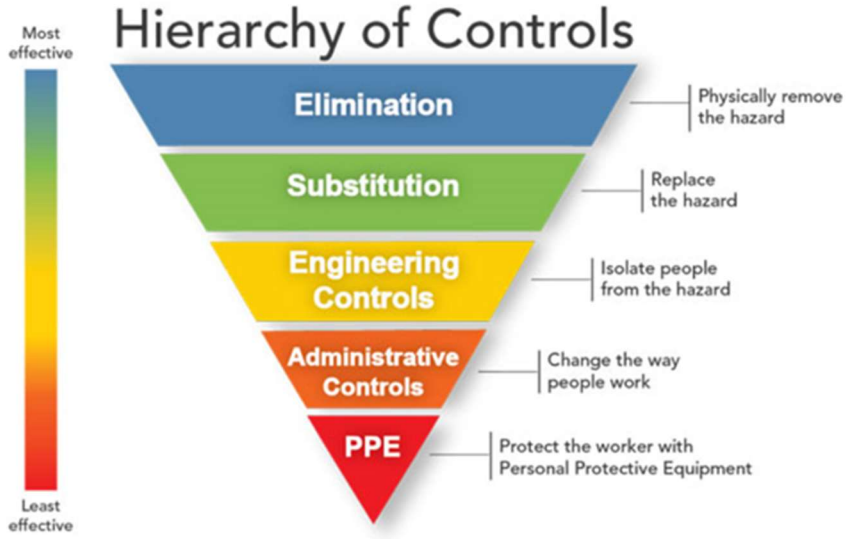
Introduction Chemicals management

What is chemicals management?

Systematic process of handlings, storing, using and disposing of hazardous substances in a safe manner.

Good chemicals management includes:

- Chemical inventory: maintaining up-to-date, accurate record of all chemicals on-site
- Risk assessment: evaluate the hazard, use and potential exposure
- Identification of control measures to minimize risks
- Implementation of control measures
- Proper storage and waste handling



Chemicals management

Why is it important to keep your chemicals management up-to-date?

- Constantly changing CLP classifications coming from:
  - Newly generated data under REACH identifying new hazards
  - Classification decisions made by ECHA
- Changes in regulatory frameworks:
  - One-substance-one-assessment (OSOA) implemented in Jan. 2026. Will lead to database combining hazard data coming from different regulatory frameworks

Chemicals management

Poor chemicals management leads to:

- Incorrect identification of SEVESO requirement
- Failure to apply necessary controls, reporting or emergency planning
- Incorrect protective measures
- Inadequate emergency response strategies
- Increased risk to workers and the public

Adequate regulatory monitoring of substances is key!

Lack of pro-active monitoring can lead to surprises, lack of preparedness and additional financial cost.

Chemicals management meets process safety & Seveso

Incidents

Seveso incident (1976)

Runaway reaction resulted in:

2,4,5-Trichlorophenol

reaction

2,3,7,8-Tetrachlorodibenzodioxin

Toulouse (2001)

- Impurities and incompatible combinations of materials
- Storage conditions not aligned with stability limits

More incidents

… where proper chemicals management could have changed the outcome:

- Bhopal (1984) -> insufficient understanding of reaction conditions and toxicity
- West Fertilizer Explosion (2013) -> poor link between inventory and hazard assessment
- T2 Laboratories (2007) -> lack of substance data (reaction kinetics, heat generation and decomposition)
- Chevron Richmond (2012) -> high corrosion rates due to chemical composition change
- Beirut explosion (2020) -> long-term storage without proper understanding of degradation

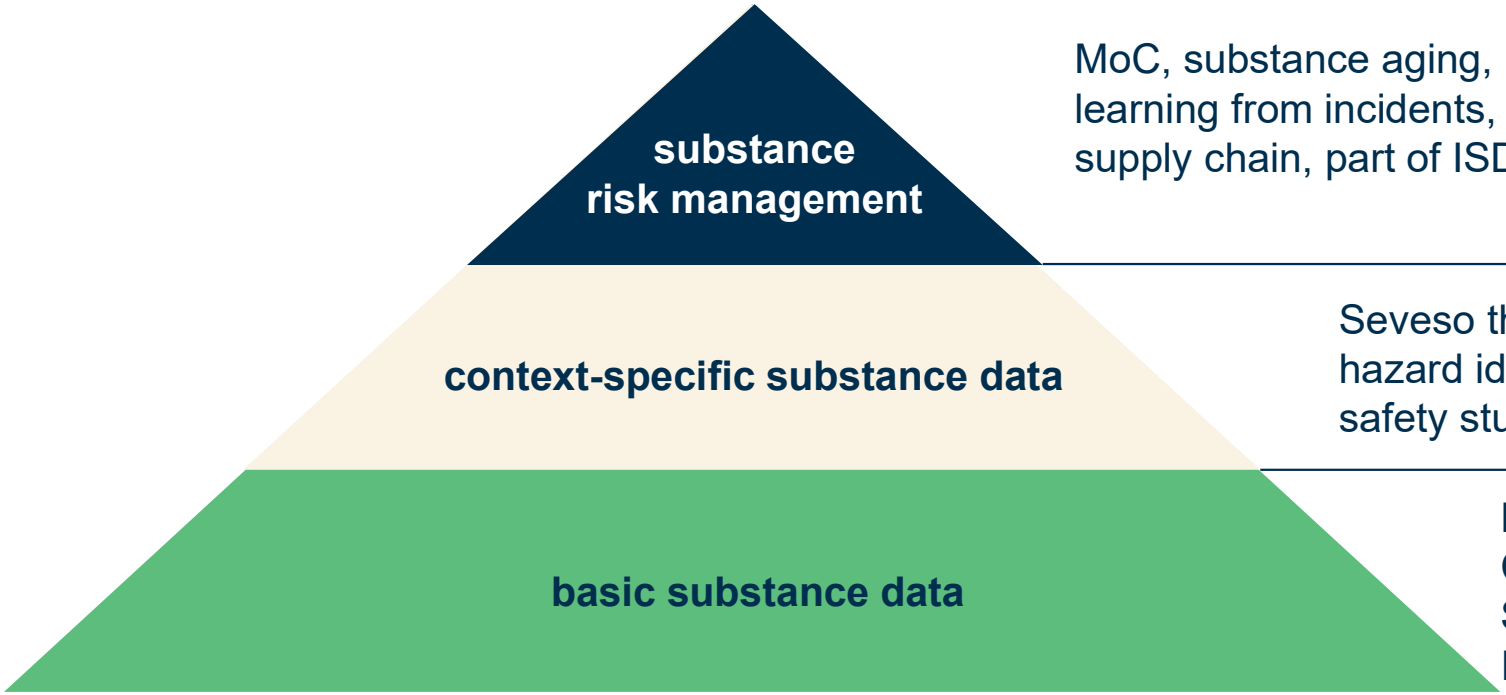
Chemicals management meets process safety

From chemicals management as compliance artefact to a design input for process safety

- Every HAZOP, LOPA, and Seveso scenario rests on assumed substance properties
- Every safety distance, consequence calculation, and effectiveness of a protection layer is related to substance behaviour
- When substance data is wrong, outdated, generic, or missing — the safety case inherits the flaw, invisibly

The layers of substance knowledge

The layers of substance knowledge



MoC, substance aging, review cycles,
learning from incidents, SVHC authorization,
supply chain, part of ISD

Seveso threshold,
hazard identification,
safety studies

REACH dossiers,
CLP classifications
SDS management
Inventory completeness

Challenges in process safety management

Challenges regarding substance management

When integrating substance management and process safety management there are various challenges.

- Technique blind spots of safety studies
- Surrogate substances in risk assessment
- SVHC and SVHC use authorization
- Inherently Safer Design

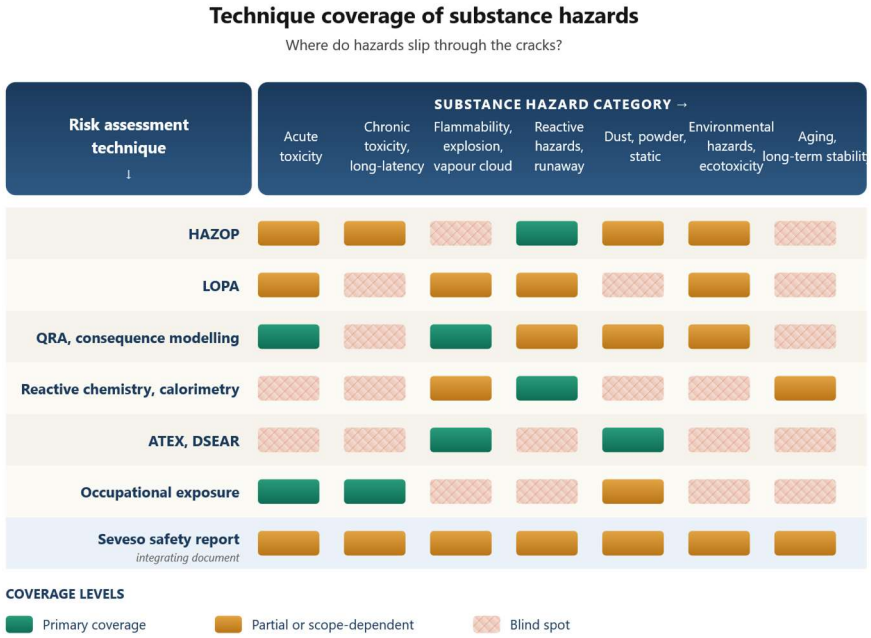
Technique blind spots

Each technique used in PSM and safety studies has its field of view and scope that reflects on a specific part of the substance information.

- For example: A QRA focusses on acute risks (release and effects), HAZOP focusses on process deviations
- Substances can have effects that are not covered (i.e. delayed health risks as a result of a single exposure during an incident)
- Compliment with additional studies (i.e. reactive hazard reviews)
- PSM and Seveso should integrate all of the relevant and expected hazards

- What has none of my studies covered?
  - Check the portfolio of safety studies and techniques and reflect upon it using the context specific information on substances

Example:



Surrogate substances

In practice substance data is often incomplete and surrogate substances are used in risk assessment.

- Blind spots could occur when the use of surrogate substances become invisible
- The relevant properties can differ between safety studies and therefore result in different surrogate substances
- Ensure to have a good understanding of the assumptions on substances and surrogate substance that are used in safety studies -> also integrate it in MoC
- The use of surrogate substances should be reviewed periodically

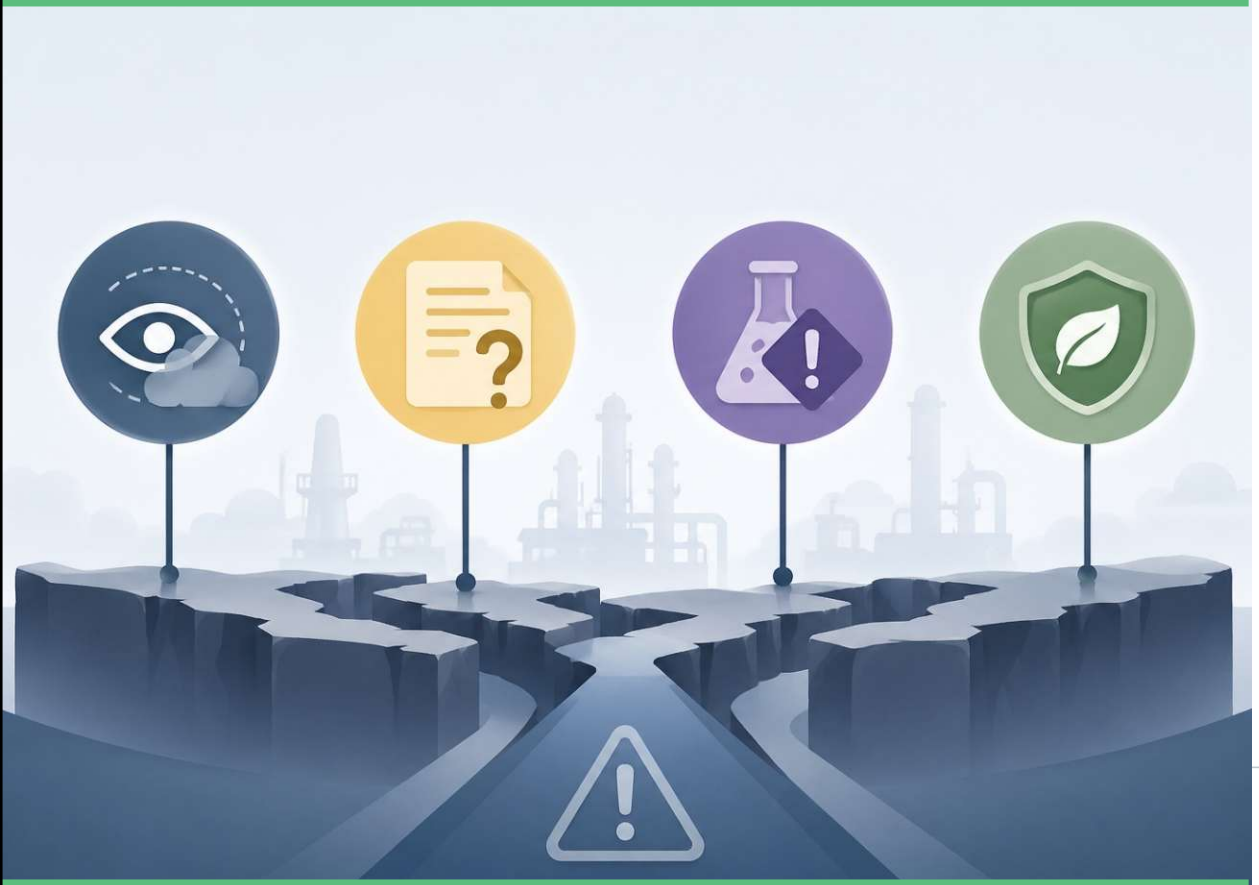
SVHC and SVHC use authorization

Under REACH authorisation is required if SVHC's will be used after a specified 'sunset' date. Based on socio-economic analysis with specific risk management measures and within specific operation conditions.

- The use of SVHC requires authorization because it is a serious concern
- Risk management measures will be introduced to the PSM system
- Authorization or exemption should not result in a lower level of scrutiny in PSM
- The safety studies should always look at the intrinsic hazards of the substance even if the use of the SVHC is authorized

Inherently Safer Design

- To be able to apply the ISD principles, a good understanding of the chemicals within the context of your plant is paramount
- Triggers to apply ISD principles could also appear in the operational phase of the life cycle
- New insights on chemicals could trigger a re-evaluation of the ISD principles on the design.
- SVHC candidate lists should be integrated in PSM as trigger for the substitute principle of the ISD framework
- Chemical management enables the continuous application of the ISD principles throughout the life cycle



How can chemicals management be used to improve PSM?

Conclusion

- Substance knowledge drives process safety

- Lack of proper chemical management could lead to:
  - Misleading risk assessments -> large investments in a later stage
  - Incorrect safety measures -> ineffective investments in safety measures
  - Hidden escalation scenarios -> inadequate protection of people and valuable assets

- Challenge yourself:
  - Do our safety studies use substance data that is fit for purpose?
  - Where are we relying on assumptions regarding substances we no longer challenge?
  - Is substance knowledge actively maintained—or passively inherited?

Questions after the webinar…

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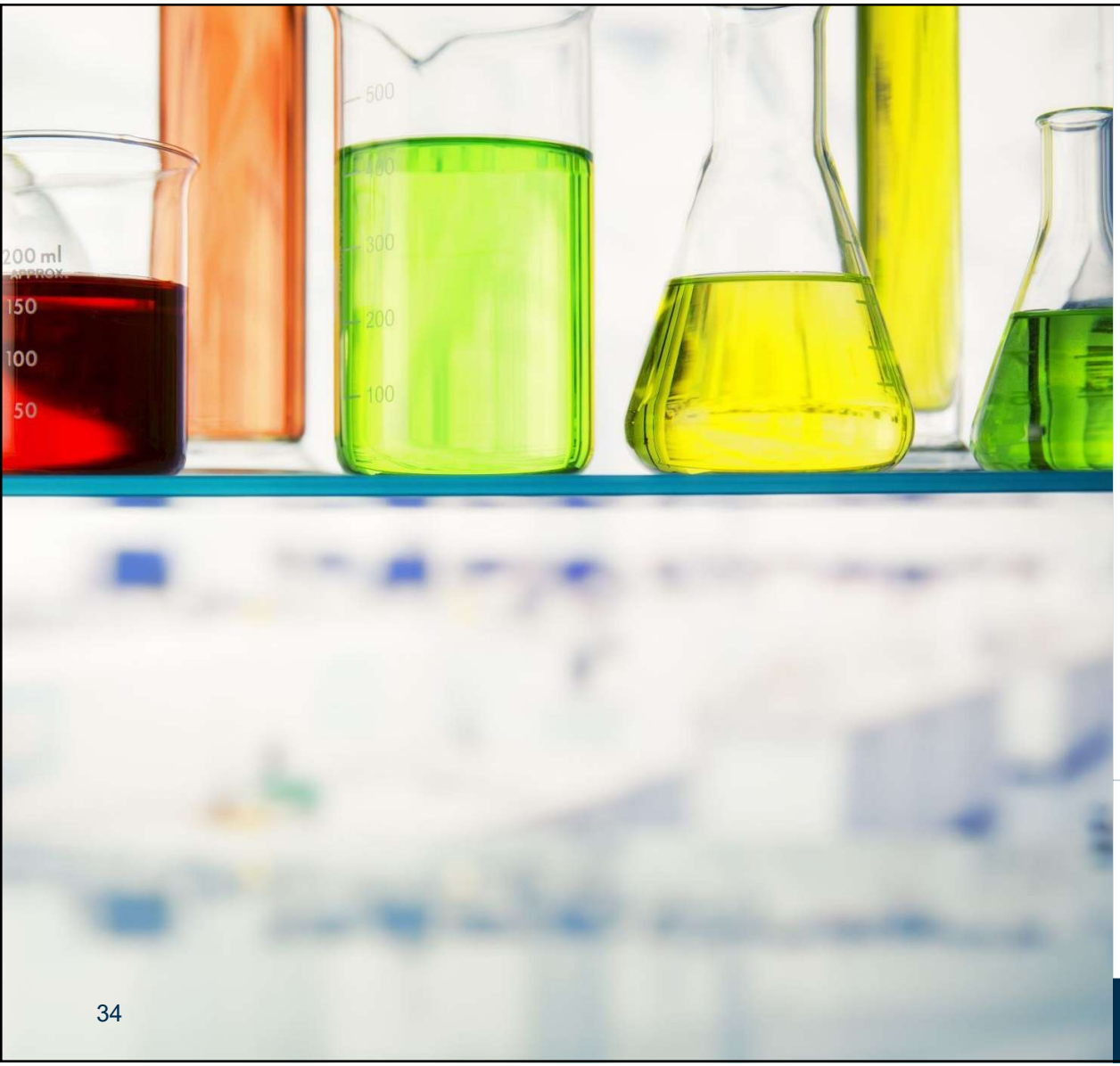
Haskoning will be present on:

- Process Safety Congres – **May 13** in Dordrecht, The Netherlands
- The 6th European Conference on Plant & Process Safety – **15 & 16 December 2026** – Rosengarten Mannheim, Germany



Further reading

Monitoring of hazard

How to track classification of substances

- Ongoing dossier evaluations ECHA on the CORAP list,
- Harmonised classification and labelling consultations

Community rolling action plan (CoRAP) prioritises substances for evaluation over a period of three years.

- Annual update in March

Year	Year in previous CoRAP	Member State	EC/List Number	CAS Number	Substance Public Name	Initial grounds for concern[5]	Source	Member State contact details
2026	2026	IE	203-183-7	104-19-8	N,N,4-trimethylpiperazine-1-ethylamine	Reproductive toxicity Specific target organ toxicity - repeated exposure Wide dispersive use Exposure of workers	already in CoRAP	Health and Safety Authority; The Metropolitan Building, James Joyce Street, Dublin 1, D01 KOY8, Ireland; chemicals(at)hsa.ie

Monitoring hazard – harmonized classification

Example of how to track classification of substances currently under discussion

https://echa.europa.eu/registry-of-clh-intentions-until-outcome

Morpholine

EC / List no: 203-815-1 **CAS no:** 110-91-8

CLP Annex VI Index number	613-028-00-9
Further substance information	
Status	Submitted
Date of intention	20-Mar-2025
Expected date of submission	30-Nov-2025
Submitted for accordance check	26-Mar-2026

Harmonised classification at the time of the proposal	▪ Flam. Liq. 3, H226 ▪ Acute Tox. 4*, H302 ▪ Acute Tox. 4*, H312 ▪ Acute Tox. 4*, H332 ▪ Skin Corr. 1B, H314
Specific concentration limits at the time of the proposal	
Proposed harmonised classification by the dossier submitter	▪ Flam. Liq. 3, H226 ▪ Acute Tox. 4*, H302 ▪ Acute Tox. 4*, H312 ▪ Acute Tox. 4*, H332 ▪ Skin Corr. 1B, H314 ▪ Repr. 1B, H360FD

Example self assessment

Basic substance data (level 1)

1	Every hazardous substance on site has an SDS dated within the last five years.
2	The CLP classification in your PSM/Seveso inventory matches the current supplier SDS for each substance.
3	A defined person or role is responsible for tracking substance information updates and assessing their impact.
4	Your substance inventory also includes intermediates, waste streams, and off-spec materials — not only raw materials and products.

Example self assessment

Context-specific substance data (level 2)

5	Substance properties used in HAZOP and LOPA are documented with the source and the conditions they apply to.
6	Your Seveso documentation reflects actual process conditions, not substance classifications alone.
7	For substances where reactive hazards are plausible, you have process-specific reactivity data covering start-up, upset, and contamination scenarios — or you have documented why reactive hazards are not a concern.
8	Dust, vapour, or reactivity parameters in your safety case reflect the actual material on site, not handbook or generic values.
9	Where surrogate substances are used in consequence modelling or reactivity assessment, each surrogate is identified in the safety case and chosen to be conservative.
10	For SVHCs on site, authorization conditions or exemption conditions are treated as safety-critical design basis and traceable in the safety case.

Example self assessment

Substance risk management (level 3)

11	New chemicals, supplier changes, and CLP reclassifications automatically trigger MOC.
12	Substances in long-term storage are actively monitored for aging, degradation, or contamination.
13	Substance data underpinning your safety case is explicitly revisited at each PSM or safety report review cycle.
14	Lessons from incidents or near-misses involving substance behaviour feed back into your substance data and assumptions.
15	Surrogate substance choices in safety studies are revisited when new data becomes available or when the safety case is revised.
16	Substance hazards are continually reviewed against the scope of safety studies, and gaps between hazards present and hazards assessed are actively surfaced and addressed.