Trace It, Trust It: Making HAZOP & LOPA Work Together

5th EPSC Safety Congress– Aachen

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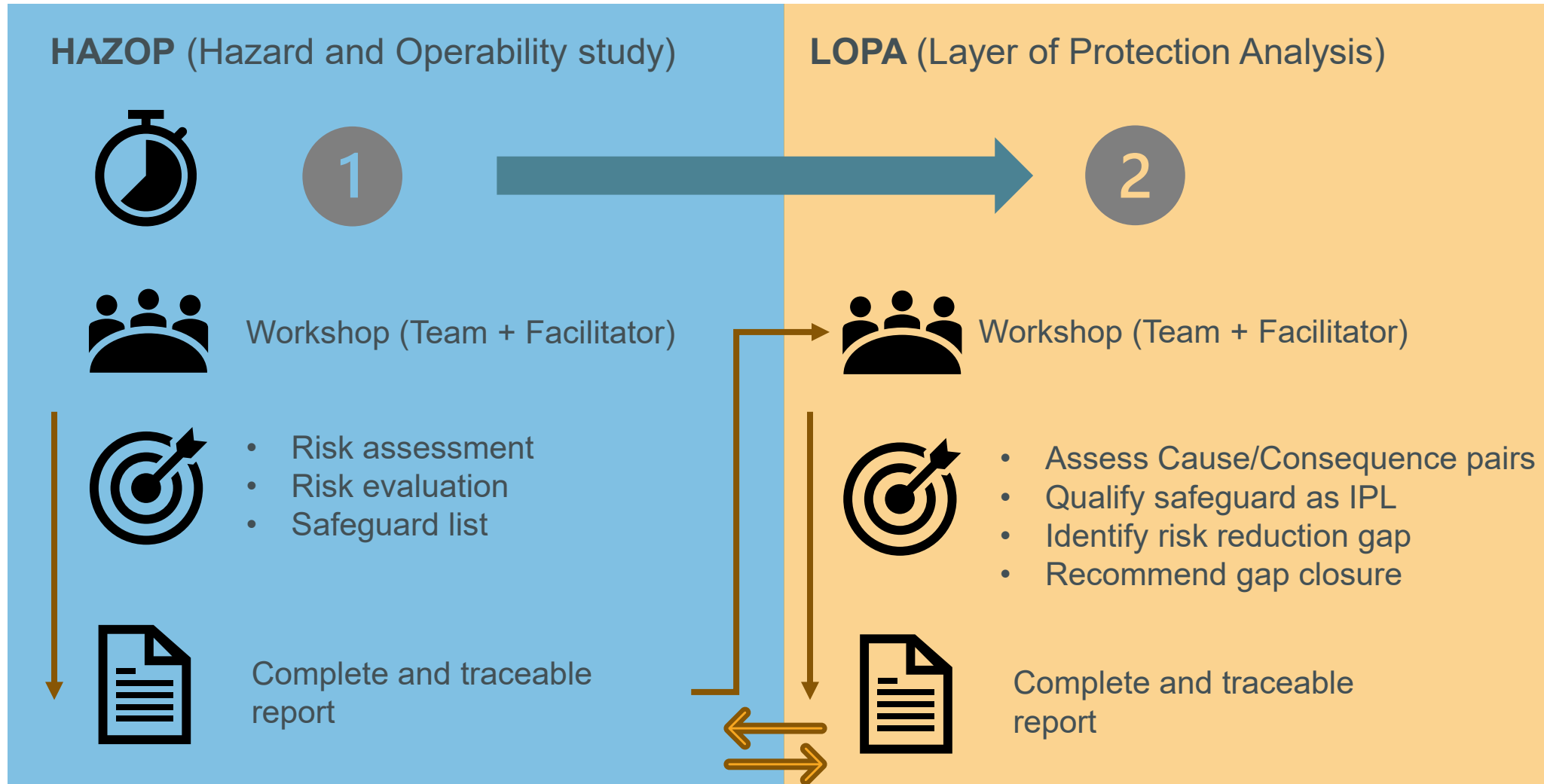
HIMA

HIMA **SMART SAFETY.**

#safetygoesdigital

HAZOP and LOPA studies

What we would like

HAZOP (Hazard and Operability study)

LOPA (Layer of Protection Analysis)

1 → 2

Workshop (Team + Facilitator)

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- Risk assessment
- Risk evaluation
- Safeguard list

- Assess Cause/Consequence pairs
- Qualify safeguard as IPL
- Identify risk reduction gap
- Recommend gap closure

Complete and traceable report

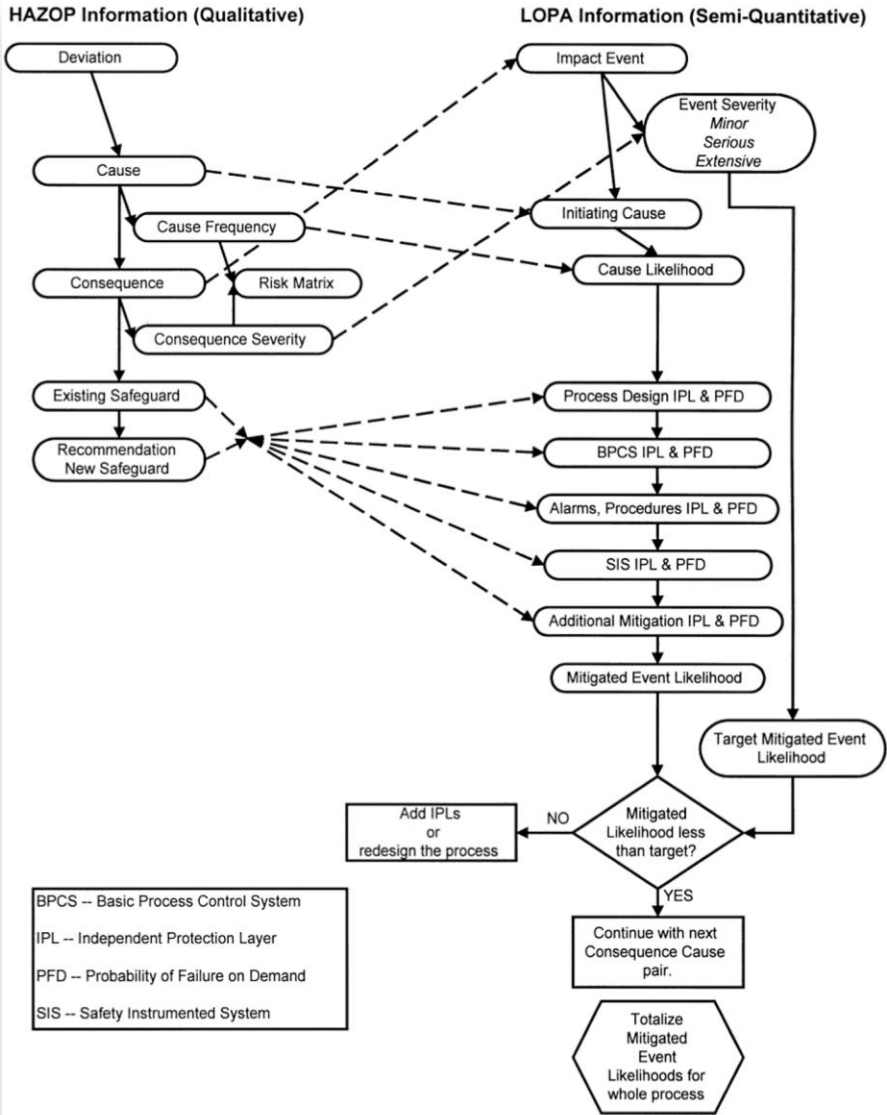Complete and traceable report

HAZOP and LOPA studies

What is often in reality

HAZOP (Hazard and Operability study)

1

Workshop (Team + Facilitator)

- Risk assessment
- Risk evaluation
- Safeguard list

Complete and traceable report

Months

A ≠ B

? ⇄ ?
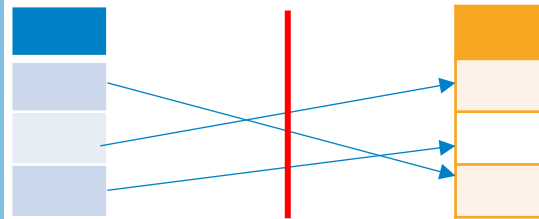
LOPA (Layer of Protection Analysis)

2

Workshop (Team + Facilitator)

- Assess Cause/Consequence pairs
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Complete and traceable report

What to connect to keep traceability

Traceability = Proper data mapping

HAZOP   LOPA
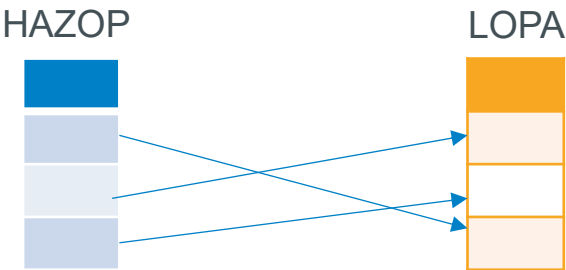
Data mapping is given, it is rule based and known since a while.

How well is it systematically applied?

☹

HAZOP Information (Qualitative)   LOPA Information (Semi-Quantitative)

BPCS -- Basic Process Control System

IPL -- Independent Protection Layer

PFD -- Probability of Failure on Demand

SIS -- Safety Instrumented System

Dowell III, A.M. Layer of Protection Analysis for Determining Safety Integrity Level. ISA Transactions, 1998. 37(3): 155-165

What to connect to keep traceability

Example of real experience

What I searched in order

❌ HAZOP ref node / deviation

❌ initiating cause = cause

❌ Impact event = consequence

❌ SIF tag

✔️ Tag included in the initiating cause

Finding one link, I should have taken some **assumptions** to build a real connection between HAZOP and LOPA scenarios.

Is it a traceable and auditable situation?

This was the easiest example; in many cases was not possible even to assume

What was the task and how it ended up?

Digitalization project to trigger quality improvement

Customer requested to digitalize the entire Functional Safety Lifecycle.
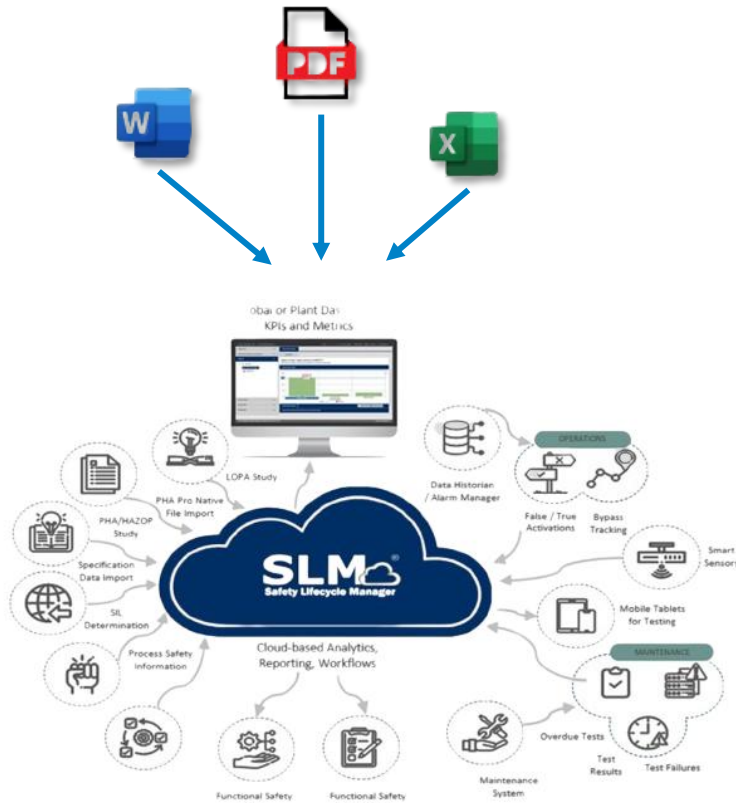
Low quality of inputs

Option 1: digitalize as it is.

Option 2: quality is raised and THEN is digitalized.

What was the task and how it ended up?

Digitalization project to trigger quality improvement

A clear link between HAZOP scenario and LOPA worksheet was build together with the customer.

End of the story: It was possible to digitalize HAZOP and LOPA improving their quality and data mapping ensuring clear traceability.

What if?

What if customer had started digitally?

Reduce manual operation and trust digital solution
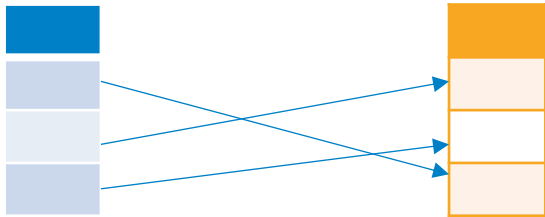
Modern Functional Safety / Process Safety digital platforms automate the needed mapping

Real example:

Now you can trace and trust data

Keep control over critical changes

Not only trust and trace, get more support from digitalized solutions

Scenario: HAZOP-LOPA revalidation

Hazop

Workshop (Team + Facilitator)
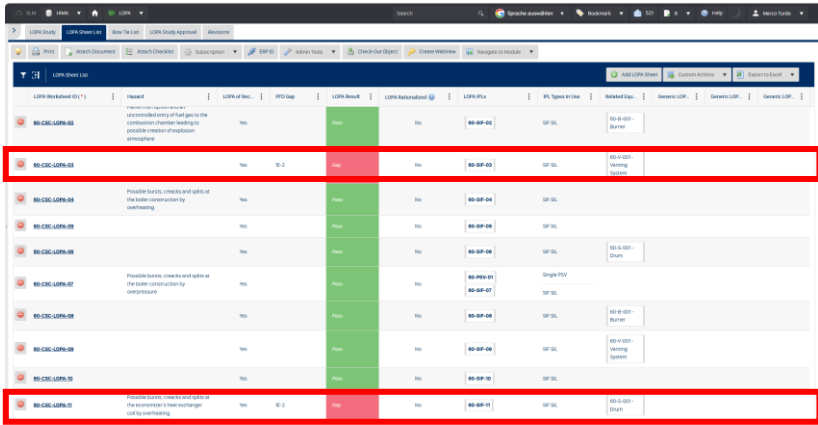
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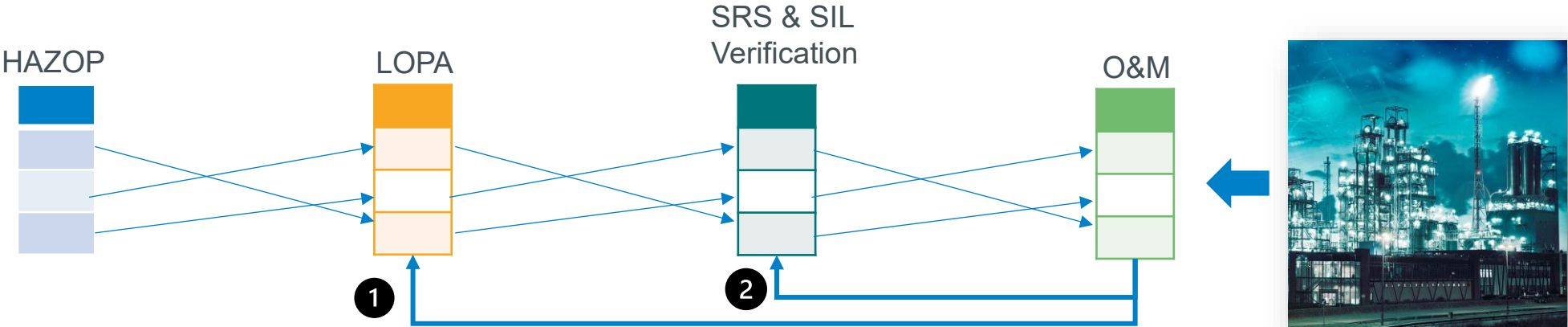- Safeguard list

Complete and traceable report

Changes

No Gap is present before revalidation in the LOPA report (after IPL implementation)

New Gaps are highlighted

Following the data journey

Think beyond LOPA

1 **Example 1**: IPL performance compliance is indicated during the LOPA

2 **Example 2**: Statistical failure rates are used for actual PFD calculation

Some digital lifecycle management platforms allows quality, consistency and traceability during the entire functional safety lifecycle.

Conclusions

Trust — It does not matter if digitalized or not, we should be able to trust safety relevant data

Digitalized processes and platforms supports with built in data mapping and traceability

Behind tools and processes, key competences shall be available

Extended Safety Lifecycle Digitalization multiplies benefits within organizations

Contact

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