

Process Safety Focus Sites

A program to reduce PSIs and leakages

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Bob van Woezik

- Nationality: Dutch
- Marital status: Married, 3 boys
- Education: Chemical Technology Twente University (MSc, MTD, PhD)



1999 AkzoNobel Functional Chemicals, global manufacturer of Chelates, Micronutrients, Organic peroxides, Metal alkyls

Functions: Process Engineer; Maintenance & Project manager; HSES&Q manager; BG Process Safety program manager



2015 OCI Fertilizers, global manufacturer of Methanol, Ammonia, Nitric Acid, Ammonium Nitrate

Function: Corporate Process Safety & Occupational safety manager



2018 DSM/dsm-firmenich, global manufacturer Perfumery, Taste & Texture, Nutrition products

Function: Senior Global Process Safety Expert

- Process Safety Lead Premix
- Expertise: CHA, HAZOP, ERA/SPH, MSA, OBRA, MSP



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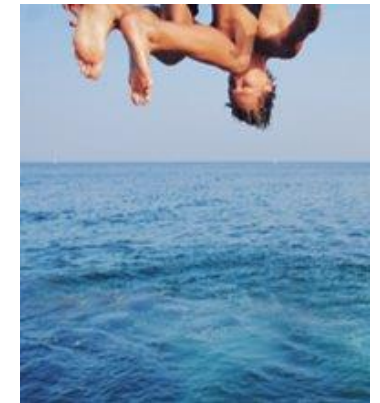
Perfumery & Beauty



Taste, Texture & Health



Animal Nutrition & Health



Health, Nutrition & Care

Content

Process Safety Incidents

- PSI Performance
- PSI Analysis

Self Assessment Tool

- SAT approach
- SAT example Flange Management

PSI Focus sites Program

- Creating a Learning Platform
- PSI reduction results



PSI performance

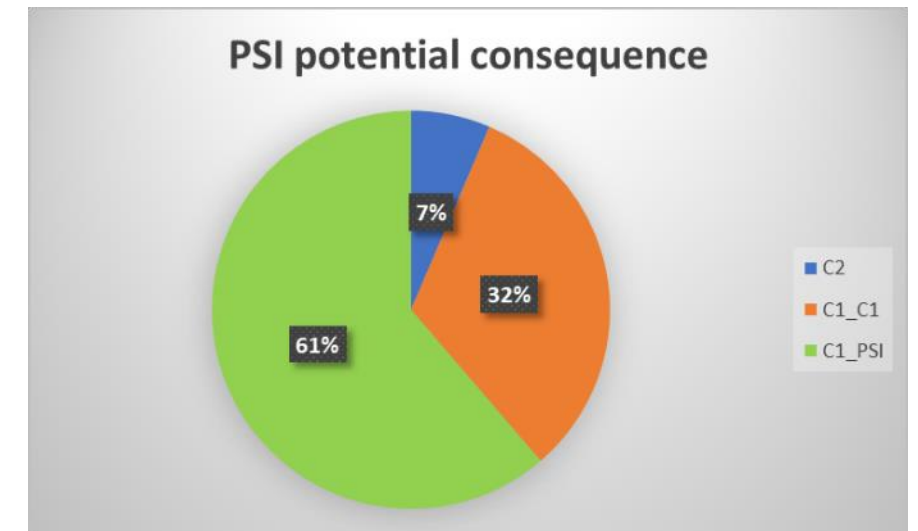
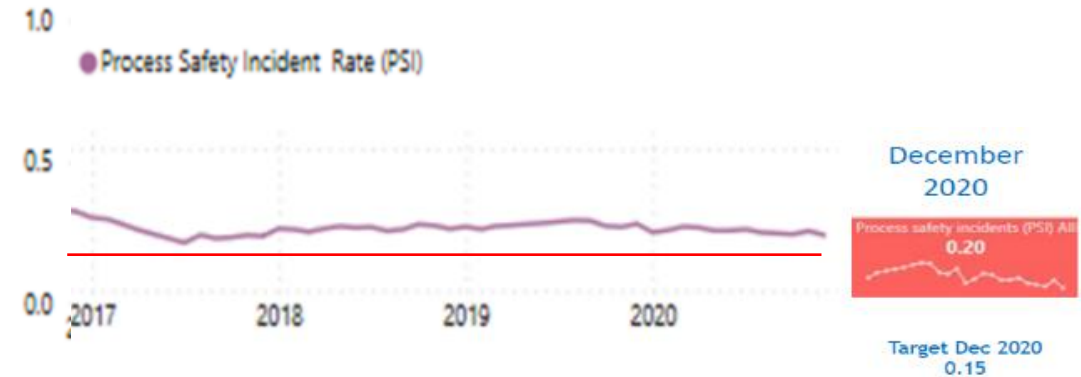
PSI improvement

- Over the years, the PSI rate DSM was plateauing
- Several BG actions, but no improvements visible
- In 2020 started to structurally improve the PSI rate

PSIs

- We use definition Cefic-ICCA
- PSIs do not always have PS potential
 - 7% PSI have serious potential \geq C2 (fire/explosion, fatalities, environmental disasters)
 - >90% of PSIs are spills/leaks, limited SHE consequence, max C1 (FA, MTC, no environmental effect)
- PSIs were mainly LOPC exceeding the threshold value

- ➔ Better HAZOP will not significantly improve our PSI rate
- ➔ We need a 2-pronged approach



2-pronged approach

- PSI with Serious SHE potential:

Engineering solutions

Design, Risk Assessment HAZOP, FMEA

- Spills/leaks with limited SHE potential:

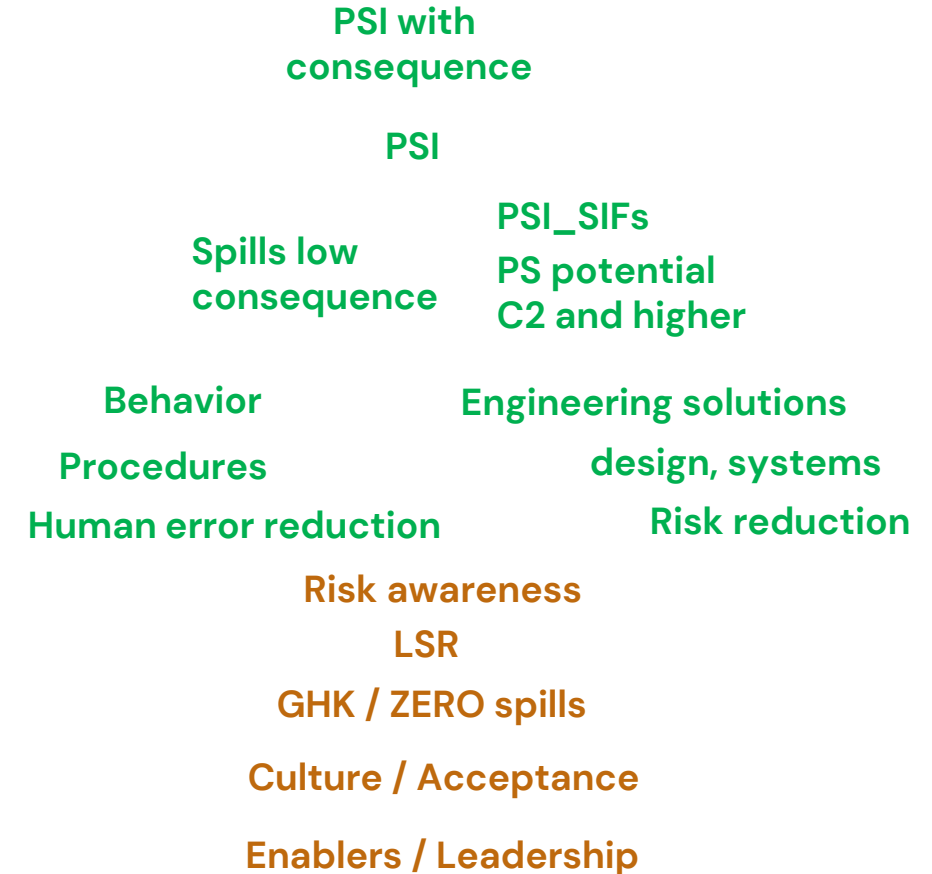
Behavior, with supporting engineering solution

Good practices from peers and industry with easy solutions to reduce complacency and error

→ Same fundament, reducing spills will also improve PSI with serious SHE potential

→ Do not evaluate an individual spill based on its risk but understand the holistic consequence of zero spills mind set

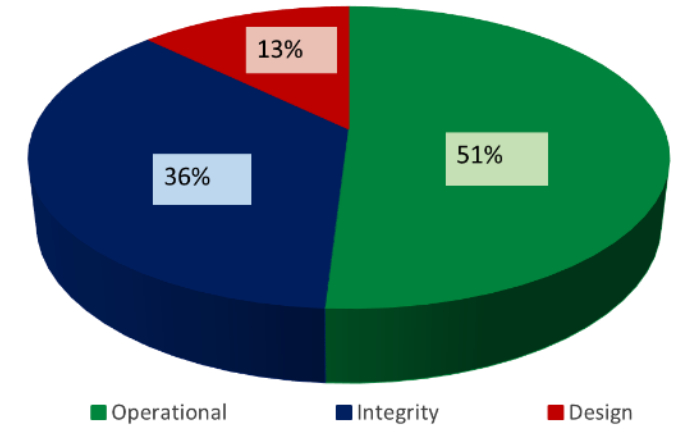
→ We need to develop an approach for reducing spills/leaks



PSI Analysis

Analysis

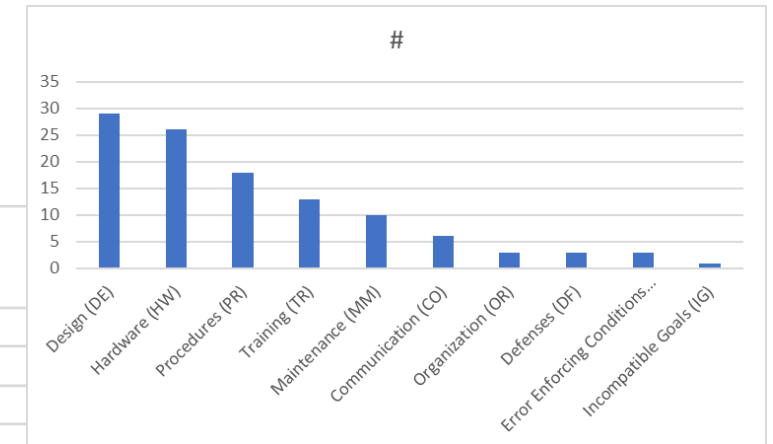
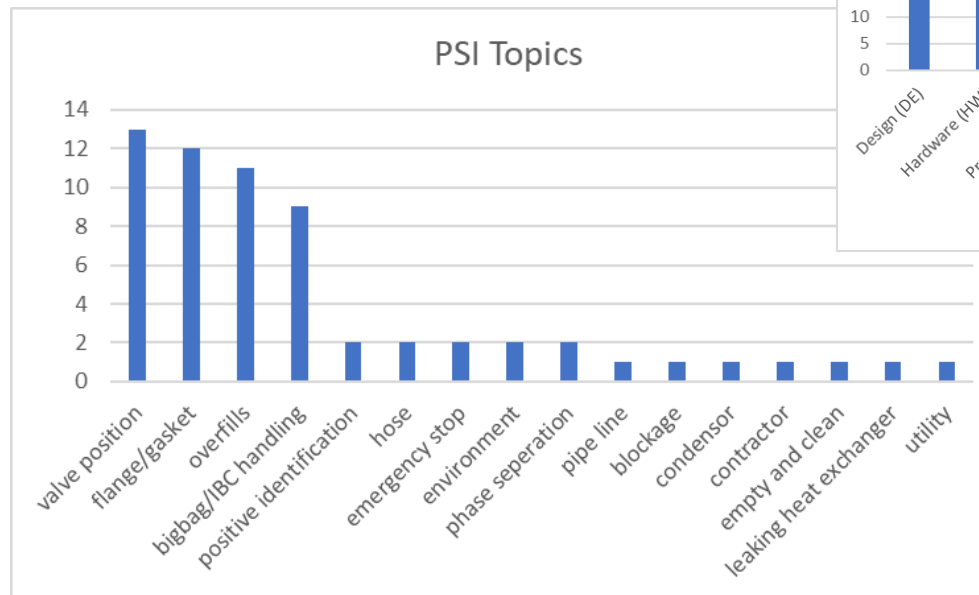
- Started analyzing all PSIs: Operational/Integrity/Design; Basic Risk Factors; Risk assessment methods used, etc.
- Not found to be practical. Too high level, too big, academic approach



PSI improvement topics

- Categorizing in practical topics, technical objects
- Easy to improve, including the technical and behavior components
- Pareto analysis identified 4 main topics:
 - Wrong Valve position
 - Flange management
 - Overfills
 - BigBag/IBC handling

→ We need to develop a specific tool for each indentified topic (SAT)



SAT approach

Development of SATs

- SAT (Self Assessment Tool): Questionnaire linking to practices
- Working groups, with experts and site people
- Collected useful practices from DSM and industry
- Covers the whole life cycle

Typical chapters:

- Management Procedure / Instruction
- Knowledge and skills
- Design
- Maintain & operate

SAT in practice

- Developed 4 types of SATs and Piloted in 2021
- Assessment done by site, circa 4 hrs each by multidisciplinary teams



	Emmen	Freeport	Village Neuf	Heerlen
Implemented	7%	14%	46%	21%
Partly implemented	68%	46%	50%	39%
Not implemented	25%	39%	4%	39%

Gap assessment result (28 questions)



SAT example - PSI SAT Flange Management

- A. Score in column 1 (Implementation) whether the detailed step, to your opinion: Is carried out correctly (Green), Can be improved (Yellow) or Needs to be improved (Red).
- B. Indicate in column 2 the present bottleneck when a step can and/or needs to be improved.
- C. Ideas about how to solve the bottleneck can be indicated in column 3.
- D. Finally, report any remarks about a step in column 4.
- E. In column 5 you'll find additional information
- F. Column 6 provides links to "Good Practices"

Chapters

- Procedure/Instructions
- Knowledge & Skills
- Design
- Maintenance
- Operation
- Analyze & Improve

Implemented	1
Partly implemented	2
Not implemented	3

Step	Description	Detail	1 Implementation	2 Bottleneck(s)	3 Possible action to deal with bottleneck	4 Remarks	NR.	5 Additional description for inspiration	6 Reference example material
1	Flange Management Procedure / Instruction	1.1 Do you have a Flange Management procedure/instruction at your site?	1				1	Site has an up-to-date Flange Management procedure, which is part of a the site management system including review cycle.	
		1.2 Does the procedure/instruction cover all the "Flange" life cycle activities (Design, construct, operate, maintain, improve, dismantle)	2				2	The consecutive life cycle phases are described in the document, or links/references to other documents describing this phase are provided (e.g. Plant Specbook for design phase).	
		1.3 Are the responsibilities clearly defined in the procedure/instruction	3				3	Site responsibilities are defined and described in the procedure. Responsibilities are defined related to knowledge, design, maintenance, operate, improve/management review.	Dalry Bolted joint procedure_section 4
		1.4 Does the procedure/instruction describe/determine what are critical flanges?					4	Critical flanges are defined. For critical flanges specific competence, tools, work procedure may be required. This is defined in the procedure. Critical flanges are flanges which likely lead to a monthly PSI based quantity and/or toxicity (see PSI flow chart)	Dalry Bolted joint procedure_section 3
2	Knowledge and skills of Flange Management	2.1 Are all relevant people (SHE, operations, maintenance including contractors and improve) at your site aware of the existence of the procedure/instruction, are they trained and do they know the content?					5	The flange management procedure is part of the site management system and describes how relevant roles/people are being regularly informed/trained on the existence/application of the procedure (e.g. online or information sessions). These awareness/training sessions also serve to verify that participants understand the content and evidence is documented. External service providers should assure and document that their people are formally trained as per the site procedure.	
		2.2 Are those who are working on flanges practical trained and does the site have evidence of the fulfilment of the required competence?					6	The site has defined in the Flange Management procedure who may work on flanges and what qualification is required. Next to knowledge of the procedure (previous question), practical training is provided to the relevant roles/persons. This is valid for own staff (operators, maintenance) and external service providers. A certification which demonstrates evidence of capability on working with flanges is available (e.g. certain levels: certificate for working on critical flanges). Remark: Many external trainings are available that provide flange integrity management according to EN1591-4. e.g. 2 day flange training including certification.	
9	Chapters	Requirement Question	Score	gaps	action		7	People are aware of the Flange management procedure and always use it applied correctly. (There procedure embedded checks applied correctly.	Example material e.g. procedure, training provider, maintenance instruction

PSI Focus sites Program

PSI Focus sites Program

- Only sharing the SAT with sites is not effective
- It requires management commitment and guidance

Selection of PSI focus sites

- PSI focus sites were selected based on PSI rate
- Annually reviewed: stay – celebrate – new
- New sites receive Invitation letter from CEO
- Best to have about 6-8 sites, a mix of old and new ones

Develop PSI improvement plan

- Analyzing own PSI and LOPCs from last 3 years
- Creating Awareness: Zero Spill mindset
- Improve by utilizing the 4 developed Self Assessment Tools, local initiatives and from other sites (Learning Platform)



Creating a Learning Platform

Support and facilitate

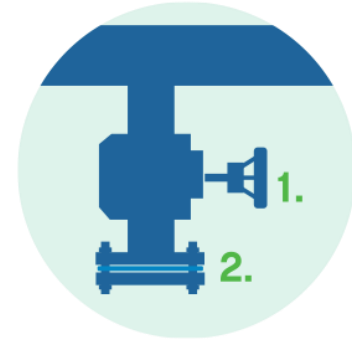
- Provided Example analysis, Plans and listed useful practices
- Appointed Dedicated regional PS contacts to support each site
- Made PSI reduction part of the Peer-to-Peer reviews

Learning platform

- Connect Sites with similar issues
- Monthly calls sharing good practice by one of the sites
- Important to Connect to existing initiatives!

Learn and make it your own

- Hunt for 'SINGLE BARRIERS'
- Qr code validation questions
- Orange caps visualisation



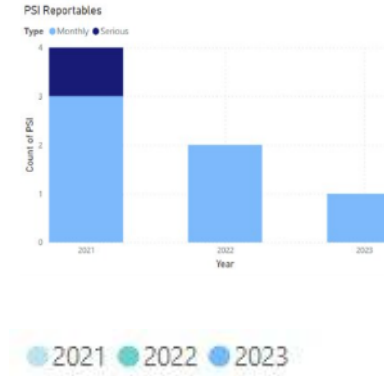
PSI reduction results

Performance Monitoring

- Monitoring PSI reduction for PSI focus sites
- Do not expect big improvement during the first 1-2 year
- Average annual improvement Focus sites of -45%
- Program results are visible in company PSI performance by -25%

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- Analysis 2023 for dsm-firmenich: Same issues.
- Flange leaks / Overfills / BigBag-IBC handling / Open drains
- New topics: Pump leaks / Hose leaks: New SATs to be developed?

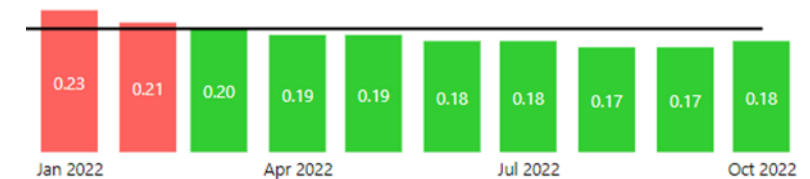


Individual Site

Focus Sites -45%



Company -25%





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