PIPESYSTEMCONSULT GMBH HAZOP, SIL & LOPA REFERENCES

PipeSystemConsult GmbH (PSC) is an independent engineering company that provides flexible and cost-effective consulting services to clients in the pipeline, power generation and industrial energy sectors.

The company has over 35 years' international experience in engineering management and design. PSC specializes in implementation of Functional Safety Management in accordance with IEC 61511, including HAZOP, HAZID, LOPA, SIL, QRA, Functional Safety Assessment and Audit.

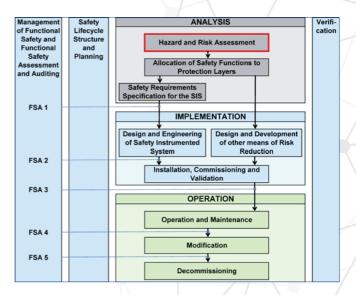
PSC has provided independent Chairman and Scribe services for over eighty HAZID, HAZOP (including HAZOP revalidation) and LOPA studies both nationally and internationally. PSC experts are certified according to IChemE and the Exida CFSE program.

The first step of the Safety Life Cycle according to IEC 61511 is a Hazard and Risk Assessment (HRA) to determine the risks associated with a particular plant or process. Level of analysis can range in complexity from 'What if' Checklist to HAZOP, FMEA, FTA up to QRA.

Following the HRA, risk reduction analysis of Safety Instrumented Functions (SIFs) is carried out via calibrated risk graph or LOPA.







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Below are listed some of the HRA's led by PSC over the last ten years:

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Owner	HRA-Study	The statement of the st
Gasunie,	Over 15 HAZID/HAZOP/	
Germany	SIL studies/updates for	
	compressor stations and	
	gas pipelines	
ADCOP Pipeline Co.,	Follow-up HAZOP for	
Abu Dhabi	crude oil pipeline, pump	
	stations and tank farm	
Confidential	HAZOP Update, SIL	
	Verification of legacy	
	systems for a gas	
	compressor station	
Klaipėdos Nafta,	hazop, lopa, sil	(W3) (W2) (W1)
Lithuania	Analysis for an LNG	S1 kelne PLT-Sicher- heitsberg (z. 8. technische
	Reloading Station	(i) (i) (i) (ii) (ii) (iii) (i
	HAZOP, LOPA for FSRU	SiL 2 SIL 1 SIL 1#
Net4Gas,	Over 10 HAZID/HAZOP/	(i) SIL 2 SIL 2 SIL 1
Czech Republic	SIL studies and updates for	G2-SIL 3 SIL 2 SIL 2
	various gas pipelines and	A1 SIL 3 SIL 3 SIL 2
	facilities	A2 SIL 4* SIL 3 SIL 3
Petrom,	HAZOP of 34 crude oil	SIL 4* SIL 3 PLT-Sicherheits-
Rumania	collection manifolds	
Gassco,	HAZID, Risk Analysis	
Germany	of offshore gas heating	
	system for Gas Receiving	
	Facility	Sensor StL 2 StL 2 StL 2
DLR,	HAZID (PHA) of electricity	SFF = 95,0 % SFF = 97,5 % HFT = 0 SFF = 81,3 % HFT = 0
Germany	supply, auxiliary systems of	PFD _{erg} = 2,5×10-4 PFD _{erg} = 1,3×10-4 bewerte nach: iEC 61508 IEC 61508 IEC 61508
	rocket test facility	Kriterium 1
BEP Bunde-Etzel Pipeline,	HAZOP of gas pipeline	SIL aufgrund Architektureinschränkungen (SFF, HFT): Sensor: SIL 2, Steuerung: SIL 3, Aktor: SIL 2 → SIL 2 SIL 2
Germany	and stations	Kriterium2 (für T ₁ =1 Jahr)
Batangas LNG,	HAZID, QRA of planned	SIL aufgrund Gesamtausfallwahrscheinlichkeit (PFD _{avg}): PFD _{symm} = PFD _{Semuer} + PFD _{skem} + PFD _{skem} + PFD _{skem}
Philippines	LNG Regas Terminal	= 2,5×10 ⁻⁴ + 1,3×10 ⁻⁴ + 4,5×10 ⁻⁴ = 8,3×10 ⁻⁴ → SIL 3 Quelle: Endress & Hauser

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