

Client:



**Rechim S.r.l.**  
**Argenta (FE)**

**Generatore di energia da combustione**

**Preliminary Hazards Analysis PHA**

**Document Revisions**

Rev	Date	Description	Authored
00	19/8/2025	First emission	M.Moro

## Rechim S.r.l. - Argenta (FE)

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**Project:** Generatore di energia da combustione

### NODES LIST

N°	Title	From	To	Equipment(s)	P&I
1	Forno combustore e caldaia				
2	Reattore di deacidificazione e filtro a maniche				
3	Reattore DeNOx				
4	Stoccaggio reflui infiammabili				
5	Stoccaggio ammoniaca soluzione				
6	Stoccaggio carbone attivo				

[illegible]

[illegible]

[illegible]

[illegible]

**Company:** Rechim S.r.l.  
**Project:** Generatore di energia da combustione

**Date:** 18/7/2025  
**Revision:** 00

**Node:** 5 - Stoccaggio ammoniaca soluzione  
**Process conditions:** Serbatoio atmosferico da 20 mc in bacino dedicato. Approvvigionamento da ATB, con piazzola di carico. Sistema a pioggia di diluizione vapori in emergenza.

[illegible]

**Company:** Rechim S.r.l.  
**Project:** Generatore di energia da combustione

**Date:** 18/7/2025  
**Revision:** 00

**Node:** 6 - Stoccaggio carbone attivo

**Process conditions:** Serbatoio di stoccaggio carboni attivi. Presenza di sensore di temperatura e sistema di inertizzazione con azoto per emergenza.

[illegible]



## IMPACT (DAMAGE)

Gravity	Impact Description	Accidents	Property Damage	Explosions or Fires	Environmental or Off Site Impacts
5	Extreme	Fatality or Multiple Serious Injuries/Illnesses (amputation, permanent disability)	More than \$500,000	Large explosion or fire involving entire site	Major off-site impact (vapor cloud explosion, fire, major toxic gas release, major off-site environmental release, fish kill)
4	Major	Serious Injury or illness (amputation, permanent disability) or Multiple Recordable Injuries/Illnesses	More than \$100,000 but less than \$500,000	Large explosion or fire involving majority of site	On-site or off-site environmental release to surface water
3	Moderate	Recordable Injury/Illness	More than \$25,000 but less than \$100,000	Medium fire involving portion of site	On-site or off-site environmental release to soil/ground or multiple odor or noise complaints from event
2	Minor	First Aid treatment only	More than \$5,000 but less than \$25,000	Small fire extinguished with fire extinguisher	One odor or noise complaint from event
1	Minimal	Irritation, minimal hazard	Less than \$5,000	Non-recordable fire (smoke, spark, etc.)	No off site impact

## LIKELIHOOD

Likelihood	Extent	Description
5	Certain	Very likely to occur. Event will happen in 1 year or less
4	Likely	Quite possible or not unusual. Event will happen between 1 to 10 years.
3	Infrequent	Unusual but possible. Event will happen between 10-100 years
2	Rare	Conceivably possible, but very unlikely to occur Event will happen 100-1000 years
1	Negligible	It has never happened or practically impossible. Event will happen 1000-10000 years

#### References list:

- [1] Layer of Protection Analysis: Simplified Process Risk Assessment, CCPS/AIChE, 2001.
- [2] Guidelines for Process Equipment Reliability Data, with Data Tables, CCPS/AIChE, 1989.
- [3] Handleiding Risicoberekening BEVI/purple Book, RIVM
- [4] ANSI/ISA 84.00.01-2004 (IEC61511-1 Mod), Functional Safety: Safety Instrumented Systems for the Process Industry Sector – Part 1, ISA, 2004.
- [5] On the basis of design calculations
- [6] American national standard safety code B20.1-1984
- [7] Data is based on industry consensus
- [8] IEEE Standard 493 1909
- [9] Reliability Data Book for Components in Swedish Nuclear Power Plants, RKS/SKI 85-25, 1987.
- [10] Swain, A. and Guttman, H., Handbook of Human Reliability Analysis with Emphasis on Nuclear Power Plant Applications, NUREG/CR-1278, 1983.
- [11] Considerations in human factors, appendix A of CCPS Guidelines for initiating events and independent protection layers, 2013 (HOLD)
- [12] New reference
- [13] Grossel, S., Deflagration and Detonation Flame Arresters, CCPS, 2002.
- [14] Guidelines for Safe and Reliable Instrumented Protective Systems (IPS), CCPS, 2007.
- [15] Guidelines for Pressure Relief and Effluent Handling Systems, CCPS, 1995.
- [16] ASME Code Pressure Relief Devices
- [17] API Publication 937 Evaluation of the Design Criteria for Storage Tanks with Frangible Roofs Joints, 1996.
- [18] NFPA 69 Standard on Explosion Prevention Systems, 2008.
- [19] API 2000/ISO 28300 Venting Atmospheric and Low-Pressure Storage Tanks, 2009 / API 221 Removal of Benzene from Refinery Wastewater, 1991.
- [20] Failure rate and event data for use within risk assessments, HSE – UK, 2012
- [21] PHA procedure, Chlor Alkali (draft)
- [22] Guidelines for Chemical Process Quantitative Risk Analysis 2nd ed, CCPS, 2000
- [23] Guide to Practical Human Reliability Assessment, Appendix II, Human-error data, B. Kirwan, CRC Press, 1994

Further references for detailed support in complex situations.

OREDA – Offshore reliability data"

EU JRC – "EIReDA"

Exida – "Safety equipment reliability handbook" RAC – "Automated Databook"

#### Additional References:

- [1] Guidelines for initiating events and independent protection layers, CCPS, Draft Edition, 2011
- [2] Guidelines for enabling conditions and conditional modifiers in layer of protection analysis, CCPS, 2014
- [3] Layer of protection analysis – Quantifying human performance in initiating events and independent protection layers, P.M. Myers, Journal of loss prevention in the process industry (2012)
- [4] Summary of the human error assessment and reduction technique, HSL- UK.
- [7] Guidelines for Preventing Human Error in Process Safety, CCPS, 1994
- [8] Guide to Practical Human Reliability Assessment, B. Kirwan, CRC Press, 1994
- [9] Procedural based controls in layer of protection analysis, R. Freeman, Process Safety Progress, vol. 27, no. 4 (2008).

RISK MATRIX

		Probabilità				
		1	2	3	4	5
Danno	1	1	2	3	4	5
	2	2	4	6	8	10
	3	3	6	9	12	15
	4	4	8	12	16	20
	5	5	10	15	20	25
Giudizio		Critical	High	Medium	Low	