



FUELS INDUSTRY
Association of South Africa

LEARNINGS – SAPREF HAZOP & LOPA Review

2024



Background

In Compliance with the new Major Hazardous Installation (MHI) regulations which came into effect in January 2023, SAPREF Island View (IV) Complex being an MHI installation, will need to be registered under the new regulations.

As part of the registration process a Safety Report must be compiled for IV. The Safety Report will include a full HAZOP and LOPA review for the complex.

The HAZOP covered our storage facilities at the various Sites, the loading facilities at the Berths, as well as the interconnecting pipelines between Sites and Berths.



Risk Assessment

The quantification of risk (Likelihood vs Severity) was done using a risk assessment Matrix as shown below:

SEVERITY	CONSEQUENCES				INCREASING LIKELIHOOD				
	People	Assets	Environment	Reputation	A	B	C	D	E
					Never heard of in the Industry	Heard of in the Industry	Has happened in the Organisation or more than once per year in the Industry	Has happened at the Location or more than once per year in the Organisation	Has happened more than once per year at the Location
0	No injury or health effect	No damage	No effect	No impact					
1	Slight injury or health effect	Slight damage	Slight effect	Slight impact					
2	Minor injury or health effect	Minor damage	Minor effect	Minor impact					
3	Major injury or health effect	Moderate damage	Moderate effect	Moderate impact					
4	PTD or up to 3 fatalities	Major damage	Major effect	Major impact					
5	More than 3 fatalities	Massive damage	Massive effect	Massive impact					



HAZOP Learnings

Sinking of Floating Roofs:

- Design window operating parameters were considered and controls in place to ensure operation within these limits. A gap was found in monitoring and maintaining the required Roof lifting speed of < 2m/hr to prevent roof tilt. Hazop and LOPA recommendation was to consider roof lifting speeds alarms.

Floating Roof Rim Seal fires:

- Whilst our floating roof tanks have double seals and flame eyes for fire detection, a recommendation was made to investigate lightning protection for these tanks. Lightning protection systems for floating roof petroleum storage tanks (FRTs) should do more than just intercept incoming lightning strikes, because an intercepted lightning strike is still likely to cause ignition of the tanks' contents. A completely effective lightning protection system (LPS) should be designed to protect against BOTH direct lightning strikes and the effects of nearby lightning strikes.

Blocked in Lines:

- IV Complex has long lengths of pipeline running between Sites and the Berths with multiple systems interconnecting. Due to operational requirements some systems were found to be blocked in, which could result in LOPC's due to Thermal Radiation. Some systems can be managed by creating an open path to Tanks or other relief systems. This would require certain valves in the system to be kept locked open to ensure an assured open path. Where open paths cannot be maintained due to operational constraints, thermal relief valves will be installed.

Berth Loading / Unloading:

- Whilst the loading arm systems have sophisticated safeguarding the Berth where bunkering is done still uses hose connections. LOPC and personnel safety risks were highlighted. Hose management processes in place sufficiently mitigated against LOPC risks however gaps were found on people safety.
- Jetty operators are at risk of putting themselves in the line of fire should there be a hose failure. Recommendations include installing ESD valve at the Jetty close to the hose with HZ activation at safe location while monitoring during loading and installing a protection barrier for the Jetty Operator.



LOPA Learnings

Following the HAZOP review a number of LOPA assessments were recommended to assess adequacy of safeguards in place in certain systems.

One area of concern was on the Mogas pump safeguarding systems. Cross company transfers leave the system vulnerable in case of blocked discharges, which could lead in overheating and damage to the pumps resulting in LOPCs and potential escalation to Fire.

With the following barriers in place, the LOPA assessment found the systems to be Tolerable (1×10^{-4}) but not ALARP (1×10^{-6}):

Control Barriers:-

- Spillback Control Valve
- Low Flow Alarms

Recovery Barriers:-

- Operator Surveillance
- Site Emergency Response

The Site currently has single seal systems on all pumps, and are experiencing seal failures on some of these systems.

Dual Seal pumps bring the risk to ALARP as per the LOPA criteria. A site initiative has thus been undertaken to convert all Light Hydrocarbon pumps to dual seals.



FUELS INDUSTRY
Association of South Africa

Thank You

2024