

Integrated Revalidation HAZOP/SIL Study: Lessons Learned

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> Background

- Life Cycle Model
- Study Scope & Scheme
- Lessons Learned

> Summary



- Process Hazard Analysis:
 - Hazard evaluation that identifies and analyzes the significances of hazardous situation associated with a process or activity.
- What is Revalidation?
 - Updating the results of initial PHA and identify, evaluate and attempt to control any newly introduced hazards.
- Industry Practices:
 - Initial PHA is typically performed during design stages.
 - Recent trends mandates frequent updates.
- Why Revalidation?
 - Changes on Field, Equipment & Personnel









Risk Assessment

Asset Integrity

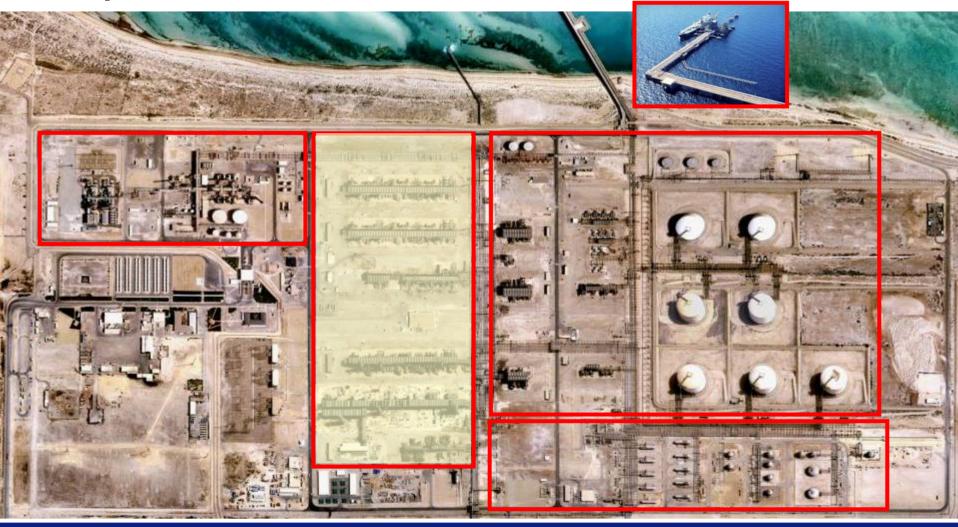
"A Process Hazard Analysis shall be performed on individual process node within a unit and on the entire unit at least every 5 years"



Ju'aymah NGL Fractionation



• Scope & Scheme:



JNGLF Study



-Analyzes process deviations on continuous nodes of operations.

HAZARD & OPERABILITY SAFETY INTEGRITY LEVEL

- Evaluates the reliability of ESD system loops and other Safety Instrumented Functions (SIFs) during operational demand.

JNGLF Study

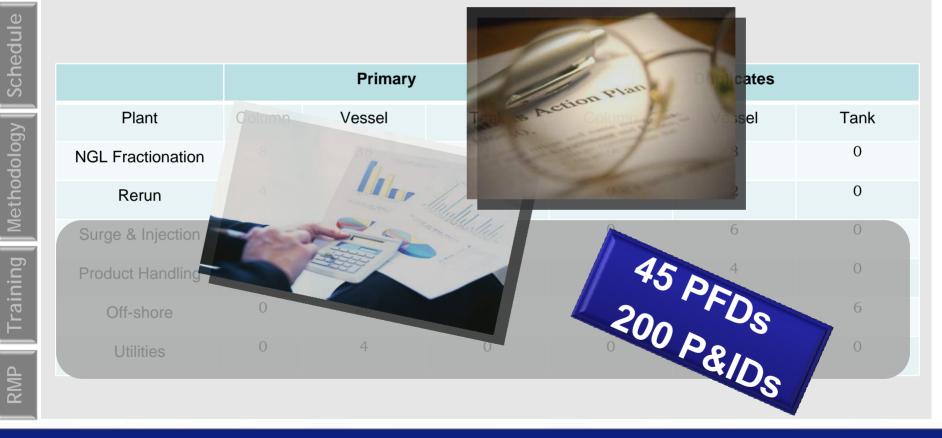
- Consultant: Consultant: ERSG, Australia



- Scope: HAZOP & SIL for 3 Fractionation modules, Rerun units and Auxiliary systems.
- Total Process 35 Nodes
 Nodes
- Start: October 3rd, 2009
- Finish: November 5th, 2009
 - Venue: JNLGF Training building
 - Team: 10 full-time & 3 part time
- Daily hours: 6-8 hrs



- Revalidation shall be business-driven.
- Process nodes estimation defines the roadmap.



Preparation



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- **Process nodes estimation defines the roadmap.**
- Success is determined by teamwork.



Preparation



- Revalidation shall be business-driven.
- Process nodes estimation defines the roadmap.
- Success is determined by teamwork.
- Key engineering documents shall be available.



Preparation

Schedule

Methodology

Training

RMP



- Clear study schedule helps to streamline activities.
- Daily plan & objectives supports team to focus.
- Spotting concerns engages management support.

4.0 <u>De-ethanizer Refrigerant System Unit :</u>

The De-ethanizer Refrigerant System Unit will be broken down in to the following Process Sub-Units – which will each undergo a detailed HAZOP guide word review:-

Node Number	Node description Reference P&ID				
Node Number	Node description	Reference Forth			
Node 2.1	Refrigerant flash drum R84- D-104	R84-A-NA-B44995 Sheet no: 006			
Node 2.2	Refrigerant compressor K.O drum R84-D-103	R84-A-NA-B44995 Sheet no: 006			
Node 2.3	Refrigerant compressor R84-K-101 process feed line	R84-A-NA-B44995 Sheet no: 007			
Node 2.4	Refrigerant compressor R84-K-101 process discharge line	R84-A-NA-B44995 Sheet no: 007 Nate: This includes recycle line refrigerant flash drum R84-D-18			
Node 2.5	Refrigerant compressor R84-K-101 steam turbine steam inlet / outlet	R84-A-NA-B44995 Sheet no: 007			
Node 2.6	Refrigerant accumulator R84-D-102	R84-A-NA-B44995 Sheet no: 008			
Node 2.7	Refrigerant condenser R84- E-104	R84-A-NA-B44995 Sheet no: 008			
Node 2.8	Refrigerant economizer R84-E-105 A/B	R84-A-NA-B44995 Sheet no: 008			

0	0	Task Name			Duration	Start		-	
1		JGP FRACTIONATIO	N HAZOP / SIL STUDY PROJECT				Finish	uarter 4th Quarter	1st.Qu
2		Meet to establish	h support structures		49.32 days	Tue 29 Sep '09	Sun 13 Dec '09	Aug Sep Oct Nov De	Jan Fe
1	-	ERS project	t management into session		1.5 days	Tue 29 Sep '09	Wed 30 Sep '09		1
4		Appointment of project manager			1.5 days	Tue 29 Sep '09	Wed 30 Sep '09		1
5		Appointment of project manager			0.5 days	Tue 29 Sep 109			1
6		Atoon	Context of Instances I in the		0.5 days	Tue 29 Sep 199	Tue 29 Sep '09		1
7		Appointment of technical facilitator (HAZOP / SIL) Project review and planning			0.5 days	Wed 30 Sep '09	Wed 30 Sep '09		1
1		Logistics			4.4 days		Wed 30 Sep '09		1
9					0.6 days	Wed 30 Sep '09	Wed 7 Oct '69	-	1
10	Plan logistical arrangements - visa, Rights, accontinedation Establish & equip op's room at JOP			0.3 days	Wed 30 Sep '09	Sat 3 Oct '09	1	1	
11	1	Plan roll ou			0.3 days 0.3 days	Wed 30 Sep 109	Wed 30 Sep '09		1
12		Plenon	Contracting of the			Wed 30 Sep '09	Sat 3 Oct '09		
83		Ottain	e communications strategy		0.9 days	Sat 3 Oct '09	Sun 4 Oct '09		
14		Procus	# HAZOP / SIL software		0.3 days	Sat 3 Oct 109		1	
15		Planting	e coucur / sil software		0.5 days	Sat 3 Oct 109	Sat 3 Oct '09		
16		Select	ession (On-site Activities Start)		0.1 days	Sun 4 Oct 109	Sun 4 Oct 109		
11					2.9 days	Sun 4 Oct '09	Sun 4 Oct 109		
10		Map is	Review P&ID's & split for Phases		0.2 days	Sun 4 Oct '09	Wed 7 Oct '09		
20		Set un	Map key words - HAZOP Bet un con		1 day	Sun 4 Oct '09	Sun 4 Oct '09		
20	-	Briat a	Bet up software - HAZOP / Sill, database Brief JOP HAZOP / Sill, database JOP Deserver		0.4 days	000 4 Oct 709	Mon 5 Oct 109	4	
22		JGP On-site HJ	AZOP / Sit learn		1 day	Mon 5 Oct 109	Tue 6 Oct '09	1 6	
25	_	Phase t: c	Contract In		0.3 days	Tue 6 Oct 109	Wed 7 Oct 09	E	
24	3	Proces	Conduct Phase 1 of HAZOP (SIL s) ss Engineer device	PISE shate 42.8 d	42.8 days	Wed 7 Oct 09	Wed 7 Oct '09	6	
8	-	Conce	the 4 has	de	42 days	Sat 10 Oct '09	Sun 13 Dec '09		
8	-	Apply	triveren of the second ender note	Boles	3 days	Sat 10 Oct '09	Sat 13 Dec '09		
7	+-	Identif	by causes a local deviations / iden	the house of	3 days	Sat 10 Oct '09	Sat 12 Dec '09		
71	+-	lowigh	V consequences, categorize (risk m)	ory macards	3 days	Tue 13 Oct 100	Tue 13 Oct '09		
=	1		n likelihood (mix matrix)	Mike.	3 days	Sun 18 Oct 'no	Sun 18 Oct '09	5	
			(risk matrix)			Wed 21 Oct Vol	Wed 21 Oct '09	1	
			Tasi		3 days	Tue 27 Oct You	Tue 27 Oct '09		
뇬	t age	HAZOR IN .	Stell		2 days	Sun 1 Nov '09	Sen 1 Nov You		
-	mice 17	HAZOP_BIL_Project		Rolled Up	Task		Tue 3 Nov 109	6	
			Progress	Rolled Up	Salt	Project	0	L L	
Rolled I									
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	and the second division of the second divisio			- united Up	Progress	Deadline			
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Schedule

Methodology

Training



- Unit breakdown avoids potential duplicates.
- Opportunities for optimization shall be invested.
- Visible P&ID for all team sets review unity.
- SIL integration minimized 50% of time and efforts.



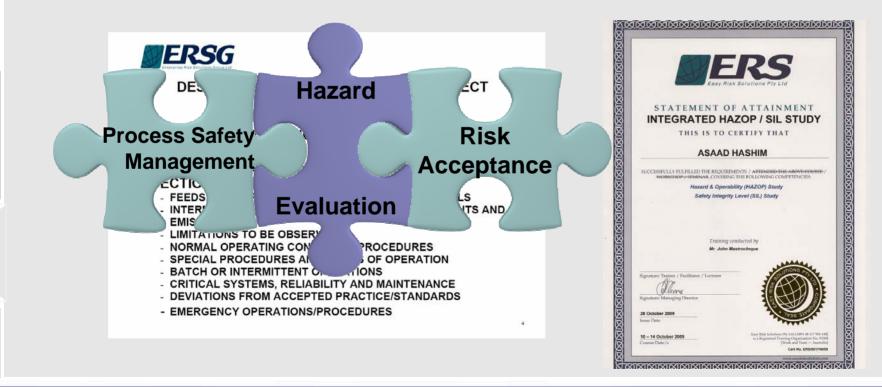
RMP

Schedule

Methodology



- Advantage for participants when trained on basics.
- Discussion participation shall be fostered.
- Opportunity for new engineer's learning.



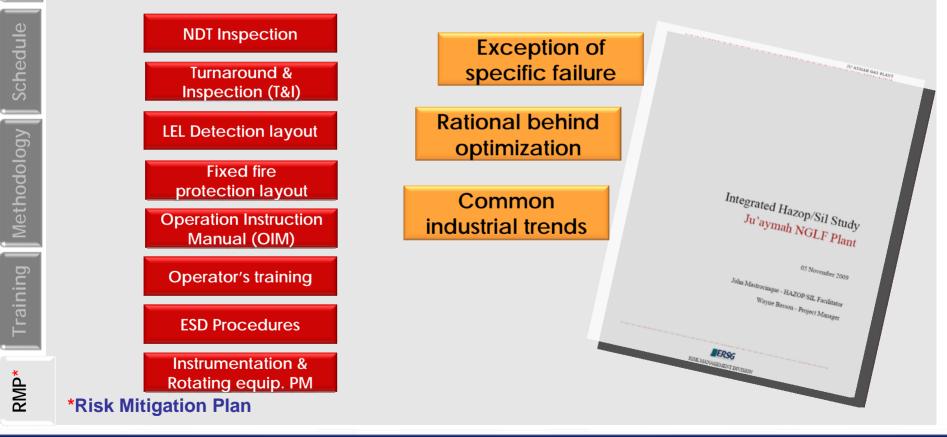
Methodology

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RMP



- Preparation
- **Report value is how helpful for Implementation team.**
- Attention is to be given for procedural systems.





- **Report value is how helpful for Implementation team.**
- Attention is to be given for procedural systems.
- Categorizing action plans addresses RMP priority.

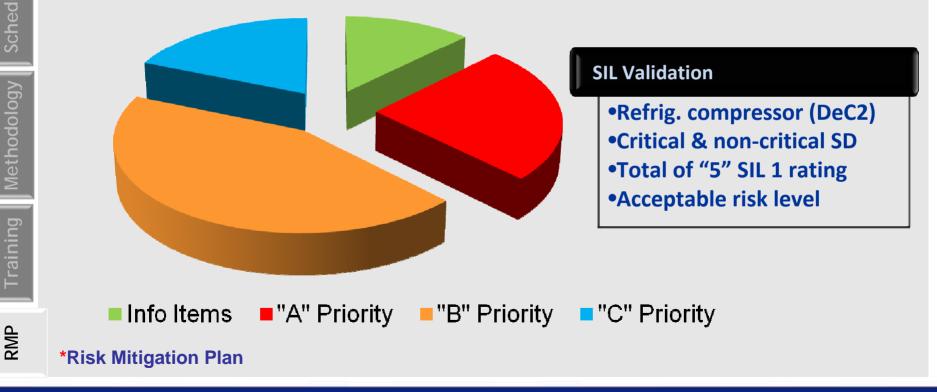
		Likelihood (that an injury will occur from the hazard)								
		Frequent > 1 per year	Occasional 1 in 5 years	Possible 1 in 30 years	Uncommon 1 in 100 years	Very rare 1 in 1000+ years				
	Catastrophic	High	High		High	Medium				
*	Fatality or Disability Injury	High	High		Medium	Medium				
Severity	Minor (Loss Time Accident)	High	Medium		Medium	Low				
Se	First Aid required	Medium	Medium		Low	Low				
	No injury or minor first aid required		Low							

RMP

*Risk Mitigation Plan



- oaratior
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- PHA revalidation would loose value if not driven by businessobjectives and management support.
- Ju'yamah NGL's scheme of integrated PHAs was successful to optimize time, efforts and assigning RMP.
- PHA is an opportunity for risk reducing and process learning specially for new engineers.
- Findings of retroactive SIL on existing facilities are likely to be minimum unless major upgrade occurs.
- Risk Mitigation Plan should be prioritized either qualitatively or quantitatively for implementation.





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