HAZOP METHODOLOGY

GENERAL

The HAZOP technique used in this study applied a combination of process parameters (such as flow, pressure, temperature) and guide words (such as no, less, more, reverse) to generate deviations from the design intent. The causes and consequences of each deviation were identified. Safeguards that can prevent or mitigate the hazard, and which are already provided in the design, were listed.

Actions were recommended to prevent or mitigate any residual hazard that was considered significant. The approach was systematically applied to all parts of a system such that safety and operability concerns on the complete system were identified.

The HAZOP method will be in line with the method outlined in project's HAZOP Procedure.

HAZOP PROCEDURE

The HAZOP process was divided into the following steps:

- Select the appropriate section of the plant (node);
- Define the node's design intent and process conditions;
- Apply the first/next parameter;
- Apply the first/next guide word, which when combined with the parameter will give the deviation;
- Determine (by brainstorming) all the potential cause of the deviation;
- Agree the credibility of each cause;
- Assess the consequences of each cause;
- Assess the protection provided against the causes and its consequences;
- Evaluate the likelihood of the net effect of consequence and protection;
- Agree a recommendation for action or further consideration of the problem;
- Apply the next guide word (relevant to the selected parameter);
- Apply the next parameter until they have been considered; and
- Move onto the next node of the system until the whole study has been examined.

At the start of the review, during the meetings, the appropriate Discipline Engineer described briefly how the system equipment is intended to operate. Then, the process deviations are examined for each node using the appropriate guide word in relation to the process aspects.

HAZOP Guidewords

	Deviation	Parameter	Guide Word
1.	Low/No Flow	Flow	Low/No
2.	More/High Flow	Flow	More
3.	Reverse/Misdirected Flow	Flow	Reverse/Misdirected
4.	High Pressure	Pressure	High
5.	Low Pressure	Pressure	Low
6.	High Temperature	Temperature	High
7.	Low Temperature	Temperature	Low
8.	High Level	Level	High
9.	Low Level	Level	Low
10.	Contamination/ Composition Change	Composition	As well as
11.	Service Failure		Other than
12.	Start-up/Shutdown	Start-up/Shutdown	Other than
13.	Maintenance	Maintenance	Other than
14.	Leak	Flow	As well as
15.	Corrosion	Corrosion	Other than
16.	Operation		Other than

RECOMMENDATIONS

Recommendations to enhance safety or operability of the facilities, and the organization(s) responsible for addressing these recommendations, were recorded in the worksheets. The category of each recommendation, will also be assigned in accordance with project HAZOP procedure.

Category of HAZOP Recommendation

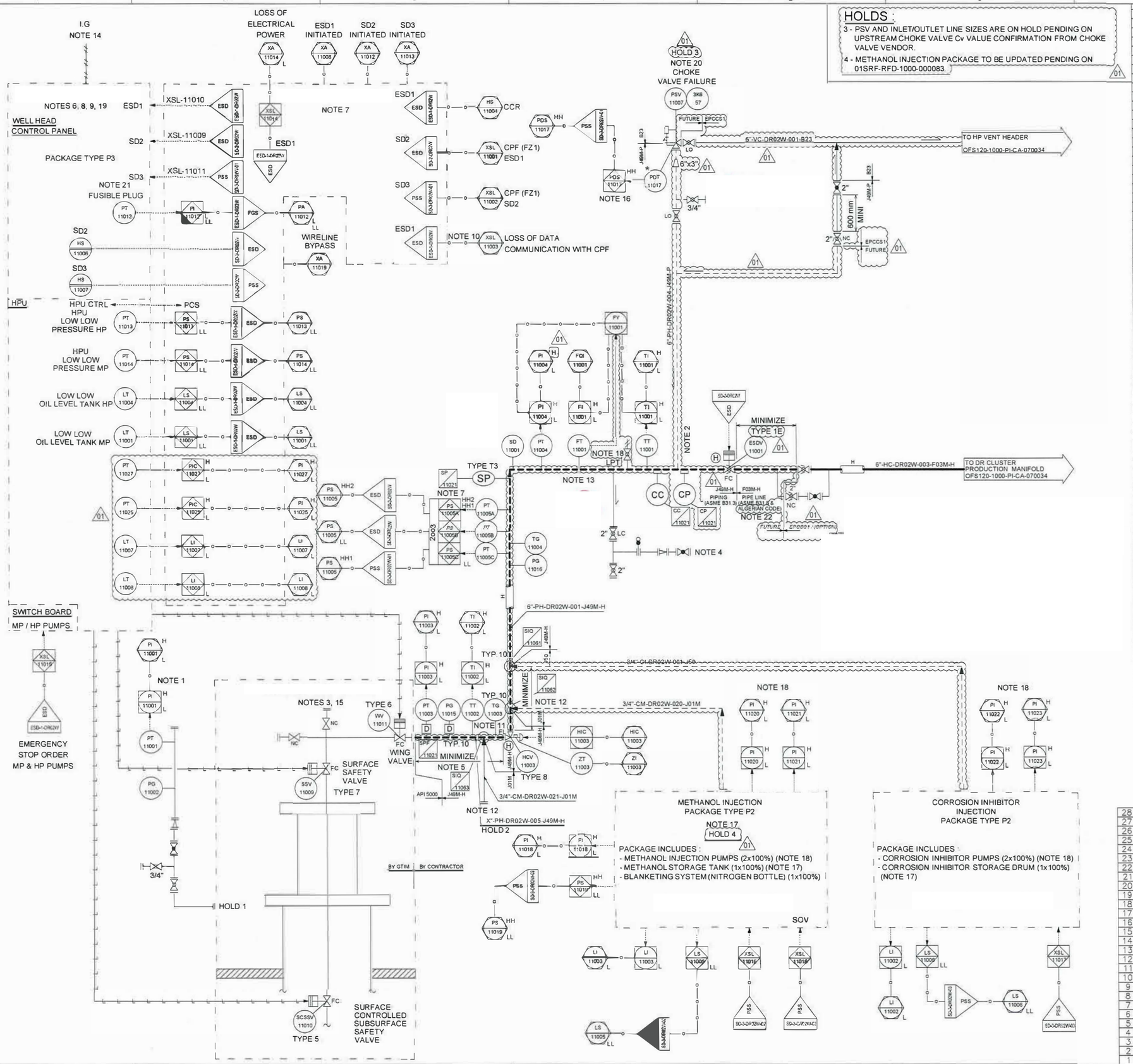
Category	Description	Remark
Category 1	**Critical and / or mandatory to safety** Related to safety and require action as soon as practicable for the system design, in the view of the HAZOP Team, to require urgent action from the project team	
Category 2	**Important issue and / or recommended by HAZOP team** For further action or amendment to design, to improve the operability or reduce the risk of the particular area under examination	
Category 3	**To be clarified or reviewed by Project Team** Require further procedures or study work from a specialist to check the possibility of potentially hazardous scenarios developing from a particular property deviation	
Category 4	**Drawing errors or document inconsistency** It is recommended that corrections are implemented before the next phase of the project	
Category 5	**Remark / clarification by HAZOP team - No further action required**	

RECOMMENDATIONS & FOLLOW-UP

HAZOP recommendations, will be dentified by the study team for resolution or further investigation. The HAZOP Actions Sheets are included in *EPC365 HAZOP monitor for follow-up..*

Typical List of HAZOP Recommendations

No.	Recommendations	Action By	Category
1.	Investigate if sizing the PSV11007 (and downstream piping/vents) taking into account the presence of mechanical stop on HCV11003 can be still considered an independent protection layer ensuring risk reduction factor of 100 (i.e. PSV fully independent from HCV11003 and fully effective).		Category 3
2.	Consider remote indication on DCS from sand detector SD11001 in order to ensure early detection of potential presence of sand that could lead to damage to wellhead and flowlines.		Category 3
3.	Preservation and Maintenance Procedure shall include the depressurization of the piping between HCV11003 and ESDV11001 before the removal of PSV11007 for maintenance. Verify if the depressurization is acceptable on the basis of project/ company philosophy.		Category 3
4.	Verify the requirements to provide double PSVs downstream of wellhead choke valve on the basis of Project and Company design philosophy.		Category 3
5.	Review the requirements to install double block and bleed systems on each instrument connection between HCV11003 and ESDV11001.		Category 3
6.	Deleted.		
7.	Verify the necessity to provide a small size bypass for pressurization of the test manifold.		Category 3
8.	Ensure that the safe position of the vent discharge also considers the noise level.		Category 3
9.	Ensure that operating procedures for pigging operations include the actions to be undertaken in case of blockage of flowline during pigging operations.		Category 3
10.	Emergency response procedures shall take into account the maximum duration of gas release from cluster area considering the inventory of gas that could be released.		Category 3
11.	Ensure that adequate means (procedural or engineering methods) is provided to detect small and medium leaks from clusters are provided.		Category 3
12.	Operation instructions to address actions to be undertaken by the operator in case of detection of no/less flow in the trunkline.		Category 3
13.	Operation instructions to address actions to be undertaken by the operator in case of detection of low temperature in the trunkline.		Category 3
14.	Operation instruction to include bacteria detection and analysis through sampling.		Category 3
15.	Estimate the expected duration of depressurization of each trunkline during the preparation for maintenance.		Category 3



NOTES

GENERAL NOTE :

- TO PREVENT GALVANIC CORROSION ON WET PIPING, FLANGED CONNECTION SHALL BE PROVIDED WITH INTERNAL CRA CLADDING ON THE CS FLANGE FACE AS PER GS-EP-COR-001.
- DR02W IS FUTURE WELL ONLY ENGINEERING IS PERFORMED BY CONTRACTOR.PROCUREMENT AND CONSTRUCTION ARE OUT OF CONTRACTOR'S SCOPE.

NOTES :

1 - CASING VENT LINE. DEPRESSURISATION OF ANNULUS BY FLEXIBLE CONNECTION TO LOCAL VENT HEADER (HOLD 1).
2 - DISTANCE TO BE MINIMISED BETWEEN CHOKE VALVE AND PSV INLET BRANCH LINE.
3 - WELLHEAD EQUIPMENT (INSIDE DOTTED LINE) AND INSTRUMENT DETAILS ARE INDICATIVE ONLY - SUBJECT TO FINAL ARRANGEMENT BY GTIM.
4 - DRAINAGE BY COMMON PORTABLE CLOSED DRAIN SKID. (000-UZ-13-01)
5 - DISTANCE SHALL BE LESS THAN 3m.
6 - TO LIMIT THE EFFORT OF SOUR AND FLARE RADIATION. THE OUTDOOR PANELS SHALL BE PROTECTED BY SHADES.
7 - PLC & TRANSMITTERS ARE CERTIFIED SIL 2.
8 - FOR DETAILS OF CONTROL AND SAFETY INTERFACE LINKS BETWEEN WHCP/HPU AND RTU REFER TO "SPECIFICATION-WELLHEAD CONTROL PANEL/HPU" (01SRF-OFS115-SP-JA-407000) AND "SPECIFICATION ICSS" (01SRF-TIMGEN-1000-SP-JA-405000).
9 - ESD LOGIC TO BE INHIBITED IN CASE OF WELL SERVICES OPERATIONS, AND ALARM TRIGGERED.
10 - ADJUSTABLE TIME DELAY ON ESD 1 IN CASE OF LOSS OF COMMUNICATION (12h).
11 - CHOKE VALVE INTERLOCKED WITH WV : -WV CLOSED ---> HCV TO 0%, -WV OPEN ---> PERMISSIVE TO OPEN HCV.
12 - DURING NORMAL OPERATION, METHANOL INJECTION DOWNSTREAM WELLHEAD CHOKE VALVE.
DURING START-UP, METHANOL INJECTION UPSTREAM WELLHEAD CHOKE VALVE USING PORTABLE SKID (RB-11-401).
13 - WET GAS FLOWMETER STRAIGHT LENGTH REQUIREMENT (UPSTREAM / DOWNSTREAM FLOWMETER) AS PER 01SRF-TIMGEN-1000-PI-CA-000006/000007.
14 - PRODUCTION GAS (MAXIMUM 57 barg) TO BE USED TO PRESSURIZE FUSIBLE PLUG (INSTRUMENT GAS) (ABOVE 5 barg). TAPPING POINT DOWNSTREAM CHOKE VALVE. OVERPRESSURE PROTECTION (PSV & PSHH) TO BE PROVIDED.
15 - X-TREE VALVES SEQUENCE : - CLOSING : WV ---> SSV --> SCSSV
- OPENING : SCSSV ---> SSV ---> WV
16 - PDT ON PILOT TO DETECT PSV OPENING. PDSHH 11017 WILL TRIGGER SD3.
17 - EACH TANK / DRUM IS, AS A MINIMUM, EQUIPPED WITH A VENT FITTED WITH FLARE ARRESTOR, A LEVEL GAUGE AND A LEVEL TRANSMITTER WITH A SWITCH LL.
18 - EACH PUMP IS SUPPLIED , AS MINIMUM, WITH A CALIBRATION POT, ONE DISCHARGE AND ONE SUCTION DAMPENER (IF NEEDED), ONE PSV WITH RETURN TO TANK , ONE CHECK VALVE PER PUMP AT PUMP DISCHARGE, ONE DISCHARGE PRESSURE TRANSMITTER WITH LOW AND HIGH ALARMS.
19 - THE WHCP VENDOR SHALL ENSURE WHCP SAFETY VALVES CANNOT BE BYPASSED BY LEAVING A MANUAL VALVE IN THE WRONG POSITION AFTER MAINTENANCE (INTERLOCK FOR INSTANCE).
20 - SPARE PSV TO BE STORED IN THE WAREHOUSE.
21 - VALVE PROVIDED ON FUSIBLE PLUG LOOP FOR LOCAL MANUAL INITIATION OF ESD1.
22 - "F03M" PIPE LINE CLASS SHALL START AT LEAST 10 METERS DOWNSTREAM OF THE CI INJECTION POINT.

GENERAL HOLDS :

A - PSV SIZING AND ARRANGEMENT TO BE FINALIZED AFTER PSV SELECTION.
B - RELIEF LINE SIZING UPSTREAM AND DOWNSTREAM RELIEF DEVICES TO BE PENDING CHOKE VALVE AND PSV VENDOR DATA.
C - PACKAGE PIPING AND INSTRUMENTATION INTERFACE DETAILS TO BE CONFIRMED BY VENDOR.
D - DRAIN LOW POINT AND VENT HIGH POINT LOCATION PENDING PIPING LAYOUT.
E - IF PSV INLET LINE SIZE IS INCREASED, ACCORDINGLY, CORRESPONDING MAIN LINE SIZE FROM CHOKE VALVE TO PSV INSTALLATION POINT WILL BE INCREASED

HOLDS :

1 - DEPRESSURISATION FACILITIES FOR THE CASING TO BE INFORMED
2 - CHOKE VALVE UPSTREAM LINE SIZE TO BE CONFIRMED PENDING ON 01-SRF-REC-1000-000131

LEGEND :

*TO BE PROVIDED BY VENDOR

REFERENCE DRAWINGS :

- PID'S SYMBOLS : 01SRF-TIMGEN-1000-PI-CA-000001 TO 000014.

Revision	Date	Status	Revision memo			
01	28-NOV-14	IFH	ISSUED FOR HAZOP	PDH	SMS	CKB
00	08 AUG-14	FA	ISSUED FOR APPROVAL	PDH	EHS	LHH

PIPING AND INSTRUMENTATION DIAGRAM PRODUCTION WELL

Doc Type PI	Syst./S-Syst. 11	Discipline CA	Class 1	Electronic Filename 01SRF-OFS115-1000-PI-CA-070021_rev 01.dwg	
Company Document N°			REV 01	Scale : NONE	
Contractor Document N°			FORMAT A1	Folio 1 of 1	

FILE: 01SRF-OFS115-1000-PI-CA-070021_rev 01.dwg

HAZOP Worksheet

Node: 1. Typical Production Well

Deviation	Cause	Consequence	Safeguards	Recommendations	Recommendation Category	Resp	Remark
1. Low/No Flow	1. No flow from production well.	1. Reduction in flowline pressure. Loss of production.					
	2. Spurious closure of SSV11009 or WV11011, due to hydraulic system failure/ inappropriate operations/ wellhead control panel failure/ etc.	1. Reduction in flowline pressure. Loss of production.					
	3. Spurious closure of HCV11003.	1. Loss of production.					
		2. Potential overpressurization due to shut-in pressure, leading to mechanical damage and loss of containment (LOC). However, rupture of piping is not credible because piping is rated for 239barg up to ESDV11003.	1. Piping up to ESDV11001 is rated for shut-in pressure (239barg).				
	4. Inadvertent closure of manual valve (NO valve) upstream of ESDV11001.	1. Loss of production.					
		2. Discharge of sour hydrocarbon (HC) gases through PSV11007 (set pressure 57barg). Environmental issues.	1. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV11007 is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				
			2. Safe location of vent discharge.				
		3. Potential overpressurization of flowlines due to shut-in pressure, leading to mechanical damage and loss of containment. However, rupture of piping is not credible because piping is rated for 239barg up to ESDV11003.	1. Piping up to ESDV11001 and pig launcher are rated for shut-in pressure (239barg).				
			2. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				
			3. PSHH2 11005A/B/C (2oo3) (HH2 set point is 57barg)downstream of HCV11003 initiating SD2-XXXXXW to close SSV11009 and ESDV11001. (SIF)				
	5. Spurious closure of ESDV11001.	1. Loss of production.	1. Discrepancy alarm on ESDV11001.				
		2. Potential overpressurization due to shut-in pressure, leading to mechanical damage and loss of containment.	1. Discrepancy alarm on ESDV11001.				
			2. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				
			3. Piping up to ESDV11001 is rated for shut-in pressure (239barg).				
		3. Ultimately leading to discharge of sour HC gases through PSV11007 (set pressure 57barg), leading to environmental issues.	1. Discrepancy alarm on ESDV11001.				
			2. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				

Node: 1. Typical Production Well

Deviation	Cause	Consequence	Safeguards	Recommendations	Recommendation Category	Resp	Remark
			3. Safe location of vent discharge.				
	6. Blockage in flowline, check valve or valves due to hydrate formation (up to ESDV11001).	1. Loss of production.					
		2. Potential overpressurization of flowlines due to shut-in pressure, leading to mechanical damage and loss of containment. However, rupture of piping is not credible because piping is rated for 239barg up to ESDV11003.	1. Intermittent methanol injection from Methanol Injection Pkg ABBN2W-UZ-11-301 downstream of HCV11003. (Also refer to Node 41 for deviations related to Methanol Injection System).				
			2. Piping up to ESDV11001 and pig launcher are rated for shut-in pressure (239barg).				
			3. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				
			4. PSHH2 11005A/B/C (2oo3) downstream of HCV11003 initiating 2oo3 logic SD2-XXXXXW to close SSV11009 and ESDV11001 (set point of 57barg). (SIF)				
		3. Discharge of sour HC gases through PSV11007 (set pressure 57barg), leading to environmental issues.	1. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.				
			2. Safe location of vent discharge.				
2. More/High Flow	1. Choke valve HCV11003 fails open (mechanical stop provided on HCV11003).	1. Potential overpressurization of flowline downstream of HCV11001, leading to mechanical damage and loss of containment. However, rupture of piping is not credible because piping is rated for 239barg up to ESDV11003.	1. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.	1. Investigate if sizing the PSV11007 (and downstream piping/vents) taking into account the presence of mechanical stop on HCV11003 can be still considered an independent protection layer ensuring risk reduction factor of 100 (i.e. PSV fully independent from HCV11003 and fully effective).	Category 3		1. fully effective? to be evaluated in SIL.
			2. PSHH2 11005A/B/C (2oo3) downstream of HCV11003 initiating 2oo3 logic SD2-XXXXXW to close SSV11009 and ESDV11001 (set point of 57barg). (SIF)				
			3. PSV11007 sized for choke valve failure case, considering the presence of mechanical stop on HCV11007 in accordance with API 521 4.4.8.3 (set pressure of 57barg).				
3. Reverse/Misdirected Flow	1. Refer to Node 2 Reverse Flow deviation.	1. Reduction in production.	1. Check valve provided downstream of HCV11003.				
4. High Pressure	1. Refer to More Flow.						
	2. Refer to No/Less Flow Causes 3-6.						
5. Low Pressure	1. Refer to No/Less Flow Causes 1&2.						
	2. Leak or rupture in downstream pipeline due to random causes.	1. Loss of containment of sour hydrocarbons, leading to potential fire/explosion.	1. PSLL 11005A/B/C (2oo3) downstream of HCV11003 initiating SD2-XXXXXW to close SSV11009 and ESDV11001. (SIF)				
6. High Temperature	1. High temperature of wellfluild.	1. Potential over-temperature of the	1. TAH11002 provided upstream of				1. Design temperature of

Node: 1. Typical Production Well

Deviation	Cause	Consequence	Safeguards	Recommendations	Recommendation Category	Resp	Remark
		flowlines, leading to damage of the coating and increased corrosion.	HCV11003. 2. TAH11001 provided downstream of HCV11003.				the system is 120degC. Operating temperature is 50degC.
7. Low Temperature	1. Low ambient temperature - blocked-in gas inventory due to isolation during winter season.	1. Hydrate formation in flowlines, leading to blockage in flowlines.	1. TAL11002 provided upstream of HCV11003. 2. TAL11001 provided downstream of HCV11003. 3. Intermittent methanol injection from Methanol Injection Pkg ABBN2W-UZ-11-301 downstream of HCV11003. (Also refer to Node 41 for deviations related to Methanol Injection System).				
8. High Level	1. Not applicable						
9. Low Level	1. Not applicable						
10. Contamination/ Composition Change	1. Human error - wrong chemical injected instead of corrosion inhibitor.	1. Impact on equipment due to increased rate of corrosion.	1. Operating procedures.				
	2. Human error - wrong chemical injected instead of methanol.	1. Increased hydrate formation probability. Also refer to Low Temperature.	1. Operating procedures.				
	3. Carryover of sand from wellhead.	1. Increased erosion, leading to damage to mainly the elbows and flowlines over a long period.	1. Sand detector SD11001 provided downstream of HCV11003 (no sand carryover is expected based on Design Basis).	2. Consider remote indication on DCS from sand detector SD11001 in order to ensure early detection of potential presence of sand that could lead to damage to wellhead and flowlines.	Category 3		
		2. Potential damage to the wellhead.	1. Sand detector SD11001 provided downstream of HCV11003 (no sand carryover is expected based on Design Basis).				
11. Service Failure	1. Loss of hydraulic oil due to failure of pumps or loss of oil in wellhead control panel.	1. Spurious change of valve positions. Refer to No/Low Flow Cause 2.					
	2. Loss of power.	1. Spurious change of valve positions. Refer to No/Low Flow Cause 2.					
	3. Loss of data communication through fibre optic.	1. Loss of control of process parameter in the wellhead area, leading to potential upset (safety systems are still available).	1. Automatic shutdown of the wellheads in case of loss of communication for over 12hr. 2. Fibre optic system is fully redundant (SIL2 by design).				
12. Start-up/Shutdown	1. Opening of HCV11003 during start-up operations.	1. Rapid temperature drop in piping downstream of HCV11003. Potential damage to piping leading to loss of containment(temperature can fall below -46degC which is the minimum design temperature).	1. Operating procedures - pressurization using N2 prior to start-up.				
13. Maintenance	1. Maintenance of PSV11007.	1. Necessity to shut down the wellhead in order to remove the operating PSV and replace with the spare in warehouse, resulting in loss of production.	1. Spare PSV available in warehouse to reduce logistics time and minimize impact on production.	3. Preservation and Maintenance Procedure shall include the depressurization of the piping between HCV11003 and ESDV11001 before the removal of PSV11007 for maintenance. Verify if the depressurization is	Category 3		

Node: 1. Typical Production Well

Deviation	Cause	Consequence	Safeguards	Recommendations	Recommendation Category	Resp	Remark
				acceptable on the basis of project/ company philosophy.			
		2. Gas trapped within HCV11003 and ESDV11001 with the potential for overpressurization in case of external fire (during maintenance).	1. Preservation and Maintenance Procedure provided.	4. Verify the requirements to provide double PSVs downstream of wellhead choke valve on the basis of Project and Company design philosophy.	Category 3		
	2. Maintenance of instruments downstream of HCV11003 at wellhead area.	1. Potential high pressure downstream of HCV11003 in case of simultaneous malfunction of HCV11003 and PSV11007 unavailable. Maximum pressure that can be reached in case of HCV11003 malfunction is around 63barg provided that PSV11007 is available. In case of PSV11007 not available and PSHH11005 available, gas can be trapped between ESDV11001 and HCV11003 with a maximum pressure of 239barg. The system between HCV11003 and ESDV11001 is rated for 239barg. Hence, no issue is expected from mechanical integrity point of view. Hazards for operators can be observed if maintenance of instruments is required under this double jeopardy situation. (Based on COMPANY specification, double block and bleed is not required for the case of operating pressure not exceeding 70barg.)	1. Preservation and Maintenance Procedure (local pressure gauge provided).	5. Review the requirements to install double block and bleed systems on each instrument connection between HCV11003 and ESDV11001.	Category 3		
14. Leak	1. Refer to Low Pressure Cause 2.						
	2. Corrosion due to presence of sour gas (H2S, CO2) and bacteria.	1. Potential damage of piping over a long period, resulting in loss of containment.	1. Injection of corrosion inhibitor at wellheads.				
	3. Leak through PSV11007.	1. Discharge of sour HC gases through PSV11007 leading to environmental issues.	1. Safety fence provided around the wellhead.				
		2. Loss of production due to PSV maintenance. Refer to Deviation Maintenance.					

		SHEET:	
		DATE:	
	HAZOP ACTION SHEET	Category:	Category 3
HAZOP Team:			
No.: 1	Node: 1. Typical Production Well		
Reference Drawings		Action led by:	

Deviation:

1. Low/No Flow; 2. More/High Flow; 3. Reverse/Misdirected Flow; 4. High Pressure; 5. Low Pressure; 6. High Temperature; 7. Low Temperature; 8. High Level; 9. Low Level; 10. Contamination/ Composition Change; 11. Service Failure; 12. Start-up/Shutdown; 13. Maintenance; 14. Leak

Causes:

.. Choke valve HCV11003 fails open (mechanical stop provided on HCV11003).

Consequences:

1. Potential overpressurization of flowline downstream of HCV11001, leading to mechanical damage and loss of containment. However, rupture of piping is not credible because piping is rated for 239barg up to ESDV11003.

Safeguards:

1. PSHH1-11005A/B/C (2oo3) (HH1 set point is 52barg while the PSV is set at 57barg) downstream of HCV11003 initiating SD3-XXXXXW to close WV11011.; 2. PSHH2 11005A/B/C (2oo3) downstream of HCV11003 initiating 2oo3 logic SD2-XXXXXW to close SSV11009 and ESDV11001 (set point of 57barg). (SIF); 3. PSV11007 sized for choke valve failure case, considering the presence of mechanical stop on HCV11007 in accordance with API 521 4.4.8.3 (set pressure of 57barg).

Recommendation:

1. Investigate if sizing the PSV11007 (and downstream piping/vents) taking into account the presence of mechanical stop on HCV11003 can be still considered an independent protection layer ensuring risk reduction factor of 100 (i.e. PSV fully independent from HCV11003 and fully effective).

SECL Response:

Mechanical stopper will not be considered PSVs are designed considering the rated flow of choke valve without mechanical stopper.

GTIM Comments:		
C.M: OK PRO: Agree.	☑ Agree ☐ Agree with comments ☐ Disagree ☐ To be followed	Endorsed by: Signed: Date:

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