

Project: Refinery Expansion	Rev.1 by JB
SUMMARY 2 OF SIL VERIFICATION	

No.	SIF Tag / Description	TARGET		ACHIEVED			SIL achieved						Parameters						
		SIL	RRF	SIL	RRF	PFDavg/PFH	SIF			Arch. C.	Per subsystem			Cpt	TI(y)	LT(y)	Beta	MTR _{DD}	
		Pr.	AC	SC	Route	SE	LS	FE	SE1>	SE1>	FE1>	FE2>							
1	M4-LT-1111-01	SIL-1	20	SIL-1	56	1,79E-02	1	1	2	1H/2H	2	3	1	SE1>	95%	1	15		48
	On High High Level (LT-1) [1oo1] in Tank 100-1111 close valve XV-1 [1oo1]	MTTFS	10	MTTFS	71									SE1>					
2	M4-LT-1112-01	SIL-1	20	SIL-1	371	2,70E-03	2	1	2	1H	1	3	2	SE1>	95%	1	15		48
	On High High Level (LT-1) [1oo1] in Tank 100-1111 close valve XV-1A/B [1oo2]	MTTFS	10	MTTFS	47									SE1>					
3	M4-LT-1212-01	SIL-2	200	SIL-2	459	2,18E-03	2	2	2	1H	2	3	2	SE1>	95%	1	15	5%	48
	On High High Level (LT-1A/B) [1oo2] in Tank 100-1111 close valve XV-1A/B [1oo2]	MTTFS	10	MTTFS	44									SE1>					
6	M4-PT-2312-06	SIL-2	200	SIL-2	459	2,18E-03	2	2	3	1H	2	3	2	SE1>	94%	1	15	5%	48
	On High High Pressure (PT-6A/B/C) [2oo3] in Vessel 100-2312 close valves XV-6A/B [1oo2]	MTTFS	10	MTTFS	49									SE1>					
7	M4-PT-2312-06B	SIL-2	200	SIL-2	459	2,18E-03	2	2	3	1H	2	3	2	SE1>	94%	1	15	5%	48
	On High High Pressure (PT-6A/B/C) [2oo3] in Vessel 100-2312 close valves XV-6A/B [1oo2].	MTTFS	10	MTTFS	49									SE1>					
8	M4-PT-2312-06SS	SIL-2	200	SIL-2	227	4,40E-03	2	2	3	1H	2	3	2	SE1>	95%	1	15	5%	48
	[Severe Service Case] On High High Pressure (PT-6A/B/C) [2oo3] in Vessel 100-2312 close valves XV-6A/B [1oo2]	MTTFS	10	MTTFS	49									SE1>					
10	M4-PS-1112-10	SIL-2	200	SIL-1	239	4,19E-03	2	1	3	1H	1	3	2	SE1>	90%	1	15		
	On High High Pressure [1oo1] in Vessel close valves XV-6A/B [1oo2]	MTTFS	10	MTTFS	46									SE1>					

Pr: Probability of failure
 AC: Architectural Constraints
 SC: Systematic Capability
 SE: Sensor FE: Final Element

SFF: Safe Failure FrEtion
 DC: Diagnostic Coverage=DD/(DD+DU)
 RRF: Risk Reduction FFEtor
 MTTFS in years: Mean Time To Fail Spuriously

■ SIL, RRF, MTTFS are achieved ■ SIL & RRF targets are not achieved ■ MTTFS target is not achieved

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No.	SIF Tag / Description	TARGET		ACHIEVED			SIL achieved						First two sensors and actuators							
		SIL	RRF	SIL	RRF	PFDavg/PFH	SIF			Arch. C. Route	Per subsystem			Parameters						
							Pr.	AC	SC		SE	LS	FE	Cpt	TI(y)	LT(y)	Beta	MTTR _{DD}		
11	M4-PT-1112-10 On High High Pressure [1oo1] in Vessel close valves XV-6A/B [1oo2]	SIL-2	200	SIL-2	392	2,55E-03	■	2	2	3	1H	2	3	2	SE1>	90%	1	15		
		MTTFS	10	MTTFS	47										SE1>					
13	M4-PTTT-1212-13 On High Pressure PT-10 [OR] High Temperature TT-10 [1oo2] in Vessel close valves XV-6A/B [1oo2]	SIL-2	200	SIL-2	469	2,13E-03	■	2	2	3	1H	2	3	2	SE1>	90%	1	15	1%	48
		MTTFS	10	MTTFS	37										SE1>	98%	1	15	1%	48
16	M4-PT-1112-16 On High High Pressure (PT-1) [1oo1] in Vessel close valves XV-16A/B [1oo2]	SIL-1	20	SIL-0	146	6,87E-03	■	2	0	2	1H	0	3	2	FE1>	73%	1	15	10%	48
		MTTFS	10	MTTFS	47										FE2>					
17	M4-PT-1112-16-CMP On High High Pressure (PT-1) [1oo1] in Vessel close valves XV-16A/B [1oo2] (90% credit by comparison used for PT-1 by comparing with PT-2 of BPCS)	SIL-1	20	SIL-2	252	3,97E-03	■	2	2	2	1H	2	3	2	SE1>	74%	1	15		48
		MTTFS	10	MTTFS	47										SE1>					
19	M4-PT-1111-19 High High Pressure on PT closes feed valve. Calculation of Bypass impact	SIL-1	20	SIL-1	48	2,08E-02	■	1	1	3	1H	1	3	1	FE1>	73%	1	15	10%	48
		MTTFS	10	MTTFS	72										FE2>					
20	SIF-20 On High High Pressure (PT-6A/B/C) [2oo3] in Vessel 100-2312 close valves XV-6A/B [1oo2]. Calculation of Bypass impact	SIL-2	200	SIL-2	459	2,18E-03	■	2	2	3	1H	2	3	2	SE1>	94%	1	15	5%	48
		MTTFS	10	MTTFS	49										SE1>					
30	M5-FT-2312-30 On Low Low Air Combustion Flow (FT-30A/B/C) [2oo3] in Incinerator 100-2312 closes Fuel Gas Valves (1oo2 XV-30/31) & Natural Gas Valves (1oo2 XV-32/33) [2oo2 of FG & NG]	SIL-2	200	SIL-2	244	4,11E-03	■	2	2	3	1H	3	3	2	FE1>	73%	1	15	10%	48
		MTTFS	10	MTTFS	28										FE2>	73%	1	15	10%	48

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