

ภาคผนวก ข.2-2

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ตัวอย่างผลการศึกษา HAZOP ยกตัวอย่างเฉพาะการล้นถัง T-200 (SM Tank)

## PTTGC HAZOP Worksheet

**Company:** GC styrenics company

**Location:** GCS plant

**Unit:** Storage Tank

**Study Date:** 21/9/2021

**Node description:** Node T3 T200 storage tank including unloading SM

**Design Intention:** Styrene monomer from TTT to T200 and transfer to process and unloading to truck

**Design condition:** Pressure (-0.005)-(0.02) kg/cm2, Temperature 40 °C , Level Max98%

**Operating condition:** Pressure 0 kg/cm2, Temperature 40 °C , Level 30-95%

**Drawings:** PS1-011-01 (Rev 13)

Parameter	Deviation	Possible Causes	Potential Consequences	Without Safeguard					Existing Safeguards	With Existing Safeguard					Recommendation		
				L	Severity				RR	Existing Safeguards	L	Severity				RR	Recommendation
					P	En	Ec	S				P	En	Ec	S		
Flow	No Flow	1. LIT-T200 malfunction (Reading High actual low)	1. Interlock working to stop transfer SM inlet to T-200 2. P-200 loss suction 3. Pressure Discharge pump P-200 low  4. No SM feed to process 5. Process condition swing 6. Product out off specification	3	1	1	3	1	M	1. Level back up LI-T200A 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. PM plan LIT-T200 4 years calibration and 3 years function test	2	1	1	3	1	L	Change tag no. LIT-T100 to LIT-T200 in P&ID
		2. P-200A/B fail	1. No SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. Pressure Discharge pump P-200 low 4. Process condition swing 5. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. Stand by pump 6. PM plan P-200A/B 1 month visual	2	1	1	3	1	L	
		3. CV-T200P malfunction close	1. Interlock working to stop transfer SM inlet to T-200 2. P-200 loss suction 3. Pressure Discharge pump P-200 low 4. No SM feed to process 5. Process condition swing 6. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm L,LL 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. PM plan CV-T200P 8 years overhual and 1 year function test	2	1	1	3	1	L	
		4. Inlet line to T200 fully plug	1. No SM to T-200 2. Level T-200 Low 3. P-200 loss suction 4. Pressure Discharge pump P-200 low 5. No SM feed to process 6. Process condition swing 7. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm L,LL 2. FT-TTT/FT-GCS alarm L,LL 3. WI W-(P-PS-OP)-020 for SM receiving	2	1	1	3	1	L	

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Parameter	Deviation	Possible Causes	Potential Consequences	Without Safeguard						Existing Safeguards	With Existing Safeguard						Recommendation		
				L	Severity					RR	Existing Safeguards	L	Severity					RR	
					P	En	Ec	S	P				En	Ec	S				
		5. Outlet line to process fully plug	1. No SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. Pressure Discharge pump P-200 high 4. Process condition swing 5. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. WI (W-(P-PS-OP)-048) for moving SM during CD	2	1	1	3	1	L			
		6. Outlet line to truck fully plug	1. Level T-200 high (During top up SM from TTT/DOW) 2. No SM to truck	3	1	1	1	1	L	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. By pass line 6. WI (W-(P-PS-OP)-020) for unloading SM	2	1	1	1	1	V			
		7. XV-T200C malfunction close	1. No SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. P-200 loss suction 4. Pressure Discharge pump P-200 low 5. Process condition swing 6. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. PM plan XV-T200C 1 year function test and 8 years overhaul	2	1	1	3	1	L			
		8. FX-T200 damage	1. No SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. P-200 loss suction 4. Pressure Discharge pump P-200 low 5. Process condition swing 6. Product out off specification 7. LOPC 8. Emergency shutdown 9. Styrene monomer to ATM 10. High smell and affect long term to people and single fatality 11. Fire case	3	4	4	5	4	H	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. Pre-incident plan 6. Emergency response procedure No. P-(Q-SH-CM)-001 7. Gas detector (1AE-13/14) 8. Bund 9. PM plan FX-T200 2 years visual examination check and 15 years change	2	4	4	3	4	M			
	Low Flow	1. LIT-T200 malfunction (Reading High actual low)	1. Interlock working to stop transfer SM inlet to T-200 2. P-200 loss suction 3. Pressure Discharge pump P-200 low  4. Low SM feed to process 5. Process condition swing	3	1	1	3	1	M	1. Level back up LI-T200A 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. PM plan LIT-T200 4 years calibration and 3 years function test	2	1	1	3	1	L			
		2. CV-T200P malfunction close	1. Interlock working to stop transfer SM inlet to T-200 2. P-200 loss suction 3. Pressure Discharge pump P-200 low 4. Low SM feed to process 5. Process condition swing 6. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm L,LL 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. PM plan CV-T200P 8 years overhaul and 1 year function test	2	1	1	3	1	L			

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Parameter	Deviation	Possible Causes	Potential Consequences	Without Safeguard						Existing Safeguards	With Existing Safeguard						Recommendation
				L	Severity				RR	Existing Safeguards	L	Severity				RR	
					P	En	Ec	S				P	En	Ec	S		
		3. Inlet line to T200 partial plug	1. Low SM to T-200 2. Level T-200 Low 3. P-200 loss suction 4. Pressure Discharge pump P-200 low 5. Low SM feed to process 6. Process condition swing 7. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm L,LL 2. FT-TTT/FT-GCS alarm L,LL 3. WI (W-(P-PS-OP)-020 ) for SM receiving	2	1	1	3	1	L	
		4. Outlet line to process partial plug	1. Low SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. Pressure Discharge pump P-200 high 4. Process condition swing 5. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. WI (W-(P-PS-OP)-048) for moving SM during SD	2	1	1	3	1	L	
		5. Outlet line to truck partial plug	1. Level T-200 high (During top up SM from TTT/DOW) 2. low SM to truck	3	1	1	1	1	L	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. By pass line 6. WI (W-(P-PS-OP)-020 ) for unloading SM	2	1	1	1	1	V	
		6. Strainer suction pump P-200 plug	1. P-200 loss suction 2. Low SM feed to process 3. Level T-200 high (During top up from TTT/DOW) 4. Pressure Discharge pump P-200 low 5. Process condition swing 6. Product out off specification	3	1	1	3	1	M	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. Pump stand by	2	1	1	3	1	L	
		7. FX-T200 leak	1. low SM feed to process 2. Level T-200 high (During top up from TTT/DOW) 3. P-200 loss suction 4. Pressure Discharge pump P-200 low 5. Process condition swing 6. Product out off specification 7. LOPC 8. Emergency shutdown 9. Styrene monomer to ATM 10. High smell and affect long term to people 11. Fire case	3	4	4	5	4	H	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Interlock no. INT-006 3. FT-TTT/FT-GCS alarm L,LL 4. CV-T200P/CV-T200 alarm status close 5. Pre-incident plan 6. Emergency response procedure No. P-(Q-SH-CM)-001 7. Gas detector (1AE-13/14) 8. Bund 9. PM plan FX-T200 2 years visual examination check and 15 years change	2	4	4	3	4	M	
		8. FT-TTT/FT-GCS malfunction (Reading high actual low)	1. Level T-200 low	4	1	1	1	1	L	1. Level LI-T200A and LIT-T200 alarm L,LL 2. Flow back up FIQ-DOW	3	1	1	1	1	L	

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				L	Severity				RR	Existing Safeguards	L	Severity				RR	Recommendation		
					P	En	Ec	S				P	En	Ec	S				
	More Flow	1. FT-TTT/FT-GCS malfunction (Reading low actual high)	1. Level T-200 high 2. CV-T200P close	4	1	1	1	1	L	1. Level LI-T200A and LIT-T200 alarm H,HH 2. Flow back up FIQ-DOW	3	1	1	1	1	L			