Company: Smith's Company
Facility: Ammonia Refrigeration System

Session: 1 09-28-93 Revision: 0 - -
System: 1 Ammonia Refrigeration System
Subsystem: Ultra Low Vessel Dwg#: 606A

WHAT IF...	HAZARD	CONSEQUENCES	SAFEGUARDS	S	L	R	RECOMMENDATIONS	BY
1. Corrosion of vessel, piping, instrumentation	Potential release of ammonia from leak point	Potential release of ammonia into the engine room	Ultra low vessel operating parameters will be logged by operators every four hours; small leak should be detected during logging procedures Ammonia detector in engine room; detector will alarm in control room and start ventilation fans automatically when setpoint (100 ppm) is reached	1	4	4	: No recommendations	
2. Drain valve open/leaking on ultra low vessel	Potential release of ammonia from leak point	Potential release of ammonia into the engine room	Drain valve contains a plug Ultra low vessel operating parameters will be logged by operators every four hours; leak should be detected during logging procedures Ammonia detector in engine room; detector will alarm in control room and start ventilation fans	2	3	6	Consider ensuring that the operating engineer regularly checks that caps and plugs are on placed on drain valves in the ammonia refrigeration system	CFT

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			automatically when setpoint (100 ppm) is reached					
3. Manual valve or hand expansion valve closed in liquid supply line to ultra low vessel	Low levels could develop in ultra low vessel	Potential damage to ultra low pump due to cavitation	Sight glass provided on ultra low vessel Ultra low vessel operating parameters (including level) will be logged by operators every four hours; microprocessor continuously logs and trends process variables Low level alarm/shutoff (LSL-100) alarm will automatically stop ultra low pumps	3	3	7	: No recommendations	
4. Failure of level control system (LCV-101) (for example, oil in level probe or instrument not properly calibrated)	Low levels could develop in ultra low vessel	Potentially damage to ultra low pump due to cavitation	Sight glass provided on ultra low vessel Ultra low vessel operating parameters (including level) will be logged by operators every four hours; microprocessor continuously logs	3	3	7	: No recommendations	

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			and trends process variables Low level alarm/shutoff (LSL-100) alarm will automatically stop ultra low pumps					
	High levels could develop in ultra low vessel	Slug of liquid could be sent to ultra low compressors, which could damage the compressors	Noise on compressor caused by slug of liquid would provide indication of liquid carryover - operators would respond to problem once noise is observed Low lube oil temperature cutout and alarm may detect problem before compressor damage results High level switch (LSH-102) will automatically shut down ultra low compressors if high levels develop in ultra low vessel (switch is independent of LCV-101)	2	3	6	: No recommendations	

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5. Manual valve open in level control system by-pass line	High levels could develop in ultra low vessel	Slug of liquid could be sent to ultra low compressors, which could damage the compressors	Noise on compressor caused by slug of liquid would provide indication of liquid carryover - operators would respond to problem once noise is observed Low lube oil temperature cutout and alarm may detect problem before compressor damage results High level switch (LSH-102) will automatically shut down ultra low compressors if high levels develop in ultra low vessel (switch is independent of LCV-101)	2	3	6	: No recommendations	
6. High compressor suction pressures	Higher pressure could develop in ultra low vessel	No safety or environmental consequences since unlikely to overpressure ultra low vessel (operability issue)	Pressure rating of ultra low vessel (150 psig) is above high pressure shutdown setpoint for ultra low compressors (100 psig)	4	3	8	: No recommendations	
7. Low compressor	None	No safety or	Ultra low vessel	4	3	8	: No recommendations	

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suction pressures		environmental consequences (operability issue)	is rated for full vacuum					
8. Manual valve closed in pump suction line	Ultra low suction pump could cavitate	Potentially damage to ultra low pumps	Ultra low vessel operating parameters will be logged by operators every four hours; microprocessor continuously logs and trends process variables Pressure gauge in common pump discharge line Manual valves in pump suction lines are only closed for maintenance operations; maintenance operations are covered by lockout/tagout procedures	3	3	7	: No recommendations	
9. Manual valve closed in pump discharge line	Potentially develop high pump discharge pressures	Potentially overpressurize system, which could lead to an ammonia release in the engine room	Pressure regulator (vented back to ultra low vessel) provided in pump discharge line Pressure safety valve on discharge of pump P-1B which vents to the ultra	1	4	4	Consider providing a pressure relief valve on the discharge of pump P-1A	PJP

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			low vessel Ultra low vessel operating parameters will be logged by operators every four hours (Including pump pressure) Manual valves in pump discharge lines are only closed for maintenance operations; maintenance operations are covered by lockout/tagout procedures					
10. Malfunction of pressure regulator in pump discharge line	Potentially develop high pump discharge pressures (if regulator does not open on high pump discharge pressures)	Potentially overpressurize system which could lead to an ammonia release in the engine room	Ultra low vessel operating parameters will be logged by operators every four hours (including pump pressure) Pressure safety valve on discharge of pump P-1B which vents to the ultra low vessel	1	3	3	: See recommendation identified in previous scenario concerning installing a pressure safety valve for pump P-1A	
	Low pump discharge pressures could develop	No safety or environmental		4	3	8	: No recommendations	

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	(if regulator opens prematurely)	consequences (operability issue)						
11. Manual valve closed in pump pressure regulator line	Potentially develop high pump discharge pressures	Potentially overpressurize system which could lead to an ammonia release in the engine room	Ultra low vessel operating parameters will be logged by operators every four hours (including pump pressure) Pressure safety valve on discharge of pump P-1B	1	3	3	Consider car sealing (open) the manual valves in the pump pressure regulator line	CFT
12. Pump stops (due to either mechanical failure or failure of low level switch (LSL-100))	Loss of flow to evaporators	No safety or environmental consequences (operability issue)		4	2	7	: No recommendations	
13. Leaking pressure safety valve on ultra low vessel (PSV-001A/B)	Potential release of ammonia from PSVs	Potential ammonia release to the atmosphere	PSV's covered by mechanical integrity program Ultra low vessel operating parameters will be logged by operators every four hours; release should be detected during rounds	2	3	6	: No recommendations	
14. Leaking pressure safety valve in pump discharge line (PSV-002)	Low pump discharge pressures could develop	No safety or environmental consequences (operability issue)	PSV's covered by mechanical integrity program	4	3	8	: No recommendations	