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Operation of Ammonia High Pressure Receiver HPR-1

Company Name	Section Number: TBD	Page 1
Process Safety Management	PSM/Standard Operating Procedures/Review/Revision/ HPR-1	
Prepared by: PSM Coordinator		Revision Date: 0/00
Revision Approved by: Plant Engineer		Issue Revision

Objective:	This procedure is designed to describe the Technical Operating Specifications (TOS), and to set down the Standard Operating Procedures for the safe operation of Ammonia High Pressure Receiver 1 (HPR-1).
Purpose:	The purpose of the TOS is to provide a description of the High Pressure Receiver, to define the function of the receiver, its operating conditions and limits, and consequences of deviation from these limits; To describe controls and instrumentation and safety systems, and set operating alignments. The purpose of the Standard Operating Procedure (SOP) is to set down the proper steps for starting, monitoring normal operation, and stopping and restarting the Receiver under normal and emergency conditions.
Concerns:	Very Careful attention to valve positions, temperature, and pressure levels is extremely important to the successful completion of these procedures. Deviations from normal operating limits could cause personal injury or death, small to catastrophic release of ammonia or environmental damage, or evacuation of, or injury to, members of the public. We seek to prevent incidents such as: ▪ Injury to operators and others in the area. ▪ Damage to the High Pressure Receiver. ▪ Release of any quantity of Anhydrous Ammonia refrigerant. The company Lockout/Tagout program shall be followed when taking the receiver out of service, while maintaining the receiver, and while returning it to service. If Line-Breaking is required, all Line-Breaking precautions described in the company Line-Break Policy shall be observed. Additionally, proper PPE shall be immediately available, or worn in response to the threat level posed by the work and circumstances.
Department:	Refrigeration
Operator:	Qualified Refrigeration Operator(s)
Equipment:	Ammonia High Pressure Receiver, HPR-1 outside the south compressor room. Data from U-1-A: Vertical Receiver, Serial Number xxxxx, National Board Number xxxxx, built in 1998, by E.L. Nickell Company. MAWP: 250 psig @ 240°F
Location:	
Related Documents:	
Initial Date of Development:	4/1998
Authorized By:	
Previous Revision:	4/1/1998
Annual Review By, and Date:	9/2001 plant engineer, utilities supervisor, two operators, the Process Safety Management (PSM) coordinator, and an outside consultant

Technical Operating Specifications (TOS)

Function:	The function of the High Pressure Receiver (HPR-1) is to provide storage for part of the Anhydrous Ammonia liquid inventory needed to supply the plant refrigeration loads, and recirculation receiver loads, as required to maintain efficient operation.

Description:	Capacity/ Size	Safe Operating Limits	Consequences of Deviation	Corrective Action
Vertical thermo-siphon Receiver	7'10.5" x 19'11.75" inside	250 psig MAWP, max capy 80 percent fill	Over-pressurization will cause operation of pressure relief valves. Probable risk of ammonia inhalation by nearby Community residents and businesses.	Shutdown the transfer pumps. Send all the liquid produced to Refrigeration.
			Overfilling will cause refrigerant backup into condensers.	Shutdown the transfer pumps. Send all the liquid produced to Refrigeration.
			Control failure may result in overfilling	Shutdown the transfer pumps. Send all the liquid produced to Refrigeration.

Controls and Instrumentation
Safety Systems

DESCRIPTION	ITEM NUMBER	FUNCTION	POSITION AND/OR NORMAL SETPOINT
High Level float		Measures level of ammonia liquid in tank, activate warning when reached	Less than 80 percent fill level; activates alarm light if reached. Light is in the main compressor room
Low level float		Measures level of ammonia liquid in receiver, activate warning light	At approximately 10 percent liquid level, activates warning light in the main compressor room.
Dual Pressure Relief Valves on manifold		Protect against over-pressurization above MAWP of 250 psig	Top of the receiver, on dual PRV manifold, see P&ID Sheet xx

Standard Operating Procedure (SOP)
Task Flow Diagram

1. Normal start up
↓
2. Normal shutdown
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3. Shutdown and isolation for maintenance/repair activity
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4. Emergency shutdown and isolation
↓
5. Startup following emergency shutdown and isolation, or shutdown and isolation for maintenance activities
↓

Task	Step	Comment
1. Normal Start up	1.	The receiver is not shut down under normal operations. Restart under normal conditions is never necessary.
Task	**Step**	**Comment**

2. Normal Shut Down	1.	The receiver would not be shut down during operation, for any reason. This is essential to the safe operation of the entire system.
3. Shutdown and Isolation for Maintenance or Repair	1. See Maintenance Procedures for the float columns, floats, and alarm systems	Isolation of the receiver itself is not probable. Float columns and alarms can be individually isolated for maintenance and repair. See adjunct SOP
4. Emergency Shutdown and Isolation	4.1. Close HPL supply hand valve from condensers:	Valve number xxxx (hand valve)
	4.2. Close EQ line hand valve	Valve number xxxx (hand valve)
	4.3. Close Purge line hand valve	Valve number xxxx (hand valve)
	4.4. Close HPL return from transfer tanks 1 AND 2	Valve number xxxx (hand valve)
	4.5. Close liquid injection cooling supply line valve	Valve number xxxx
	4.6. Close liquid feed to plant hand valves	Valve number xxxx and Valve number xxxx
	4.7. Shut down liquid transfer pumps 1 and 2 at TT1 and TT2 in main compressor room	Transfer Tank 1, Transfer Tank 2, per relevant SOP for both
	4.8. Assess situation	If shutdown is for any period of time, refrigeration operations will shut down as liquid supply runs out.
	4.9 Follow instructions of Emergency Response Personnel on scene.	If this situation involves fire or engulfment, evacuate immediate area of receiver and observe from a safe distance.
		If situation involves damage to any part of the refrigeration system, prepare to mitigate and/or contain escaping liquid and vapor, using appropriate PPE, if trained to do so.
5. Startup following emergency shutdown and isolation.	5.1. Assess situation. Consult with Emergency Response Personnel and Complex Management before initiating start up after emergency and/ or release.	Determine exact extent of any damage, ascertain that electrical power is available; ascertain that compressor room power is available, and that compressor room and ancillary areas are habitable under guidelines for ammonia concentration.
	5.2. Open EQ line hand valve	Valve number xxxx (hand valve) This equalizes condensers and receiver to same pressure.
	5.3. Open purge line hand valve	Valve number xxxx (hand valve). This will align purger and receive for normal operation.
	5.4. Open liquid feed to plant hand valves	Valve numbers xxxx, and xxxx (hand valves). Visually inspect for ammonia leaks. This will supply the plant loads and recirculators with liquid refrigerant.
	5.5. Open the liquid injection supply hand valves	Valve number xxxx (hand valve). This will permit liquid ammonia flow to cool compressor oil injection.
	5.6. Open liquid return from TT 1, and TT 2, hand valves	Valve number xxxx (hand valve). This will permit transfer of liquid ammonia from the transfer tanks to the receiver.

	5.7. Open liquid return hand valve from the condensers	Valve number xxxx (hand valve). This will permit flow from condensers to receiver. Condensers may now be started and checked for proper operation.
	5.8. Turn power on to transfer pumps for TT1, and TT2	Refer to SOP for both Transfer Tanks
	5.9. Begin normal startup of the ammonia refrigeration system	Refer to relevant SOP documents for compressors, accumulators, and recirculators. Re-start these prior to proceeding with full system restart.

Special Cautions and Procedures

Tremendous risk is involved in the complete shutdown and isolation of the High Pressure Receiver unless it is for an extreme emergency involving risk of injury or death to personnel, and/or community residents. Assess the risks and benefits carefully, in consultation with complex management and emergency services personnel.

For maintenance, repair or inspection procedures requiring opening of this, or any component of the Ammonia Refrigeration System to the atmosphere, the company line-breaking policy and procedures shall be strictly followed. Among the procedures and steps that are required are:

- A line break permit shall be obtained.
- Only qualified Refrigeration personnel shall perform the work
- The line to be opened shall be isolated, and isolation valves secured with locking devices appropriate to type shall be applied. Isolation valves must be logged by number, and a copy of this log kept in the maintenance office to preclude loss.
- The portion of the line to be opened shall be evacuated (pumped down, into a vacuum). Operators shall test that the vacuum condition is holding, and hold the level of vacuum for a minimum of 30 minutes.
- Prior to the opening of the line, operators shall don appropriate PPE, (APR), and wear the PPE until it is evident to the senior operator that no danger of ammonia flow exists.
- Mechanical integrity of all lines, valves, and other component parts affected by the line break related work shall be maintained.
- At the conclusion of the work process, the assembled line, valves, or other constituent parts shall be first vacuum tested, then pressure tested.
- When such testing is successfully completed, all valves shall be restored to the original alignment conditions. The original log shall be consulted to ensure that all valves originally listed have been returned to original alignments, and all tags and biscuits have been removed, and the work area restored to previous conditions.

The area of the line break shall be observed periodically to ensure leakage-free operation, and proper refrigeration function.

See also S-xx, Section xx, bid specification for acceptable parts and procedures for repair and replacement of component parts.