

SAMPLE STANDARD OPERATING PROCEDURE

SOP-COMP-01

OPERATION OF THE HIGH STAGE AMMONIA COMPRESSOR

Objective:

This procedure is established to describe the Technical Operating Specifications (TOS) and to set forth Standard Operating Procedures (SOP) for the operation of the high stage ammonia compressor.

Purpose:

The purpose of the TOS is to provide a description of the compressor, defining its function, operating conditions and limits, consequences of deviations from operating limits, describing its controls, instrumentation and safety systems and setting its operating alignment(s). The purpose of the SOP is to set forth the proper steps for starting, monitoring normal operation, shutting down and restarting of the compressor.

Concerns:

Careful attention to valve positions, suction and discharge pressure, oil temperature and discharge temperature is important to this procedure. Also, vibration and other motion of the compressor and piping are unwanted events. Among the incidents we are trying to prevent are:

- Injury to operator(s)
- Damage to piping from expanding trapped cold liquid
- Overpressurization of the system resulting in operation of pressure relief valves or failure or rupture of components and consequent release of ammonia to atmosphere
- Excessive vibration causing premature bearing failure in both compressor and motor

Plant Lockout / Tagout program should be followed when taking unit or system out of service, maintaining and returning equipment to service. Refer to plant program for details of Lockout / Tagout.

Department:

Refrigeration

Operator:

Refrigeration Operator

Equipment:

Ammonia Compressor #PID01-C-01

Location:

Engine Room

Related documents:

P & ID # PID01 , Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual

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TECHNICAL OPERATING SPECIFICATION (TOS)

Function: Provide the regulation and compression of the ammonia vapor returning from the plant.

DESCRIPTION	CAPACITY/SIZE	OPERATING LIMITS	DEVIATIONS/CONSEQUENCES
Frick Model: MD#: RWB-II+-270	535 TR and 628 BHP @ +95°F discharge (SDT) and +15°F suction (SST).	A function of motor HP capacity.	Suction temperatures greater than +15°F will result in an actual higher output than compressor's rated performance, However, it is limited by motor HP. An increase in discharge pressure will decrease the compressor's rated performance and require additional HP.
Oil separator: XX" Diameter		ASME Rated at: 300 psig DWP	
Thermosyphon oil cooler heat exchanger model:	XXX MBH total heat of rejection at 95°F liquid temperature.	ASME Rated at: Shell - 400 psig DWP Tube side - 250 psig DWP	An increase in liquid temperature (discharge pressure) will decrease the capacity of the oil cooler.
Electrical Classification: NEMA-4	Compressor Motor: 700 BHP, ODP, 1.15 SF, Wye-Delta Oil Pump Motor: 1 1/2 BHP, ODP, 1.15 SF		

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CONTROLS AND INSTRUMENTATION

DESCRIPTION	ITEM NUMBER	FUNCTION	POSITION/SETPOINT
RWBII+ microprocessor by Frick	Not Shown	Provides the interface from the compressor to the refrigeration computer system and can manually override for total control of the compressor. Also provides the necessary setpoints for compressor control, including alarms and shutdowns.	See Frick Co. Certified drawings for package P & ID and controls.
Suction pressure element	Not Shown	Provides the suction pressure for the RWBII+ microprocessor.	
Suction temperature element	Not Shown	Provides the suction temperature for the RWBII+ microprocessor.	
Discharge pressure element	Not Shown	Provides the discharge pressure for the RWBII+ microprocessor.	
Discharge temperature element	Not Shown	Provides the discharge temperature for the RWBII+ microprocessor.	
Oil Separator temperature element	Not Shown	Provides the oil separator temperature for the RWBII+ microprocessor.	
Slide valve loading solenoid	Not Shown	Signal from RWBII+ microprocessor to energize coil to load compressor.	
Slide valve unloading solenoid	Not Shown	Signal from RWBII+ microprocessor to energize coil to unload compressor.	
Oil filter inlet	Not Shown	Provides the oil filter inlet pressure for the RWBII+ microprocessor.	
Oil filter outlet	Not Shown	Provides the oil filter outlet pressure for the RWBII+ microprocessor.	
Inlet oil pressure	Not Shown	Provides the inlet pressure to the compressor for the RWBII+ microprocessor.	

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DESCRIPTION	ITEM NUMBER	FUNCTION	POSITION/SETPOINT
Inlet oil temperature	Not Shown	Provides the inlet oil temperature to the compressor for the RWBII+ microprocessor.	
Slide valve potentiometer	Not Shown	Provides the slide valve position of the compressor for the RWBII+ microprocessor.	
Current transformer sensor	C.T.	Provides the motor current value to the RWBII+ microprocessor.	

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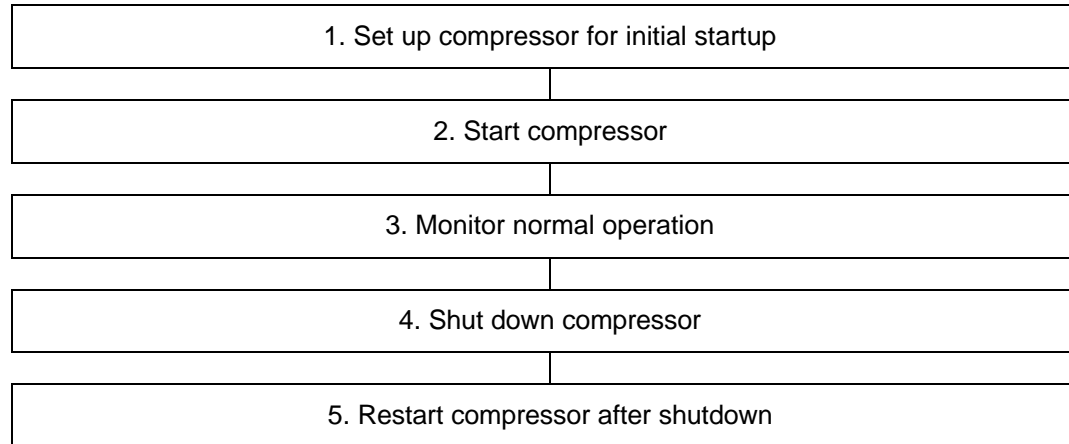
SAFETY SYSTEMS

DESCRIPTION	ITEM NUMBER	FUNCTION	POSITION/SETPOINT
Dual safety valve assembly with 3-way valve	C104, C105, and 3-way C106.	Open on rise in pressure and relieves to atmosphere.	300 PSIG
Pressure relief valve	C108 Oil cooler-shell side.	Open on rise in oil pressure and relieves to oil separator.	75 PSIG
Pressure relief valve.	C115 Oil cooler-tube side	Open on rise in liquid pressure and relieves to atmosphere.	250 PSIG
Pressure indicator	Not Shown	Monitor the pressure on the oil separator and can be utilized as a bleed off by removing the gauge and slowly opening the gauge valve.	

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STANDARD OPERATING PROCEDURE (SOP)

TASK FLOW DIAGRAM



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TASK	STEP	COMMENT
1. Set up compressor for start up.	1. Perform pre-startup safety review in accordance with 29 CFR 1910.119(i).	
	2. Confirm that all pressure tests have been completed and certified.	
	3. Confirm that the compressor has correct oil level available for operation.	
	4. Confirm that three-way valve C103 is isolating one pressure relief valve, preferably backseated.	See P & ID drawing # PID01.
	5. Confirm that all other components of refrigeration system are ready for operation.	See the SOP for the condensers, the high pressure receiver, and the recirculators.
	6. Confirm that appropriate isolation valves are open: OPEN: C101, C102, C106, and C116. Confirm that appropriate isolation valves are closed: CLOSED: C107, C109, C110, C111, C113, and C114.	See P & ID drawing # PID01.
	7. Confirm that the compressor and oil pump motors are wired for proper rotation.	.
	8. Check the setpoints in the RWBII+ microprocessor per FRICK requirements.	See Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual.
	9. Check the setpoints in the RWBII+ microprocessor for plant requirements.	
2. Start compressor	1. Initial Startup supplied by Frick-authorized start up services. Press "RUN" button on the RWBII+ microprocessor panel as appropriate for computer control functions.	See Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual. The compressor automatically starts all functions required, during start sequence.

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TASK	STEP	COMMENT
3. Monitor normal operation.	1. Confirm that the compressor continues running within the parameters and setpoints entered into the RWBII+ microprocessor	See Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual.
4. Shut down compressor.	1. Push the "STOP" button on the RWBII+ microprocessor panel. Emergency Shutdown: Press "EMERGENCY STOP" Mushroom button.	After the compressor has come to a stop, confirm that it does not spin backwards. This verifies that the discharge check valve is seating.
	2. Once the compressor has been idle for some time, confirm that the oil heaters are holding the oil at the temperature that is set in the RWBII+ microprocessor.	This can only be done if the ambient temperature is less than the oil setpoint temperature.
	3. Confirm that frost does not build on the compressor.	If the compressor is not running, there is no possibility of frost. Therefore, a check valve or solenoid valve is allowing ammonia to pass by, or the suction accumulator is overfilled.
5. Restart compressor after shutdown.	1. Confirm that appropriate isolation valves are open: OPEN: C101, C102, C106, and C116. Confirm that appropriate isolation valves are closed: CLOSED: C107, C109, C110, C111, C113, and C114.	See P & ID drawing # PID01.
	2. Allow sufficient time for the anti-recycle timer to time out.	See Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual.
	3. Press "RUN" button on the RWBII+ microprocessor panel as appropriate for computer control functions.	This will start the oil pump. Confirm that the appropriate oil pressure has been reached before the compressor motor starts.
	4. Verify that the compressor loads and unloads as set by the RWBII+ microprocessor or the refrigeration system settings.	See Frick Co. S70-200 IOM/MAR 95 Installation, Operation, & Maintenance Manual.