

PLEASE READ CAREFULLY

WARNING - *If Oil Storage Tanks Are Being Utilized, It Is Imperative That They Be Vented To Atmosphere So As To Prevent Damage To Equipment*

It has come to our attention that some compressor operators are not fully aware that it is easily possible to explode a compressor if air is mixed into the gas system. Nor are they fully aware of how easily air can be allowed to enter the gas system.

In an effort to better inform our customers we offer these points to be considered:

- Any gas (air or natural gas) flows to any lower pressure area. Therefore, anytime the pressure in the gas system (i.e. compressor cylinders, main piping, bypass / vent piping, scrubbers and bottles) is lower than atmospheric pressure, air will try to enter
- Some possible points of entry are loose connections; dump valves, piston rod packing, open vents, valves, or leaky relief valves.
- Some additional possibilities are the entry of air when the system is opened as when a compressor valve cover, packing gland or cylinder head is removed. Also, some air can enter the system through an open vent valve when the unit is shut down. As the gas cools it will contract and draw air in to fill the void created.
- With all these potential places for air to enter, it is our feeling that the best solution is to be sure the system is fully purged of all air before start-up and then a positive pressure maintained on the complete system at all times while starting, idling and running.
- Because of possible overloading of the engine, it is not always feasible to start with full suction pressure on the system. Therefore, some installations require that only a relatively low pressure be applied until the unit is started. As the unit starts and the gas flows through the open bypass valve, the suction side will naturally have a lower pressure than the discharge side. Be sure that this pressure does not get too low. Adding additional gas by opening the suction valve will prevent the compressor suction from dropping below suction pressure.
- A mixture of air and natural gas suitable to explode has occurred many times in gas systems, but the lack of ignition temperature, fortunately, has caused the situation to go unnoticed. Either compression to minimum temperature requirement or a spark can cause the ignition. This ignition will not take place without the proper air / gas mixture even though the sparks and / or compression temperature exist.

Please make yourself and your operating personnel aware of the above information. Our hope is that this information, and due consideration given to your particular installation, will prevent unnecessary harm to personnel and machines.

MANUAL

Recommended Startup And Shutdown Procedure For Gas Compressor Unit (External Fuel and Starting Source - With Bypass) Pneumatic Control Panel

A. STARTUP

1. If not equipped with discharge check valve, close discharge valve.
2. CHECK for cause of ignition shutdown.
3. Take notice of any malfunction indicators that are flanged red and correct the cause for shutdown.
4. PURGE all gas lines if any gas connections are open or if compressor has not been run for an extended length of time. (See WARNING letter in this book) For compressed gas, open vent valve and suction valve. Vent gas to atmosphere through the entire system by venting some gas with bypass valve open. For fuel and starting gas lines, vent at fuel gas pressure tap near carburetor and "bump" starter valve with "panel de-energized" to force gas through lines. Close vent valve and suction valve leaving suction pressure on system. Leave by-pass valve open.
5. UNLOAD COMPRESSOR
 - a) Leave bypass valve open.
 - b) Leave suction valve closed. (Suction pressure should remain on unit. If it bleeds off, check for cause and repair. Return to step 4 and continue from there.)
6. SET THROTTLE AT LOW IDLE and start engine by first pressing "start" button on panel face and holding in until flags turn green, then push starter button to crank engine
7. CHECK IMMEDIATELY for unusual noises, engine oil pressure and level, and compressor oil pressure level.
8. RUN AT NO LOAD until engine oil temperature rises to normal operating temperatures
9. INCREASE SPEED to operating range.

B. LOADING

1. LOAD the compressor:
 - a) Leave vent valve closed.
 - b) Open suction valve.
 - c) Open discharge valve, if closed.
 - d) Close bypass valve slowly.

2. CHECK IMMEDIATELY for engine loading, suction (and interstage) and discharge pressures. Check piston rod packing. Recheck oil and water levels and pressures. Check gas, oil, and water temperatures

C. SHUTDOWN

1. UNLOAD COMPRESSOR
 - a) Open bypass valve.
 - b) Close discharge valve (if equipped).
 - c) Close suction valve.
2. RUN ENGINE AT REDUCED SPEED and NO LOAD for a few minutes.
3. RUN ENGINE AT LOW IDLE for 30 seconds.
4. STOP ENGINE by pushing “stop” button on panel face.
5. CRACK OPEN VENT VALVE to bleed pressure.

NOTE: *Before performing maintenance or repair procedures, relieve system of all pressure by opening vent valve completely.*

NOTE: *Turbo charged gas engines, which are shut down from a full load, may experience turbo charger carboning problems. Gas engines in applications that call for a number of shutdowns per day are especially prone to carbon formation and may have an unacceptable turbo charger service life if an idle period is not included in the shutdown procedure.*

Operating And Maintenance Instructions For Finned Tube Exchangers

IMPORTANT

Before start-up, check setscrews and bolts in the fan assemble, sheaves, and locking collars of all bearings. These items should be checked again several days after start-up. THESE ITEMS MUST BE CHECKED PERIODICALLY. Operating vibrations may cause loosening of these items and could result in expensive repairs and shutdown time.

FAN & DRIVE

Although the fan and drive are inspected before shipment, alignment of the fan shaft and clearance between the fan blades and the fan ring and guard should be checked to assure that rough handling during shipment has not loosened bearing mounting bolts or caused misalignment.

If it is ever necessary to change fans or to adjust the fan blade angle, care must be taken when tightening the bolts. Do not over tighten. It is best to refer to the fan manufacturer's "assembly instructions" for the correct procedure and torque values.

V-Belt drives should be adjusted until tight enough to prevent excessive belt slippage. The belt is generally tight enough when it can be twisted one quarter of a turn with the thumb and forefinger. Over tensioning should be avoided.

LUBRICATION

In plants having successfully established maintenance procedures, lubricate bearings according to normal procedure. In general, about one cubic inch of a premium grade grease in each bearing every 2 to 3 months is adequate.

The operating temperature of the bearing may indicate how much lubrication is required. Normal temperature may range from "cool to warm to the touch" up to a point "too hot to touch for more than a few seconds", depending on bearing size and speed, and surrounding conditions. Unusually high temperature accompanied by excessive leakage of grease indicated too much grease. High temperature with no grease showing at the seals, particularly if the bearing seems noisy usually indicates too little grease. Normal temperature and a slight showing of grease at the seals indicate proper lubrication. All FIN Coolers are equipped with heavy-duty ball or roller bearings. These superior bearings should provide long satisfactory service if proper lubrication procedures are followed.

TUBE CLEANING

It is important that the fins and exposed tube surfaces be cleaned periodically to remove accumulated dirt, grease, oil and other foreign matter. This can be removed by directing compressed air, or a greaseless solvent through the fins in a direction opposite the normal airflow. The inside of the tubes should be inspected periodically and cleaned as necessary. Removal of access plugs allows visual inspection, and if necessary, the use of mechanical tube cleaner. Tapered plugs that are removed for tube inspection or cleaning should be replaced in the same hole.

PLUG LEAKS

Should tapered plugs develop leaks, additional tightening is normally all that is required. Thread dope may be used if tightening alone is not sufficient. If shoulder type plugs develop leaks, the gaskets should be replaced.

TUBE LEAKS

The repair of tube leaks depends upon the location of the leak. If the leak occurs in the tube-wall (normally caused by corrosion), it is usually most practical to use tapered tube sealing pins to plug both ends of the tube. When so many tubes have been plugged that performance is affected, retubing will be necessary. If leaks develop in the tube to tube-sheet joints, the tubes may either be plugged or re-rolled. If re-rolling is attempted, care must be used in selection of the proper tube expander for the size and gauge of the tube being rolled. As with all rolled tube joints, over-rolling must be avoided.

GENERAL

If it is ever necessary to contact our plant for service or replacement parts, it is essential that our serial number or other identifying date be obtained from the metal nameplate attached to the cooler. This is the only way to positively identify the correct parts that may be required.

MAINTENANCE OPERATION	SERVICE INTERVAL				MAINTENANCE OPERATION	SERVICE INTERVAL			
	Daily	Weekly	Monthly	Annually Or As Needed		Daily	Weekly	Monthly	Annually Or As Needed
ENGINE					COMPRESSOR				
Inspect for loose connections, leaks, vibration. Listen for unusual noises.	•				Inspect scrubbers: look for loose connections.	•			
Check oil level regulator sight glass. Check oil level.	•				Check scrubber liquid level and liquid level controller supply gas pressure.	•			
Check hose condition.	•				Note and record inlet temperature.	•			
Inspect water pump.	•				Drain supply gas regulator.	•			
Check starting motor oil level.	•				Check dump operation.	•			
Inspect wires and connections of spark Ignition system	•				Inspect frame, lubricator and packing cases for leakage.	•			
(T) Check exhaust bypass valve gasket for leakage		•			Check for loose cylinder mounts, piping supports	•			
Check throttle connection for free movement.		•			Check lubricator line connections for oil and gas leakage.	•			
Take engine oil sample for analysis.			•		Check levels: oil level regulator, oil level.	•			
Change engine oil and oil filters			•		See that suction valve covers are relatively cool.	•			
Check engine valve clearance and valve rotators.			•		Note and record cylinder discharge temperature.	•			
Check condition of air cleaner elements: change as needed.			•		Check main vent connection for leakage.	•			
Inspect magneto cannon plug, primary wire harness, coil terminals, high tension wires, spark plug connectors, spark plugs. Clean or replace as needed.			•		Take compressor oil sample for analysis.			•	
Clean engine crankcase filter.			•		Clean compressor crankcase filter.			•	
Check engine-compressor coupling alignment.				•	Change compressor oil and oil filters.				•
Check conduit lines for water			•		Inspect packing.			•	
(T) Check turbocharger impeller for proper operation			•		Check crosshead clearance and guide wear.			•	
COOLER					Inspect compressor valves.			•	
Check fan condition and cooler sheave alignment			•		Inspect pistons and rings.			•	
Inspect cooler for leaks, vibration, lubrication.	•				PANEL				
Check liquid in surge tank: check coolant condition with hydrometer			•		Note and record all panel gauge readings.	•			
Grease fan bearings: check condition of belts.		•			SAFETY SHUTDOWN SYSTEM				
Change coolant				•	Perform safety shutdown system test.			•	
STARTING AND FUEL GAS					NOTES:				
Check fuel gas pressure	•								
Dump fuel volume bottle and inlet stream strainer.		•							