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Enriching Lives

REBOOTING YOUR COMPRESSOR

#PostLockDown



This publication is directed to operators, technicians, and supervisors to establish standards and guidelines for carrying out operations & maintenance functions on Air Compressors.

For maximum benefit it should be used in conjunction with the Kirloskar Air Compressor manual, parts list & drawings. We strongly recommend following the instructions as given in the manual supplied along with the equipment, on handling, installation, operations, maintenance care, adjustments, repair etc.,

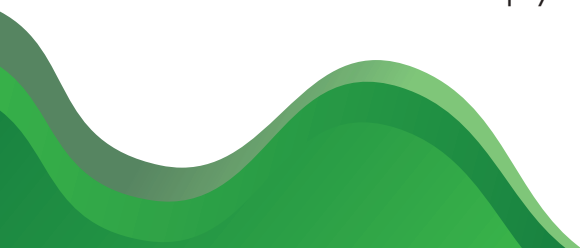
Any compressor taken out of service for extended shutdown would deteriorate rapidly from rust and corrosion if not properly protected. Contact the manufacturer or the authorised service provider to obtain the proper preservation procedure for protecting the equipment.

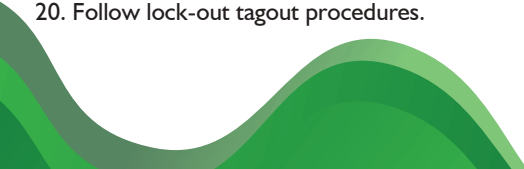
Any compressor taken out of service for shutdown without carrying out preservation & proper storage instructions as prescribed by the manufacturer, requires check inspections to be carried out by a qualified engineer. Contact the manufacturer or the authorised service provider to know the detailed start-up procedure.

For any additional information on Kirloskar Air Compressors concerning procedures, check-inspections, parts recommendations, modifications and retrofits and service package offerings for scheduled preventive maintenance or on-call visits, kindly contact service1@3t-saudi.com



General & Basic Rules of Good Installation & Operation

1. All personnel working on Compressed Air Systems should use PPEs – Safety Shoes, Hardhats, Gloves, Eye and Ear protection.
 2. Perform tasks in a safe manner in accordance with the SOPs and report immediately to their supervisors of any equipment defects or operational deficiencies.
 3. Do not work alone, one more person should be on hand to provide assistance, if needed.
 4. Always use the correct tools for the job. Always use insulated tools.
 5. Do not try attempt to repair or remove any compressor parts without first relieving pressure from the entire system.
 6. Do not try to connect meters to circuits unless you are qualified. Wait for the electrician.
 7. To prevent skin ruptures and sensory injuries when working with compressed air.
 8. Close isolation valves before working on lines or fittings.
 9. Know Warnings & Cautions, they are indicated in the manual. Caution & Warnings are to be strictly followed w.r.t to operating or maintenance procedure, work practice, equipment condition etc., if these are not explicitly observed could result in damage to, or destruction of the equipment, downtime and production losses, long term health hazard, injury or even death of personnel.
 10. Periodic calibration of instruments and display of error charts.
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11. All operators should be thoroughly familiar with the type of equipment and systems they operate.
 12. The operator should be familiar with the drawings, location of parts, functions of each part, ex. valves, switches, electrical controls, and other control devices and its operation.
 13. Use only lubricants recommended by the manufacturer and establish a lubrication schedule. Frequency of oil change is dependent upon severity of service and atmospheric dust and dirt. Ensure Oil, Grease and Greasing equipment are not contaminated and are free from dust.
 14. Supervisors to plan periodic refresher trainings to operators and maintenance personnel on normal and safe operation, inspection & maintenance procedures & practices, trouble shooting, safety, housekeeping, etc., covering various aspects on cleanliness, lubrication, temperature, vibration, maintaining inspection records, alignment, torque, leak in compressed air system, etc.,
 15. Keep the compressor clean at all the times. Wipe the machine daily with a cloth. Dirt on the machine will eventually find its way into the lubricating system. On air-cooled compressors, dirt accumulations form an insulating blanket causing increased temp. within the machine and excessive wear on moving parts.
 16. Do not use gasoline, kerosene or other low flashpoint solvents as a cleaning agent.
 17. Clean intake air filters regularly to prevent atmospheric dust from entering the compression chamber.
 18. Maintain daily operating logs that record pressures, temperature of air, lubricating oil, water in compressor, inter-cooler & aftercooler.
 19. Air receivers should be isolated from other facilities as a precaution against damage that could result from rupture of the cylinder.
 20. Follow lock-out tagout procedures.
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Compressors on Storage

A compressor unit should not be stored for more than six weeks without proper preservation. This time frame may vary according to geographical location of the unit. In very damp, humid climate, a compressor may need to be processed for long term storage in as little as one or two weeks. In very dry climate, a compressor could be stored without processing for 10 days to two weeks.

An electric motor that does not experience regular usage while being exposed to normal humid atmospheric conditions is likely to develop rust in the bearing or rust particles from surrounding surfaces may contaminate the bearings. The electrical insulation may absorb an excessive amount of moisture leading to the motor winding failure.

Installation Checks

These checks are required to be carried out to verify installation completeness before the compressor is started.

1. All foundation bolts and nuts are tight to the required torque.
 2. Ensure all assembly / system completeness
 3. Pressure gauges are installed: air high side and low side, oil access port and cooling water (for water cooled)
 4. Check for free rotation of airend and motor in case of Kirloskar Electric Screws and in case of piston reciprocating compressors, check free rotation of crankshaft and motor.
 5. Check coupling alignment on units that are direct coupled.
 6. Check alignment of pulley and flywheel for belt driven units.
 7. Check the condition of the belts & set the belt to the correct tension.
 8. Safety cage is installed
 9. Electrical Systems: Fitment, specifications, wiring is as per drawing, tightness, earthing, voltage on energising the compressor is as per the specification etc.,
 10. Motor Protection: Motor protection & Insulation Resistance
 11. All accessories have been installed: Filters, SOVs, NRV, Pressure & Safety Valves and switches
 12. All interconnecting pipelines are connected and secured
 13. Ensure correctness of the installation in accordance with the P&ID supplied along with the equipment
 14. Ensure proper protection at cable entry points for rodent control.
 15. Ensure all drain plugs are installed.
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Inspection

Compressors on Extended Shutdown without proper preservation requires thorough inspection in the following areas.

Clean the compressor to ensure cleanliness
(use dry air with pressure < 2.5 bar)

Lubrication Oil

Determine the physical condition of the oil. Check for decolourisation, emulsification, solidification, and contamination (dust, water, etc.,).

Replace the oil if required. When changing oil, clean the inside of the crankcase by wiping with clean, lint-free rag. If this is not possible, use a good grade of flushing oil to remove any settled particles as in the case of screw compressors.

Check the condition of the anti-friction bearings.

If the oil is due for replacement as per the preventive maintenance schedule, replace oil and oil filter before start-up of compressor.

The oil filter is always to be replaced along with the lubrication oil to coincide with the replacement periodicity.

In case the compressor is lubricated using an external lubricator, check oil lubricator functioning by rotating manually & also set the oil flow as recommended in the manual.

Carry out purging of the lubrication system.

Dirt Accumulation

Cylinder jackets of water-cooled compressors should be checked for dirt accumulation and cleaned at least once annually. Dirt accumulation can interfere with water flow/circulation. Cleaning can be accomplished by a hose with nozzle to inject water into the cylinder jackets.

Valves

Remove, dismantle & Inspect the valves for wear, valve seat surfaces, carbon deposits etc., Replace all defective valve parts. Failure to do this will result in more rapid valve and spring wear.

Valve parts are to be washed in non-flammable cleaning liquid. Before replacing valve, inspect valve seat and cover plate for its condition.

Make sure the valve is returned to the same port from which it was removed. Follow manufacturer's instructions for dismantling, replacement of parts, assembling and testing.

Moisture

Check for and remove moisture in Air Oil Separator in Kirloskar Screw Compressors. In piston compressors, check for and remove moisture from LP & HP cylinders. In addition to this check for corrosion inside the cylinder surfaces. Check for and drain condensed moisture from Inter & After Coolers, Pulsation Vessels & Air Receiver.

Coolers/Fans/Ducts

Ensure there are scale formation on inter & after cooler.

Clean cooling fan and duct

Electrical Control Panel

Ensure electrical panel & accessories are free of dust and foreign particles, and insects from the inside. Wiring connections to be checked for completeness, correctness in accordance with the wiring drawing supplied with the equipment. Check for insulation damages on cables and wires. Ensure tightness of power cable at bus bars, control wiring, connectors, transmitters (PT/RTD), Switches, VFD cables etc. Also, ensure the instrumentation for controls is in accordance with the P&ID.

Motor

For motors with “Do Not Lubricate” on the name plate, the motor shaft should be rotated a minimum of 20 times to redistribute the grease within the bearing every three months or more often.

The motor with re-greaseable bearing must be greased as per the instructions provided in the manual. The motor shaft must be rotated a minimum of at least 20 times manually after greasing to distribute the grease within the bearing. Winding Insulation check is to be performed. Record the IR (Insulation Resistance). Windings should be discharged immediately after measurement to avoid risk of electric shock.

Connect and Ensure tightness of power cable at motor terminal and VFD cables.

Controller

In case of compressor with new design controller, compressor idle for more than 30 days, requires resetting of RTC (Real Time Clock). Kindly contact Kirloskar Compressor Authorised Service Dealer as access to the controller is password protected.

Air Filters

Check and Clean Air Filters.

Rings

Check the condition of the O Rings and Sealing Rings at valve cover and un-loader piston, in case found worn out replace.

Safety Valves & Relief Valve

Check function of relief and safety valves as per pre-set values

Pre-Start Inspection

Carefully inspect the compressor installation to ensure the following prestart requirements are fulfilled. These checks are required to be carried out before the compressor is energised.

1. Ensure all repair work are completed.
2. Ensure system has been cleaned free of dust for testing any oil or air leaks.
3. Open all shutoff valves between compressor and receiver.
4. Turn on cooling water. Check water flow through drain vents in cooler and jackets
5. Ensure cooling fan and duct channel are free of dust.
6. Ensure water flow & pressure as specified by the manufacturer is available for water cooled units.
7. Ensure relief and safety valves are installed and operating properly.
8. Ensure compressor is lubricated in accordance with the instructions as given in the manual supplied along with the compressor, both Grade and oil level. On units installed with forced mechanical lubricator, pump or crank by hand to see the oil is getting to all moving parts.
9. Bump start (i.e., control power de-energised immediately after start-up) compressor to check the direction of rotation of the motor. If the rotation of the compressor is backwards, the phasing should be corrected (reversing any two leads will change rotation) before attempting to re-start the compressor.

10. Run the compressor in the valves (suction & discharge) removed condition for 30 min. to carry out flushing. When fixing the valves, stage wise flushing is to be carried out.
 11. All Electrical Panel, Safety Trips, Cut-out Switches functionality check to be carried out.
 12. All accessories related to the compressor including cooling tower, drier and downline filters are installed, and their healthiness have been checked.
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Start-up Procedure for New/Overhauled/Extended Shutdown

For a compressor that is New or that has been Overhauled or has been on extended shutdown, allow the compressor to run in unloaded condition for at least 1 hour to give the running surface polished finish. Periodically check for overheating. Build up load gradually over a period of several hours. After a few days of operation, shut down compressor and recheck all cylinder head, head cover, cylinder flange, crank shaft and bearings, and foundation bolts for correct tightness.

Inspection During Start up

Perform the following checks

1. Check for alarm and warning during powerup / energising the compressor
2. Make sure the compressor is unloaded
3. Check cooling fan operation (for Kirloskar Screw Compressor models)
4. The compressor does not make any unusually high-pitched noise at initial start-up
5. Oil pressure builds up and maintains proper lubricating oil level and Oil pressure stabilises
6. Solenoid Valves turns ON: Oil & Air And for Water (in case of water-cooled models)
7. Check air pressure build up slowly and maintains as per the pre-set parameters.
8. Check for air leakages
9. Ensure there are no water leakages (applicable for water cooled compressor models)
10. Check if temperature is stabilizing
11. Check temperature and pressure of lube oil, compressed air and water regularly
12. Check all the parameters on the HMI display for their healthiness
13. Check for modulation: Loading/unloading at pre-set value
14. Functional check of Relief and Safety Valve
15. If automatic water drain traps are provided, check their operation.
16. Record operating parameters in the daily logbook before releasing the compressor for operation.



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