Compressor Air Receiver Tank Internal Inspection & Preventative Maintenance SOP

1.0 Maintenance Objective & Frequency

The objective of this procedure is to perform a thorough internal inspection of the compressed air receiver tank to identify corrosion, pitting, weld defects, scale buildup, and any structural degradation that could compromise the pressure vessel integrity. This PM ensures compliance with CSA B51 (Boiler, Pressure Vessel, and Pressure Piping Code) and provincial regulations, preventing catastrophic rupture and unplanned downtime.

Frequency: Annually (12 months) or per local regulatory requirements, whichever is more frequent. Additional inspections are required if the tank has been subjected to a pressure spike, water hammer event, or after any repair/welding work.

2.0 Lockout/Tagout (LOTO) & Safety

- Electrical Isolation: Disconnect and lock out the main disconnect switch supplying the compressor motor and any auxiliary controls (e.g., auto-drain timer, solenoid valves). Verify zero voltage with a rated voltmeter.
- Pneumatic Isolation: Close the isolation valve between the compressor and the receiver tank. Close the outlet isolation valve to plant air distribution. Depressurize the tank completely by opening the manual drain valve and any vent valves. Verify zero pressure on the tank pressure gauge.
- Mechanical Isolation: Ensure all moving parts (compressor drive, cooling fans) are at a complete stop and locked out.
- Confined Space Entry: If the manway diameter is less than 24 inches or entry is required, follow your facility's Confined Space Entry Program (atmospheric testing, ventilation, standby personnel, retrieval equipment). For this SOP, a visual inspection via manway without full entry is assumed unless otherwise specified.
- Mandatory PPE: Safety glasses, steel-toed boots, cut-resistant gloves, hearing protection (if near other equipment), and a full-face shield if any debris or scale is expected. For confined space entry: full body harness, retrieval line, and supplied air respirator.

3.0 Required Tools, Parts & Lubricants

- Lockout/Tagout kit (padlocks, hasps, tags, group lock box)
- Rated voltmeter (CAT III / CAT IV, 600V minimum)
- Adjustable wrench set (up to 1.5 inch) or socket set for manway bolts
- Torque wrench (range covering manway bolt torque spec, typically 50-150 ft-lbs)
- Inspection mirror (telescoping, 360° swivel)
- High-intensity LED flashlight or inspection light (explosion-proof if environment requires)
- Wire brush (stainless steel, non-sparking if necessary)
- Digital ultrasonic thickness gauge (with calibration block, 2.25 MHz or 5 MHz transducer, couplant gel)
- Dial caliper or pit depth gauge (0-1 inch range, 0.001 inch resolution)
- Replacement manway gasket (OEM specified material, e.g., EPDM or Nitrile)

- Anti-seize compound (copper-based or nickel-based, rated for service temperature)
- Rags, solvent (e.g., isopropyl alcohol), and a bucket for debris
- Digital camera or smartphone for photo documentation
- ServiceGrid mobile device or paper work order for logging readings

4.0 Step-by-Step Maintenance Procedure

1. Perform Lockout/Tagout as per Section 2.0. Verify zero energy: confirm tank pressure gauge reads 0 psi, and manually open the drain valve to ensure no residual pressure or condensate remains.
2. Remove the manway cover bolts using the appropriate socket or wrench. Loosen bolts in a crisscross pattern to prevent gasket damage. Support the cover as the last bolts are removed to avoid dropping.
3. Clean the manway opening and gasket sealing surfaces using a rag and solvent. Inspect the gasket for cuts, compression set, or degradation. Replace the gasket if any defects are found.
4. Using the high-intensity flashlight and inspection mirror, visually examine the entire interior surface of the tank. Look for: rust scale, pitting, weld cracks, bulges, delamination, or any foreign debris. Pay special attention to the bottom quadrant (where condensate accumulates) and weld seams.
5. Using the wire brush, gently remove loose scale and debris from a representative area (approximately 4x4 inches) on the bottom of the tank and near any suspect spots. Collect debris for disposal.
6. Perform ultrasonic thickness measurements at a minimum of 10 locations: 4 points on the bottom head (quadrants), 4 points on the shell (at 3, 6, 9, and 12 o'clock positions, 12 inches from the bottom head weld), and 2 points on the top head. Apply couplant gel, hold transducer steady, and record each reading in ServiceGrid or on the work order. Compare to the original minimum design wall thickness (stamped on the nameplate). Any reading below 80% of the original thickness requires engineering evaluation.
7. Measure any visible pits using the pit depth gauge. Record the depth, diameter, and location of each pit. Pits deeper than 1/16 inch (1.6 mm) or that exceed 10% of the nominal wall thickness must be flagged for engineering review.
8. Inspect all internal fittings: the inlet diffuser (if present), the outlet pipe, and the drain connection. Ensure they are securely attached and free of corrosion or blockage.
9. Clean the interior of any loose debris using rags or a HEPA vacuum if available. Do not leave any rags or tools inside the tank.
10. Apply a thin layer of anti-seize compound to the manway cover bolts (threads only, not the sealing face). Install the new gasket onto the manway flange. Position the cover and hand-tighten all bolts. Torque bolts in a crisscross pattern to the manufacturer's specification (typically 70-90 ft-lbs for a 12-inch manway with 3/4-inch bolts). Verify torque with the torque wrench.
11. Close the manual drain valve and all vent valves. Slowly open the inlet isolation valve to repressurize the tank to line pressure. Immediately check the manway gasket for leaks using a soap-and-water solution or an electronic leak detector. If leaks are present, depressurize, retorque bolts, and retest.
12. Remove all LOTO devices following your facility's procedure (each person removes their own lock). Restore power to the compressor. Set the auto-drain to automatic mode.

5.0 Verification & Return to Service

1. Start the compressor and allow the receiver tank to reach normal operating pressure (typically 100-150 psi). Monitor the pressure gauge for stable operation and ensure the compressor cycles on/off within normal parameters.
2. Verify the auto-drain functions correctly by observing at least one drain cycle (if timer-based) or by manually testing the solenoid valve.

3. Check all external piping connections for air leaks using soap solution or ultrasonic leak detector. Tighten any leaking fittings as needed.

4. Record all inspection data (ultrasonic readings, pit measurements, gasket condition, photos) in ServiceGrid under the asset's maintenance history. Flag any readings that exceed the threshold for engineering review.

5. Complete the PM work order in ServiceGrid, noting the date, inspector name, and any corrective actions taken. If the tank passed inspection, update the next scheduled inspection date to 12 months from today.

6. If any deficiencies were found (e.g., wall thickness below 80%, deep pitting, weld cracks), immediately tag the tank out of service, notify the maintenance supervisor, and initiate a root cause analysis and repair plan per CSA B51 requirements.