

TECHNICAL BULLETIN

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Reference: ATWOOD & MORRILL® Compressor Check Valves	

Subject: Preventative Maintenance

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- APPLICATION** Protection of Large Critical Service Compressors in Refineries and Hydrocarbon Process Plants.
- PURPOSE** To alert refinery operating and maintenance personnel of the need and importance of proper maintenance and testing for these critical service valves.
- BACKGROUND** The A&M® Compressor Check Valve is used on large size compressors and air blowers used in Fluid Catalytic Cracker Regenerators (FCC) and control loops, coker heaters, wet gas compressors, ethylene compressors and other high energy systems. In FCC applications, the check valve prevents reverse flow of catalyst fines which can damage the compressor and start fires outside the compressor inlet. Similar damage can occur in coker heater applications. In ethylene applications high energy can reverse the compressor rotation if backflow occurs. If multiple compressors supply a process, failure of the driver for one compressor can result in flow reversal and backward rotation of the unit with serious damage if the check valve sticks.

Reports from Insurance companies and field service personnel have identified a lack of basic maintenance and testing for these valves as the most likely cause of failure. The most critical thing is the regular exercising of the valve. This will confirm that the valve is free to operate.

MAINTENANCE FACTORS

The following factors are the most common reasons for the compressor check valve to stick:

1. **Packing Friction:** Over tightening of the packing gland can cause the valve to stick. Care should be taken when replacing the packing or tightening the gland. The gland should be pulled down evenly, not cocked or tipped, such that it does not press on the valve shaft or body stuffing box. The gland should not be pulled down so tightly that the packing retards the free and easy movement of the valve shaft. Whenever the packing gland nuts are adjusted the valve shaft must be checked to assure it is free to move and is not stuck. Packing and grease lubrication sticks should be routinely replaced during extended shut down periods or once every two years.

2. Corrosion and foreign debris between the piston rods of the dashpot and air cylinder may cause or contribute to sticking. When valves are located outdoors and subject to the effects of weather, the protective bellows should be inspected to assure that moisture or debris does not corrode or contaminate the shafts and piston rods. Damaged bellows must be replaced and corrosion corrected to assure proper operation of the valve. Weekly exercising of the valve utilizing either the test feature on the air cylinder or the lever arm. (**Note:** Test feature is a hand test valve piped between the air inlet and the exhaust port of the cylinder. This may or may not have been ordered with the valve. WVC will be able to supply this if so desired.)

Periodically check the dashpot oil (during and prior to winter operation) to assure no water has mixed in with the oil. If water enters the oil in these mechanisms, it can freeze rendering the check valve stuck in the open position.

3. Damage to the air cylinder and dashpot piston rods may occur due to improper adjustments or repeated severe closures. If the dashpot or air cylinder piston rods are bent, they should be replaced.

RECOMMENDED PREVENTATIVE MAINTENANCE GUIDELINES

**CAUTION: KEEP HANDS AND HEAD AWAY FROM LEVER AND WEIGHT.
VALVE MAY BE TRIPPED AT ANY TIME BY CONTROL SYSTEM.**

WEEKLY – and after initial installation and after every valve re-assembly:

1. Exercise the valves utilizing either the test feature on the air cylinder or manually move the lever arm. Exercising the valve demonstrates that it is operating freely.

FAILURE TO EXERCISE THE VALVE IS THE LEADING CAUSE OF VALVE STICKING AND COMPRESSOR DAMAGE. IF THE VALVE DOES NOT MOVE WHEN EXERCISING IS ATTEMPTED, THE VALVE WILL NOT PROTECT THE COMPRESSOR.

AN EMERGENCY SHUT DOWN AND REPAIR SHOULD BE SCHEDULED.

2. Each valve should be exercised to insure that it is in perfect working condition before start-up and after shutdown as well as during operation under flow.
3. Valves with side air cylinders and outside lever(s) should be exercised in the same manner using an air test valve if so equipped. They can also be tested by manipulating the outside lever toward closing and observing that the shaft and disc rotate freely.

EVERY TWO YEARS:

1. Visually inspect the bellows to assure that they will adequately protect the air cylinder, dashpot rods and valve shaft from moisture and foreign debris. If the bellows are damaged schedule replacement at the first available time.
2. Clean the air cylinder and dashpot from all foreign debris to eliminate possible binding between caps and piston rods.

EVERY FOUR YEARS:

1. Remove the valve cover to visually inspect the internal condition of the valves. Perform a paper test between the seat and disc as outlined in the WVC Instruction Manual. Visually inspect the piston rods to assure they have not been bent from a severe closure and misalignment. Replace packing, grease fitting and cover gasket in accordance with the WVC manual.
2. Completely disassemble the valves and visually inspect the internal condition of the valves. Carefully inspect the shaft and bushings for indications of wear, corrosion and damage. Replace the protective bellows for the valve shaft, dashpot and air cylinder piston rods:
 - Check the disc arm for bending or wear in the post area
 - Check disc post for straightness and excessive wear
 - Replace the air cylinder tube
 - Replace the protective bellows, gaskets and shaft packing
 - There are three areas within the valve to inspect for signs of wear: between the shaft and the two bushings and between the disc arm and the disc post. If signs of wear are visible, record the dimensions as a bench mark to assess the wear rate of internal valve components. This will help determine how often to replace components or disclose wear patterns which should be investigated further.
3. Replace the air cylinder seals and dashpot oil. A history of very high operating temperatures may require more frequent replacement. Air cylinder repair kits are available from Weir Valves & Controls USA Inc. Clean the air cylinder and dashpot rods of all foreign debris to eliminate possible binding between caps and piston rods.

GENERAL MAINTENANCE

1. Seal or packing replacement, inspection or repair of the valve internals can be accomplished without removal of the main valve body from the line.
2. Check the condition of the valve before disassembly. Thoroughly inspect the valve shaft and all other exposed moving parts. Paint or other foreign matter such as dirt, rust or scale can greatly hamper the smooth operation of the valve.
3. Clean the surfaces wherever possible. Inspect the joints, connections and stuffing boxes where persistent leakage may occur.

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DETAILS

