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Testing and Troubleshooting Drain Traps On Compressed Air Systems

Moisture in a compressed air system reduces efficiency. A program that gives priority to testing and troubleshooting of drain traps can save significant amounts of money. Robert P. Hradsky, of Armstrong International, offers valuable guidelines.

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Testing and Troubleshooting Drain Traps On Compressed Air Systems

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Paying close attention to compressed air systems is like receiving a year end bonus for the maintenance budget and paying less for compressed air. Making dry compressed air a priority yields returns in the form of damage reductions due to freeze-ups, dirt fouling and corroded system components.

When a maintenance priority is given to compressed air systems, some plants have actually seen enough savings to shut down a second compressor, or delay the investment in a new one. However, the first step toward any savings is understanding the importance of removing moisture from the system before it can do damage.

Moisture in a compressed air system reduces system efficiency in several ways. It can wash away lubricating oils in air tools, instruments and equipment. Water in components may freeze if the ambient temperature drops below freezing. Slugs of condensate, driven through the system ahead of high velocity air, can create dangerous water hammer and differential shock that can damage tools and equipment.

High speed slugs can impact on and gradually erode piping elbows, valves, and motor vanes. Pitting of these surfaces gives salt ions and acids a place to accumulate and cause further damage through chemical action. The weakened surfaces are then vulnerable to stress corrosion from mechanical vibration and water hammer.

Intake air always contains moisture in the form of vapor. The amount of moisture in a given volume of air is dependent on the air temperature. Most of this moisture will condense into liquid water when the air is compressed.

This water, along with oils from the compressor system, can accumulate in many locations and should be systematically drained. The largest quantities of liquid accumulate, by design, in the intercooler and aftercooler. The oil-water mixture also can accumulate in receivers, dryers, filters and piping.

Removing the water is essential for quality compressed air and to minimize costly maintenance on components in the system. In instances where drain traps are not part of the system design, manual drain valves are usually opened periodically or left cracked open to drain constantly. In either case, the valves are opened far enough that some air is lost along with the liquid. To eliminate this problem, a drain trap should be installed at appropriate points (all locations where the oil-water mixture accumulates) to remove liquid continuously and automatically without wasting air. (Fig. 1)

Since oil floats on top of water, a drain trap must be capable of removing both the oil and water through the same discharge point. Two basic types of traps are used for this purpose.

The inverted bucket drain trap is often used because the discharge valve is at the top, so oil is discharged first as the trap body is almost completely filled with water at all times. Since there could be oil in the mixture, a small scrubbing wire swings freely at the top and extends through the vent in the inverted bucket. Its function is to prevent reduction of vent size by buildup of solids or heavy oil in the vent itself. Note, these traps will need to be primed after installation to ensure their effective operation.

1) Compressed air system

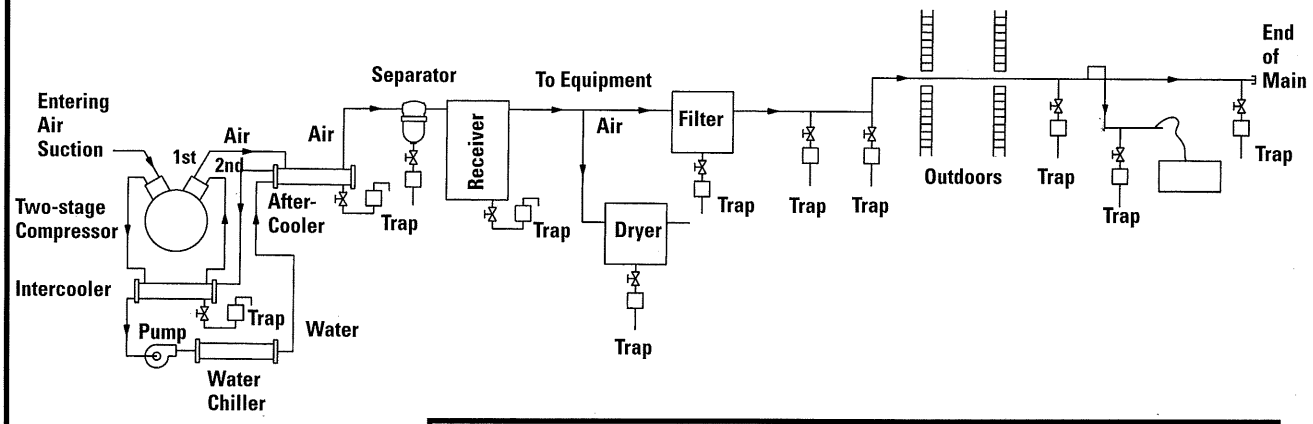

Figure 1

High Pressure Drain Traps	250 psig and up	Test daily to weekly
Medium Pressure Drain Traps	60 to 250 psig	Test weekly to monthly
Low Pressure Drain Traps	1-60 psig	Test monthly to annually

The ball float drain trap is another commonly used trap to remove liquids from compressed air. Metal (usually stainless steel) floats are attached through linkages to valves at the bottom, and a seat with an appropriately sized orifice is inserted at the trap outlet. Floats are selected to provide adequate buoyancy to open the valve against the pressure difference. Drain traps usually discharge to atmosphere so the pressure drop is equal to the system air pressure. There are three basic float-type drain traps: free floating lever, fixed pivot conical valve, and the snap action drain traps.

These float type drain traps are not recommended where heavy oil, sludge or considerable dirt are encountered in lines. Dirt can prevent the valve from seating tightly, and cold oil can prevent float traps from opening. Under these conditions an inverted bucket trap with an integral scrubbing wire should be used.

See-through liquid drainers may also be used to drain oil-water mixtures from compressed air systems. These light weight drainers have transparent bodies allowing one to see the operating condition of the unit. This helps with the inspection and enables the maintenance staff to respond before problems can develop.

Drain traps are mechanical devices and therefore subject to forces within the system that can cause failure. To ensure that these traps are properly operating and draining the oil-water mixture, a regular schedule should be set up for testing and for preventive maintenance. Size and operating pressure are the best determining factors in how frequently drain traps should be checked. Units on normal industrial applications should be checked.

It should be noted that there is an energy saving advantage to testing large traps on high capacity jobs more frequently. Furthermore, drain traps on gas and other critical applications should be checked at the same time valves and other line equipment are inspected. Your own experience will determine the required testing schedule for your system.

Troubleshooting Drain Traps

A visual inspection will generally indicate whether there is a problem with a drain trap in service. Following are three conditions that warrant attention.

1) Drain trap does not discharge

Possible Problem	Possible Correction
Insufficient liquid is coming to the drain trap to permit discharge.	Continue operation.
Drain trap filled with dirt or sludge.	Remove cap and mechanism, clean thoroughly. Install strainer in inlet side of drain trap.
Differential pressure across drain trap too high.	Check inlet and outlet pressure. If the difference exceeds the maximum operating pressure stamped on the drain trap, the valve will remain closed. Reduce the differential pressure if possible or replace the internal mechanisms with ones that are sized properly, or replace the drain trap with one correctly sized for the load.
Worn valve seat.	As the seat becomes worn, the seating surface area enlarges, lowering the trap's maximum operating pressure. Replace the worn parts with new ones.
Inlet or outlet line valves closed.	Open valves.
Strainer clogged.	Clean strainer screen.
Float defective or collapsed.	Replace float.

2) Drain trap discharges continuously

Possible Problem	Possible Correction
If drain trap discharges full stream of liquid continuously and vessel fills full of liquid.	
• Drain trap too small for job.	Replace with correct size.
• Abnormal amounts of liquid coming to drain trap.	Remedy cause or replace with drain trap that has a larger capacity and will handle peak loads.

3) Drain trap blows through

Possible Problem	Possible Correction
Dirt or scale on valve or seat.	Remove cap, clean drain trap, as well as valve and seat.
Worn valve,or seat that is wire-drawn.	Remove cap, replace mechanism.
Inverted bucket drain trap may lose its prime.	• Close the inlet valve for a few minutes. Then gradually open it. If the drain trap catches its prime, the chances are that the trap is okay. • Frequent prime loss may require an internal check valve or, if the trap is old, valve and seat may be worn and should be replaced.

If, after troubleshooting your compressed air system, you still have questions or feel your problems have not been solved, contact the drain trap manufacturer.

The investment made in learning about the oil-water removal from compressed air systems, and correcting obvious problem areas will pay for itself in a very short period of time. The bonus comes in an increased volume of quality dry air for pneumatic systems.