

## BEST PRACTICES 1.1

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### ***Remove Water from Factory Air and Minimize Costly Downtime***

One of the foremost causes of costly downtime and emergency maintenance is not oil or contaminants, which are easily removed with proper filtration, but water vapor and the resulting condensed water that is trapped in factory compressed air.

Water in facility airlines can cause corrosion, rust and pipe scale which can break loose to block or adhere to air passageways that can lead to increased pressure drop and loss in machine performance.

***Machine components will suffer premature wear and parts deterioration from water:***

- **pneumatic cylinders** will have their pre-lubricants washed away, corrode and respond slower
- **solenoid valves'** rubber seals will stiffen, become more susceptible to rupturing and leaking
- **instrumentation** can malfunction even with the presence of a small amount of moisture/water
- **air powered tools** will likely stick, jam and perform less efficiently

***End products are also at risk of suffering from quality deterioration because of water:***

- **spray painting** will be adversely affected by change in color, adherence and finish quality
- **industrial ink-jet printers** will be adversely affected by change in adherence and finish quality
- **blow molding** plastic bottles' viscosity and material consistency could be adversely affect
- **gluing / taping** adhesiveness of cardboard boxes could be adversely affected
- **pharmaceuticals** compound mixing and integrity could be adversely affected
- **food processing** may be contaminated because of micro-organism growth

### ***How does Water Vapor Enter Factory Compressed Air?***

All atmospheric air contains various contaminants and water vapor which is concentrated during the compression process. The heat generated during compression increases the capacity of the compressed air to hold moisture, thus avoiding condensation inside the compressor. Lubricants used to improve the efficiency and life of the compressor also become part of the contaminant load as do wear particles.

A compressor with a 100 hp capacity, operating at 86 °F ambient temperature, a relative humidity of 80%, compressing air to 100 psi, can produce approximately 30 gallons of condensate during an eight hour shift.

### ***Removing Liquefied Water from Factory Compressed Air***

#### **Aftercoolers**

The compressed air exiting the compressor can reach temperatures as high as 300 °F, which is unusable for industrial applications. This hot, saturated air will release 70-80% of its excess water vapor if simply cooled to near room temperatures. To achieve this type of cooling and bulk moisture removal, air or water cooled aftercoolers are often employed. Condensed liquid is removed from the aftercooler via automatic condensate drains and disposed.

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The air exiting the aftercooler will still be saturated but at a much more manageable temperature. Because the air is at a dew point of 100°F or more, it is still very vulnerable to further condensation into liquid water should it be exposed to temperatures lower than this dew point. The piping in most industrial facilities would provide such temperatures and opportunities for condensation as the air moves throughout the plant.

### **Drip Legs**

The next line of defense for removing the water vapor saturated compressed air is a drip leg. A drip leg is a vertical pipe plumbed at the air drop line (below the horizontal header pipe) to allow for water to be easily and efficiently drained away using the principle of rapid air expansion, or adiabatic expansion, to condensate water vapor into liquefied water.

To broadly summarize adiabatic expansion, temperature is the average heat or kinetic energy of all the particles divided by a given volume of air; if the volume of air is increased through expansion, the heat is divided by a larger volume number, therefore decreasing the air temperature. If the drop in air temperature falls below its dew point, then a condensate will form.

The condensate is then removed by a drain at the bottom of the drip leg which can be automatically or manually drained to avoid overflow of contaminants.

### **Water Separators**

Water separators will use mechanical separation techniques to remove condensed water in bulk from factory air either by directing inlet air into a spiral and using centrifugal force to separate the water out from the compressed air or by passing the inlet air through a special resin filter element with large meshes to trap water particles that will drop down to a collection bowl allowing the compressed air to pass through.

SMC's AMG Series water separator is capable of removing water droplets up to a 99% water removal rate, using a special resin filter to trap water droplets. The AMG is easy to install and requires no electrical power and can be either a standalone unit or integrated in to a modular air prep system.

However, the AMG water separator is not designed to remove water vapor or lower dew point which will require a refrigerated air dryer or desiccant dryer.

For more on refrigerated air dryer or desiccant dryer, visit [www.smcusa.com](http://www.smcusa.com).