

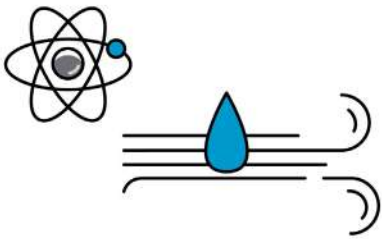
Removing Water from

COMPRESSED AIR

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NO MORE WATER.

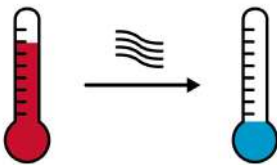
Why is there water in my air lines?



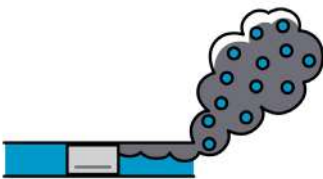
Water is in atmospheric air, so it's in your compressed air. Depending on the temperature & humidity there will be either a lot or a little water, but there will always be water.



Let's compare atmospheric air to a wet sponge. When we squeeze a sponge, the water drips out. The same happens when air is compressed. Compression will cause water to condense in the receiver tank and in the air line.



Condensation also occurs when the temperature of the compressed air is lowered. Each drop of 20°F leads to the condensation of 50% of the humidity! That is why the industry talks about the dew point. Dew point is the temperature at which the humidity condenses into water droplets.



Did you know that if you have leaks on your piping, the humidity in the atmospheric air will re-enter the air line by venturi and contaminate your point-of-use application? Studies shows that 20% -30% of the compressor production is for leakage.

Source: Compressed Air Challenge

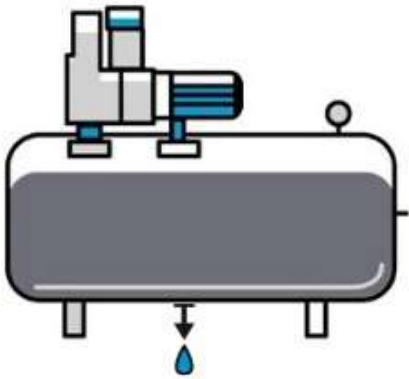


Moisture in compressed air causes:

- » Machinery breakdowns
- » Manufacturing delays
- » Wasted energy
- » Product quality issues

How to remove water from compressed air?

>> STAGE 1 Receiver Tank



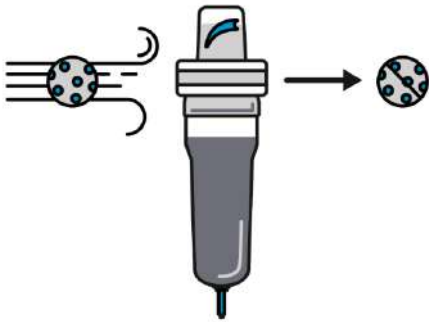
Water removal is done in stages. The first stage of water separation is within the tank. When compressed air comes out of the pump it is hot (~180°F) that means any water in the air is water vapor. The tank is room temperature so when that hot water vapor makes contact with the inside of the relatively cool tank, it condenses on the inside of the tank. Thus, the tank must be drained manually or with the use of an automatic timer drain.

>> STAGE 2 Aftercooler



An aftercooler is a heat exchanger that cools the hot compressed air. Why cool the air? Because cold air can't hold water. The colder the air the less water it holds. The aftercooler forces the condensation. Otherwise the moisture would condensate in the pipe system. Modern compressors have built-in aftercoolers.

>> STAGE 3 Water Separator & Air Filters



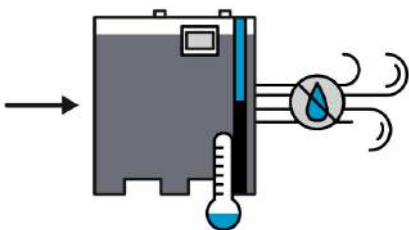
The aftercooler is followed by a water separator with automatic drainage. It directs the incoming air in a spiral and uses centrifugal force to separate the water from compressed air. Approximately 99% of the precipitated condensation water is collected in the water separator.

Air filters are used downstream of the water separator to remove solid particulates and oil-carry over. Not all applications and processes that uses compressed air require the same level of filtration

Typically, there are 3 stages of filtration:

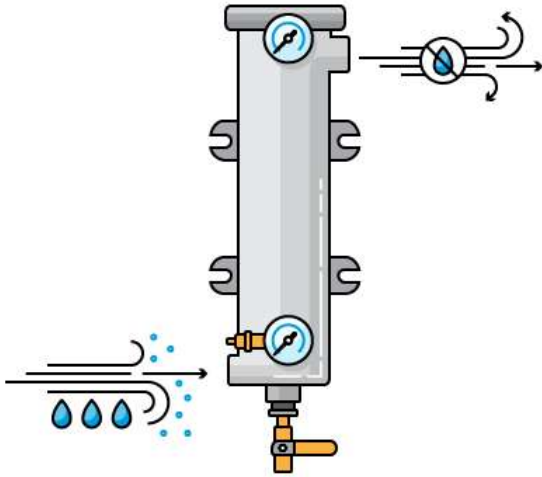
- » General Purpose: dust and fine particles
- » High Efficiency: oil droplets and aerosols
- » Activated Carbon: oil vapor, odor and taste

>> STAGE 4 Refrigerated Air Dryer



A refrigerated air dryer cools the air down to 38°F. It is basically a refrigerated coil mated with the air line. This removes the heat from the air line and cools the air in it. The water is diverted by gravity and removed with an automatic timer drain. The air dryer that is installed in the compressor room will provide compressed air dry enough for general shop air applications. If compressed air is required for sensitive applications such as sandblasting, painting, printing, and instruments a **point-of-use desiccant air dryer is highly recommended.**

>> STAGE **5** **Desiccant Air Dryer**

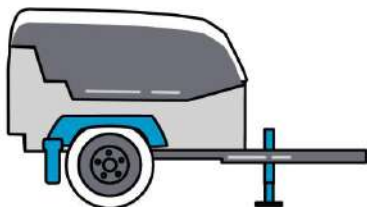


The desiccant air dryer is a single tower installed at the point-of-use that will adsorb moisture and bring the dew point down to -40°F . This very dry air is often needed for sandblasting, painting, printing, and instruments. Desiccant dryers are simple to operate, silent while operating, have no moving parts, no power consumption and minimal service requirements (mainly replacing the desiccant cartridge every 12 months).

If you don't have a refrigerated air dryer in the compressor room, you can still use a desiccant air dryer given the following:

- » Oversize the desiccant air dryer or install two dryers in series.
- » Make sure you install the air dryer **at least 20 feet** from the compressor to let the compressed air cool down. The target temperature is 70°F .
- » Use a water separator if there is excessive bulk liquids in the compressed air.
- » Use an air filter if there is no filtration in the compressor room.

Mobile Diesel Compressors



The same principles that we have discussed also applies to diesel compressors. Since refrigerated air dryers can't be used, an aftercooler and a water separator are very important. In order to locate the desiccant air dryer away from the compressor, it is possible to mount it on a dolly. That way you give time to the compressed air to cool down.

Point-of-use Desiccant Air Dryers – Typical Applications



Sandblast, Paint Booth



Paint Gun



Instruments



Nail Guns, Air Tools

Air treatment accessories



Automatic Timer Drain



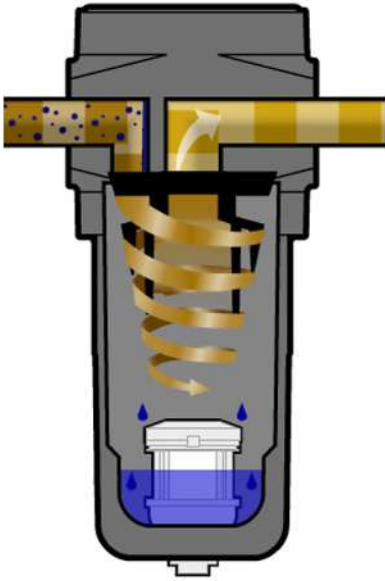
Water Separator



Compressed Air Filter

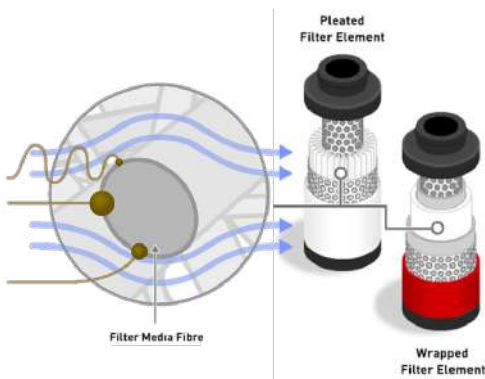
How it works?

Water Separator



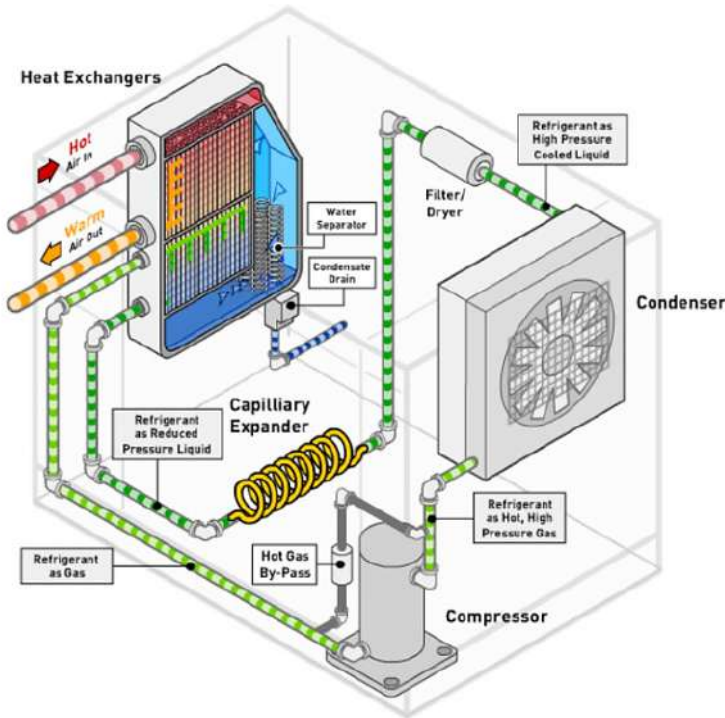
- » Air enters the inlet and is turned 90 degrees into the separator.
- » The separator contains a set of fixed vanes which the air must pass through.
- » The vanes force the air to spin inside the vessel.
- » The spinning air is then forced to change direction as it is passed the impinger.
- » The air then leaves the separator.
- » Bulk liquid is removed from the air stream due to:
 - ▶ Directional change
 - ▶ Velocity change
 - ▶ Centrifugal action
 - ▶ Water drops to the bottom of the vessel and is removed by a drain

Compressed Air Filter



- » As compressed air flows through a filter element, liquid aerosols and particulate are collected on the individual media fibers.
- » Each mechanism captures aerosols and particles of different sizes.
- » Anti re-entrainment is incorporated into the filter element and is normally provided by way of a porous foam or fibrous drainage layer.
- » Drain layer prevents bulk liquids from re-entraining back into the air stream.

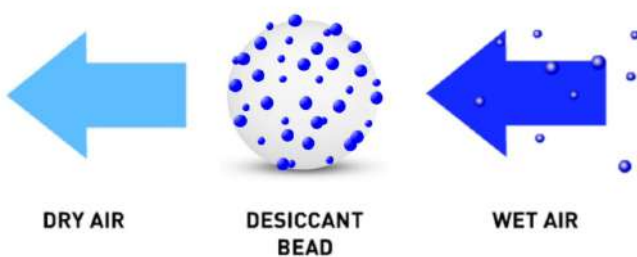
Refrigerated Air Dryer



» The Refrigerated Air Dryer can be compared to an air conditioning system for compressed air. It contains four main components:

- ▶ Compressor
- ▶ Condenser
- ▶ Expansion device
- ▶ Heat Exchanger

Desiccant Air Dryer



- » Desiccant dryer removes water vapor by passing wet air over an adsorbent desiccant material.
- » The most popular desiccant material used in air dryers is called Activated Alumina. Some dryers will also use Silica Gel or Molecular Sieve.

- » Activated Alumina is a porous media that will **adsorb** moisture contained in compressed air.
- » Water will always migrate to the driest medium and transfers from the wet air to the dry desiccant.
- » Desiccant provides a lower dew point than refrigerated air dryers.

A high-speed photograph of a water droplet falling into a pool of water, creating a series of concentric ripples. The image is in grayscale and serves as the background for the entire page.

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