Can moisture damage my compressed air system?

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Ask a Question:
Can moisture damage my compressed air system?

ANSWER:
Liquid water in a compressed air stream increases the cost of operation. It contributes to unnecessary product rejects and countless hours of unscheduled maintenance. Air tool lubricant gets washed away creating unnecessary wear. Highly acidic, this condensed water eats away at air motors and valves and, contaminates finished goods.

Invest in the correct drying technology for your application and the compressed air lines stay dry. Dry air will also pay your big dividends for years to come.

Ask a Question:
How does damaging moisture get in your compressed air system?

ANSWER:
At an ambient temperature of 75°F and 75% relative humidity, a typical 100 HP (500 scfm) air compressor inhales 90 gallons of water vapor every 24 hours. Discharging air at 100°F and 100 psig, a well maintained aftercooler may remove about 57 gallons. That leaves 33 gallons inside your air system.

At the CAGI ADF 100 design standard of 38°F, a refrigerated dryer removes an additional 29 gallons. The remaining 4 gallons safely pass through the system as water vapor. Because there is usually a rise in air temperature during compression, condensation often does not occur within your compressor itself.

Condensation in your compressed air system usually happens as compressed air cools when passing through the discharge piping. This condensed water must be drawn out of your line by a separator and a trap. While approximately two-thirds of the water vapor is converted to liquid from the system in an effective aftercooler, there is still a lot of water vapor remaining in the compressed air which is "saturated" at the exit temperature from the aftercooler.

Compressed Air Dryers have been designed and developed to help remove water vapor from the compressed air in a controlled manner in order to provide you with a required "quality of dry air" needed for your equipment and processes.

Ask a Question:
How DRY should my compressed air be?

ANSWER:
"Dryness" can be relative. Air that is dry for one type of application my not be dry enough for another. There will always some moisture present in your compressed air system regardless of the degree of drying.

There are different types of dryers available with varying degrees of moisture removal. First - you need to determine the required "degree of dryness" for your Compressed Air System, which is specified in the "Pressure Dew Point" (PDP) at a certain pressure.

It is not a good practice to specify a pressure dew point a lot lower than your application's requirements. This can result in more costly equipment and increased operating expenses. Determining the PRESSURE DEW POINT TEMPERATURE will help you determine the "dew point class" of the dryer you need.

Ask a Question:
What is "PRESSURE DEW POINT"?

ANSWER:
Pressure Dew Point - For a given pressure, the temperature at which water VAPOR will begin to condense INTO liquid water.

Ask a Question:
What pressure dew point do I need?

ANSWER:
***First - here's some information to help you understand pressure dew point*:** The lowest pressure dew point class for a refrigerated dryer is Class 4. Class 4 delivers a pressure dew point of +38°F.

Refrigerated dryers should not operate below the Class 4 range because the water vapor will freeze in the dryer. The highest pressure dew point for a refrigerated dryer is Class 6. Class 6 delivers a pressure dew point of +50°F.

The highest practical pressure dew point because higher pressure dew point causes condensation in downstream piping.

WAYS TO DETERMINE PRESSURE DEW POINT:

1. Ask the Manufacturer what the pressure dew point (PDP) requirements are for your equipment.

2. You can CALCULATE PRESSURE DEW POINT TEMPERATURE you need. Here's how:

1. Determine the lowest ambient temperature your compressed air piping system will be exposed to.

Check the location of air lines throughout air conditioned or unheated areas underground or between buildings.
(For example, your compressor and piping is inside your facility and the lowest air temperature it would ever be exposed to is 58ºF.)

2. Now you need to take that temperature number and lower it by 20º.
(For example, your 58ºF lowest ambient temperature -20º = (38º PDP NEEDED)

This will give the PRESSURE DEW POINT TEMPERATURE needed to prevent liquid water forming downstream.

Determining the PRESSURE DEW POINT TEMPERATURE will help you determine the "dew point class" of the dryer you need. These "classifications" are industry standards for compressed air dryers as established by the ISO (International Organization for Standardization).

ISO 8573.1 AIR QUALITY CLASSES of PRESSURE DEW POINTS THAT APPLY TO REFRIGERATED AIR DRYERS:
Class 4 maximum pressure dew point +38 º F
Class 5 maximum pressure dew point +45 º F
Class 6 maximum pressure dew point +50 º F

The lower the dew point, the dryer the air.
These "classifications" are industry standards for compressed air dryers are established by the ISO (International Organization for Standardization).

Ask a Question:
What is the most popular type of compressed air dryer?

ANSWER:
The **REFRIGERATED AIR DRYER** has become the most widely used dryer in general industrial plant air applications, providing a pressure dew point of 35°F to 39°F.

Refrigerated dryers deliver 33°F to 39°F dew point to provide the best value with low initial cost and low cost of operation. They are the best choice when the ambient temperature where the compressed air is used will remain higher than the pressure dew point. A 33°F to 39°F dew point is ideal for most indoor areas where people comfort is maintained.

Ask a Question:
How does a Refrigerated Air Dryer work?

ANSWER:
The basic principle is similar to a domestic refrigerator or home air conditioning system. The compressed air is cooled in an air-to-refrigerant heat exchanger to about 35°F, at which point the condensed moisture is drained off. The air is then reheated in an air-to-air heat exchanger by means of the incoming air, which also is pre-cooled before entering the air-to-refrigerant heat exchanger.

This means that the compressed air leaving the dryer has a pressure dew point of 35°F to 40°F. A lower dew point is not feasible in this type of dryer as the condensate would freeze at 32°F or lower. In a non-cycling refrigerated dryer, the refrigerant circulates continuously through the system.

Because both the flow of compressed air and ambient temperatures vary, a hot gas bypass valve is often used to regulate the flow of the refrigerant and maintain stable operating conditions within the refrigerant system.

Usually in most designs, the refrigerant evaporated within the air-to-refrigerant heat exchanger (evaporator) and is condensed after compression by an air- or water-to-refrigerant heat exchanger (condenser.) This type of design provided a rapid response to changes in operating loads.

Four Advantages of Refrigerated Air Dryers:

- Low initial capital cost
- Relatively low operating cost
- Low maintenance costs
- Not damaged by lubricant in the air system

**Refrigerated air dryers do have a limited dew point capability. Where a pressure dew point of less than 35°F is required, a refrigerant-type dryer cannot be used.*

Compressed air definitions you should know from Compressed Air & Gas Institute:

Dew Point - The temperature at which moisture in the air will begin to condense if the air is cooled at constant pressure. At this point the relative humidity is 100%.Dew points may be expressed at an operating pressure or at atmospheric pressure. Operating pressure should be specified when using "pressure dew point."

Pressure Drop - Loss of pressure in a compressed air system or component due to friction or restriction. Typically, the pressure drop through a compressed air dryer is 3 to 5 psi and should be taken into account in system requirements.

SOURCES:

"Improving Compressed Air System Performance- A sourcebook for industry" U.S. Department of Energy Energy Efficiency and Renewable Energy; "Best Practices for Compressed Air Systems" by CA; Compressed Air & Gas Institute (CAGI).