



Dew Point in Compressed Air

Helping you make a better measurement.

Webinar Presenters & Humidity Experts



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Agenda & Takeaways

Agenda

- Definition of Dew Point
- Pressure Effect
- ISO Air Classes & Dryers
- Desiccant Dryers and Efficiency
- Water in Air – practical example
- Summary

Takeaways

- Understanding the parameter helps to make a better measurement and prevent water.
- Learn the cause of liquid water in the system.
- Understand how pressure affects the measurement.
- Understand dryer performance and dew point.

Definition of Dew Point

Definition of Dew Point Temperature

- Dew point temperature is the temperature at which water vapor will begin to condense.
- The temperature at which a moist gas is saturated over a plane surface of pure liquid water.



Note – Dew point temperature does not change as temperature changes.

What about Frost Point?

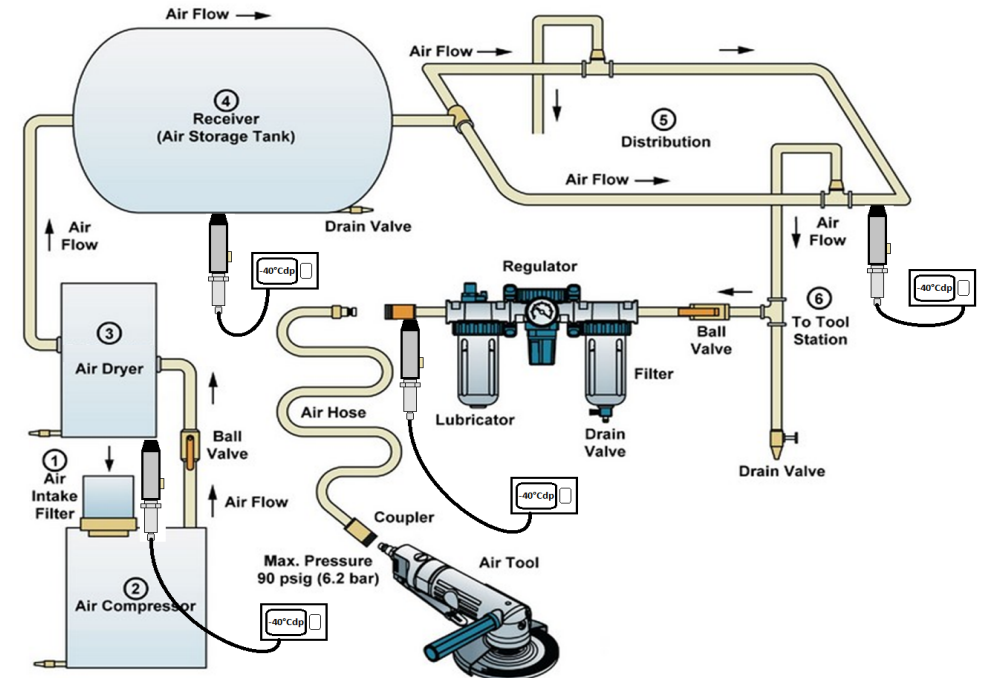
- The temperature at which a moist gas is saturated over a plane surface of pure ice.
- Which one are you measuring?
- Which one matters in compressed air?



Note – Dew point is lower than frost point (by about 4C at -40).

Why Is Dew Point Temperature so Important?

- Water in compressed air causes problems.
- If Dp reaches ambient temperature, condensation occurs.
- Dew point temperature changes with pressure and with dryer performance.



Pressure Effects

Pressure Effects on Dew Point

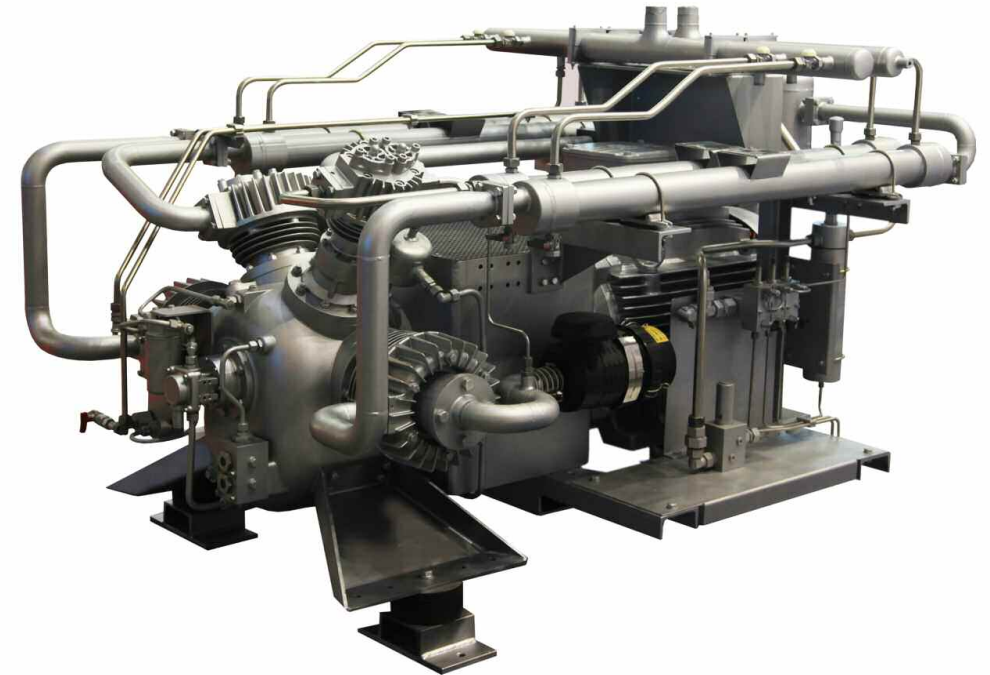
Rule of thumb:

- As pressure increases, dew point temperature rises and approaches saturation.
- As pressure decreases, dew point temperature goes lower and the air becomes dryer (relatively speaking)



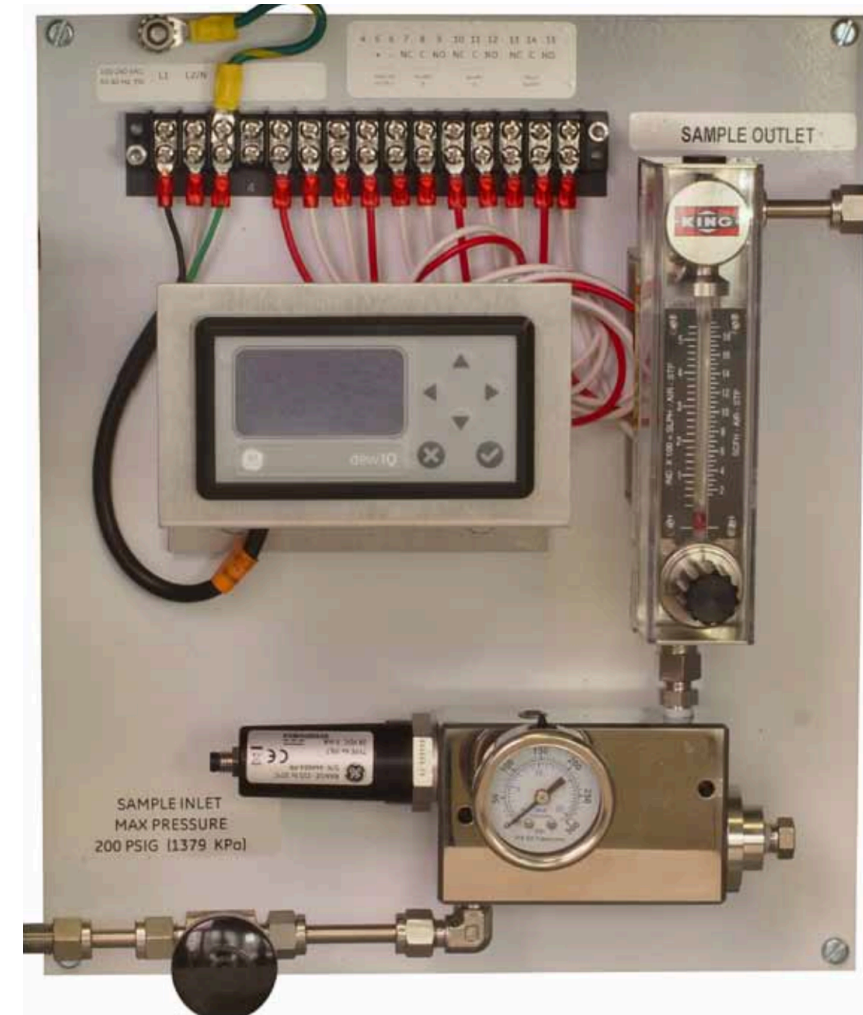
Pressure Dew Point vs Atmospheric Dew Point

- **Pressure Dew Point** is the dew point at the actual pressure.
- **Atmospheric Dew Point** is what that dew point would be if the air were expanded to atm pressure or 0 psig.
- Know what your hygrometer is reporting – pressure Dp or Atm Dp.




How do You Know ATM or Pressure?

- Is the probe on the pressure line?
- Is there a sample line from the main line?
- Is there a regulator?



What if you have to convert?



Humidity Calculator

1.08

Known Parameter [?]

Dew Point / Frost Point ▾

Known Value [?]

-10

Known Units [?]

°F

Sample Pressure [?]

0

Pressure Units [?]

psig

Pressure Compensation [?]

[off]

Gas Type [?]

Air ▾

Mol. Weight [?]

28.9645

Sample Temperature [?]

69.80000000000001

Temperature Units [?]


°F

Calculate

Results [Settings]

Water Vapour Pressure	74.649 Pa	Saturation Vapour Pressure
Dew Point	-14.593 °F	Frost point
Relative Humidity	3.0002 %	Moisture (Volume)
Moisture (Weight)	458.57 ppm	Absolute Humidity
Mixing Ratio	0.00045857 kg/kg	Wet Bulb
Enthalpy	22.289 kJ/kg	Water Activity
		0.030002

What if you have to convert?



Humidity Calculator

1.08

Known Parameter [?]

Mixing Ratio ▾

Known Value [?]

0.00045857

Known Units [?]

kg/kg ▾

Sample Pressure [?]

100

Pressure Units [?]

psig ▾

Pressure Compensation [?]

[off]

Gas Type [?]

Air ▾

Mol. Weight [?]

28.9645

Sample Temperature [?]

69.80000000000001

Temperature Units [?]

°F ▾

Calculate

Results [Settings]

Water Vapour Pressure	582.61 Pa	Saturation Vapour Pressure
Dew Point	30.816 °F	Frost point
Relative Humidity	23.415 %	Moisture (Volume)
Moisture (Weight)	458.57 ppm	Absolute Humidity
Mixing Ratio	0.00045857 kg/kg	Wet Bulb
Enthalpy	22.289 kJ/kg	Water Activity
		64.644 °F
		737.28 ppm
		4.2921 g/m3
		0.23415

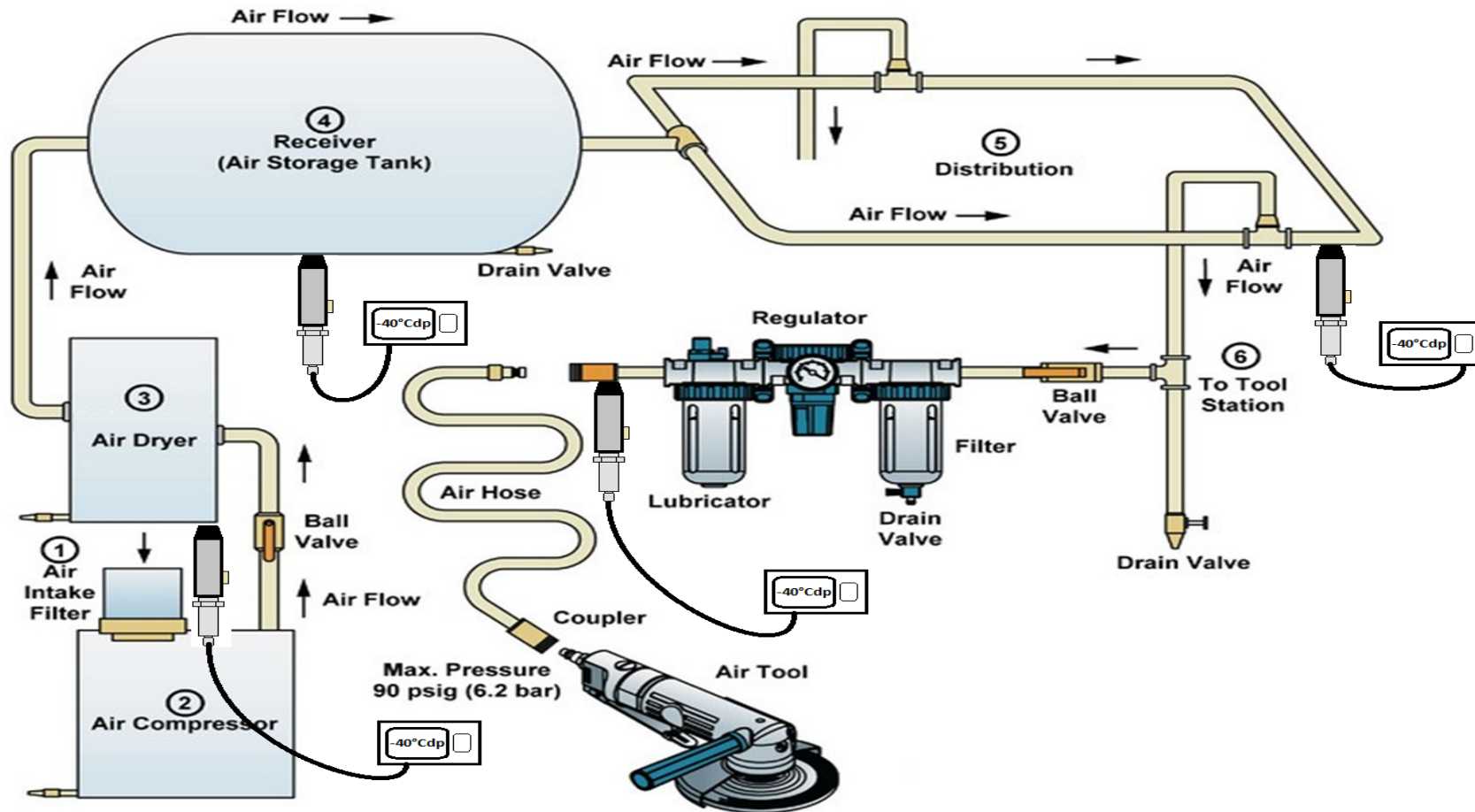
Comments & Questions



If we don't get to your question today, we'll respond via email after the webinar.

Application

Where Should you Measure Dew Point?



Air Classification - ISO 8573.1 (pressure dew point only)

Class	Particles max in microns	Dew Point C	Dew Point F	Oil mg/m ³
1	0.1	-70	-94	0.01
2	1	-40	-40	0.1
3	5	-20	-4	1
4	15	3	38	5
5	40	7	45	>5
6	-	10	50	-

Heatless Desiccant Dryers Dew Point

Dewpoint Demand Switching

- Heatless regenerative dryers
- High cost in purge air is reduced
- Some HDD consume up to 15% of their rated capacity in purge air without DDS.

For example:

- If a dryer is rated for -40 Dp at 1000 cfm, it requires 150cfm just for purge air.
- This is equal to a 35HP compressor running 24/7 just to purge the dryer.



Practical Examples

Practical Example – will it freeze?

Case:

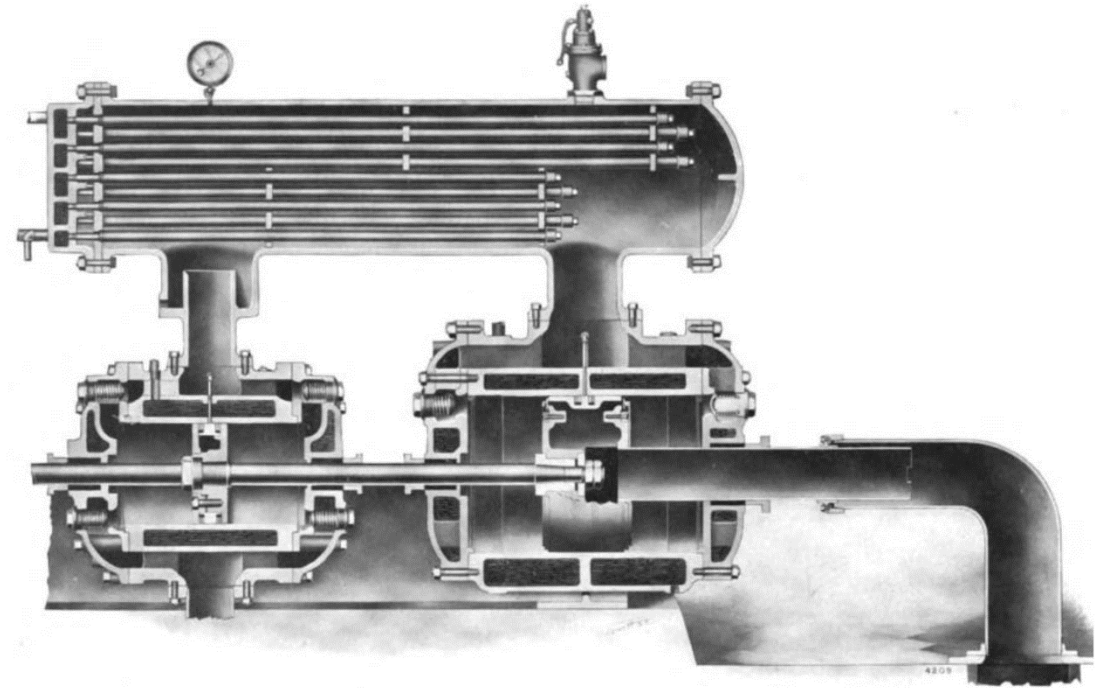
Atmospheric Dew point = 38°F

Inside temperature is 77°F

Airline goes outside in 30°F

Compressed air lines at 100 psig

- Dew point instrument reads -20°F DP from sample of gas taken from system
- Will the lines freeze?



Practical Example – will it freeze?

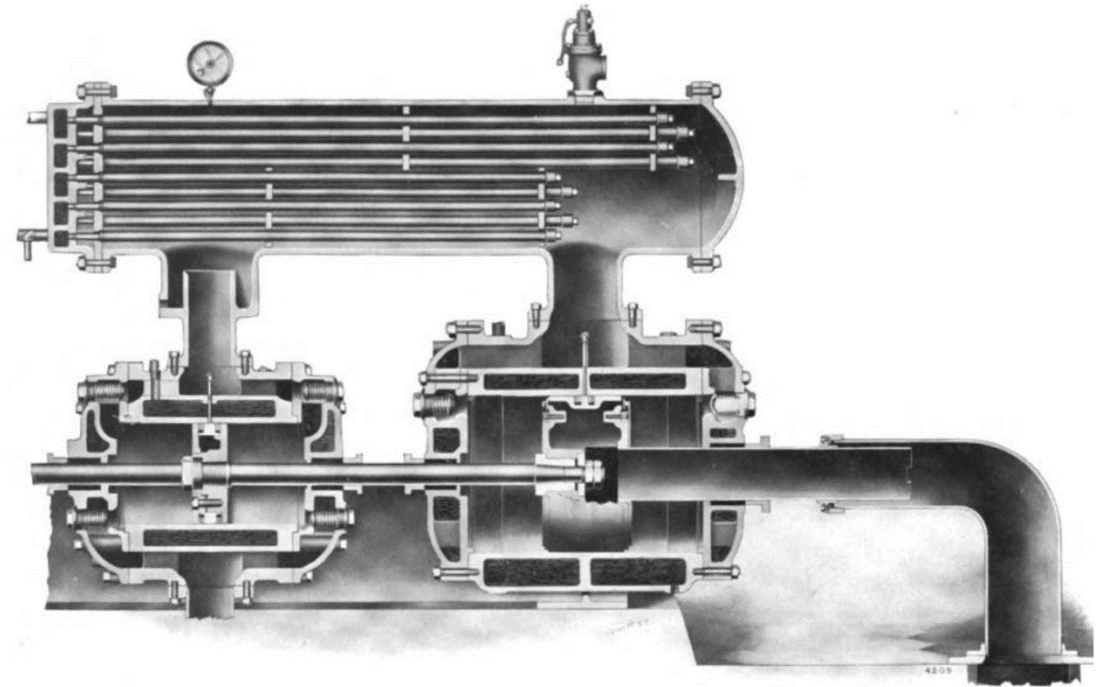
Critical Information

Atm DP: -20°F

Pressure: 100 psig

Lowest Temperature: 30°F

Pressure DP: ???

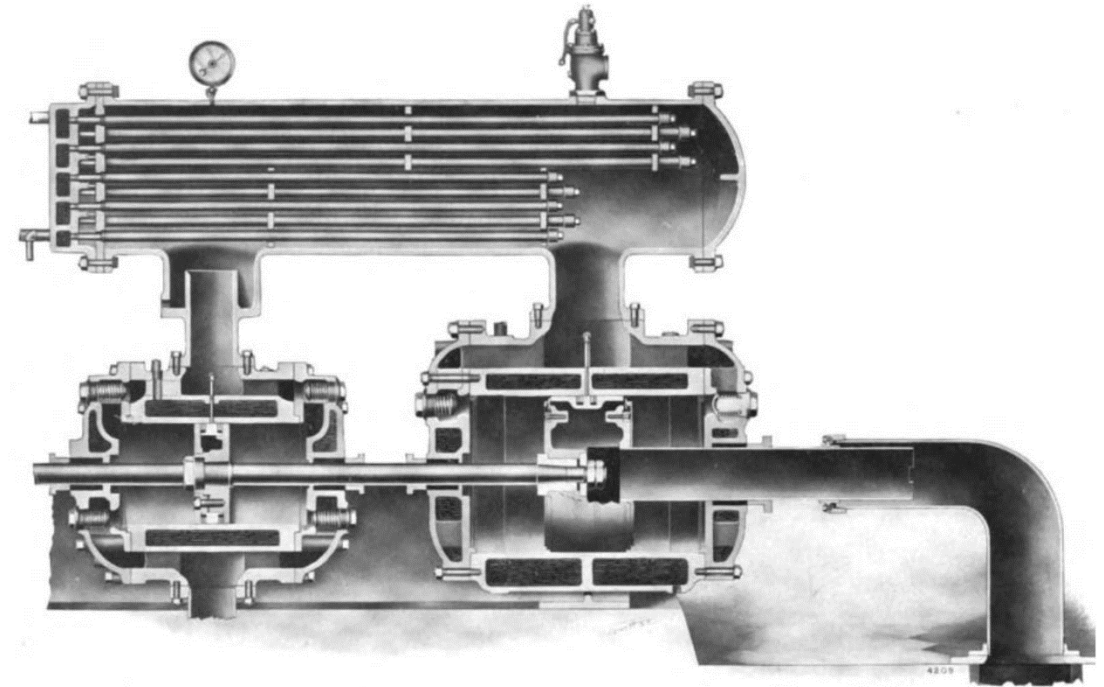


Practical Example – will it freeze?

Calculate

Mixing Ratio: 0.00034782 kg/kg

Pressure DP: 24.1°F



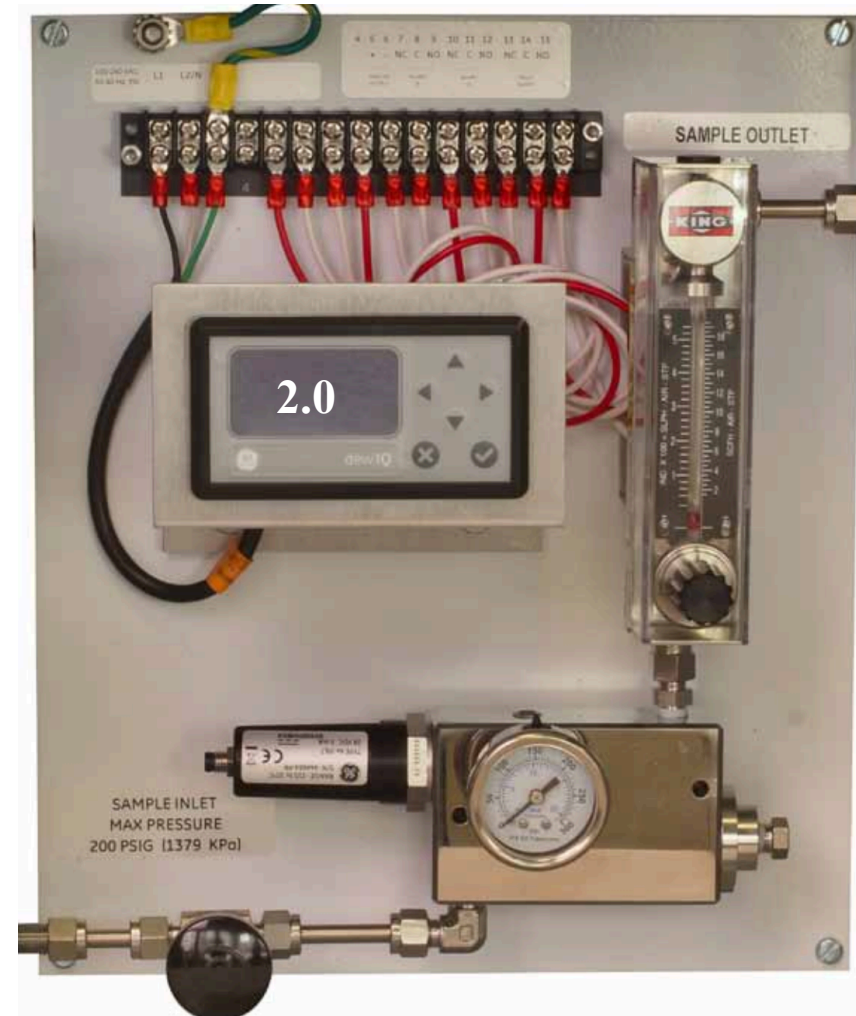
Pressure DP (24.1°F) < Outside Temperature (30°F)

No Ice!

Practical Example: What is your real dew point temperature?

Case:

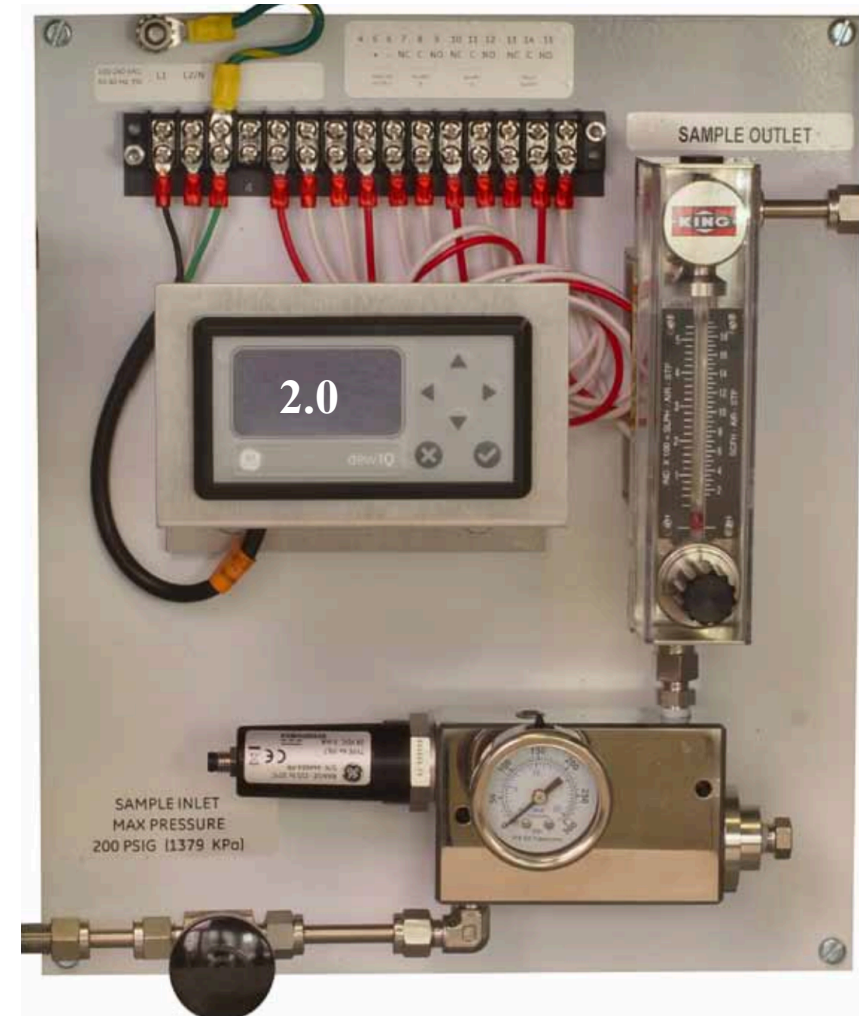
- Pressure is 70psig
- Dew point is +2F



Practical Example: What is your real dew point temperature?

Case:

- Pressure is 70psig
- Dew point is +2F
- Pressure dew point is +39F at 70psig
- At 90 psig – dew point is +45F



Comments & Questions



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Next Webinars

Humidity Theory, Terms & Tips

Thursday, November 16, 1:00PM EST

Humidity Measurement Technology Pros & Cons

Thursday, December 21, 1:00PM EST

How to Choose a Best-fit Humidity Instrument

Thursday, January 18, 1:00PM EST

Thank you!

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