

At What Pressure Should the Hydrocarbon Dew Point be Measured?

KEY CONCEPTS

- Hydrocarbon dew point
- Phase Diagram
- Cricondetherm
- Cricondetherm pressure
- Measurement Pressure

EXECUTIVE SUMMARY

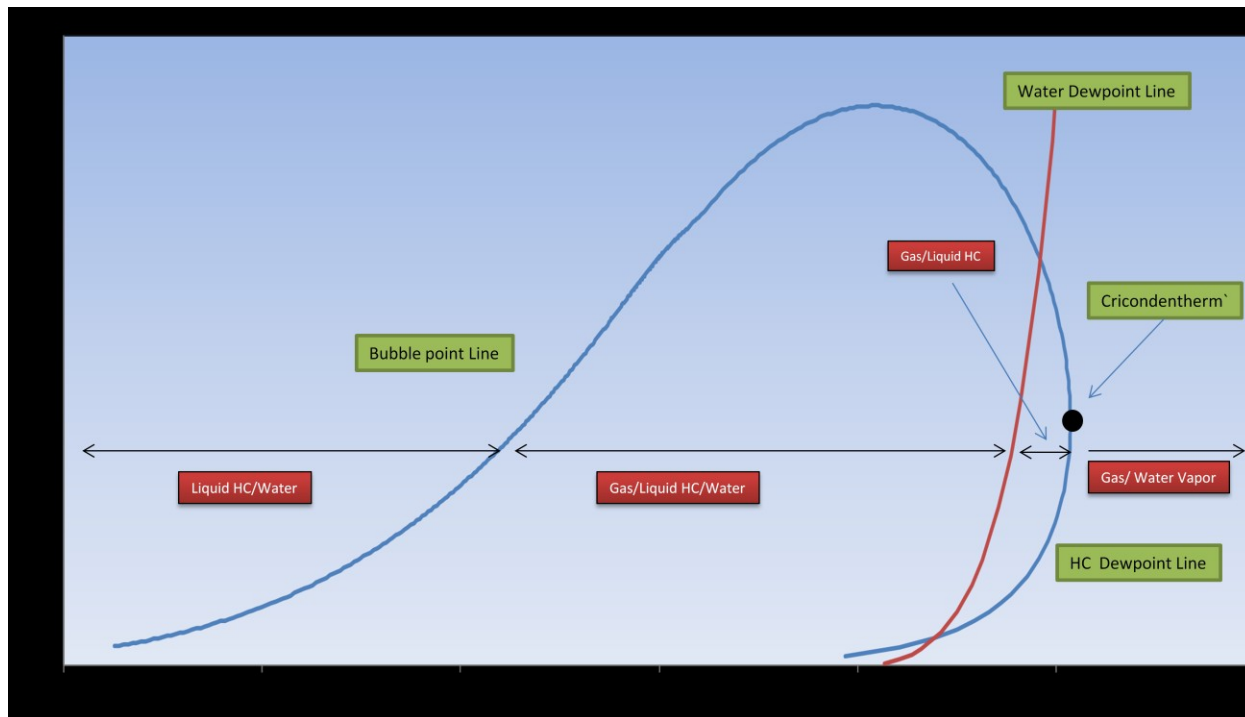
There are two pressure regions where hydrocarbon dew points are commonly measured at; the *cricondetherm pressure*, and the *process pressure*. Both can be useful measurements. In this technical note we explain the rationale for each.

INTRODUCTION

The hydrocarbon dew point of natural gas is an important quality that needs to be measured and controlled from processing, to transport and distribution. Formation of hydrocarbon liquids in pipelines, compressors and gas turbines creates significant measurement uncertainties as well as operational and safety issues. Controlling the hydrocarbon dew points can also significantly reduce pigging operations resulting in cost savings.

Chilled-mirrors are the only way one can measure a dew point, whether it is a hydrocarbon dew point or water dew point. The question is what pressure one needs to measure the dew point at.

Before discussing the answer, let's take a look at a typical phase diagram for natural gas.



The *cricondetherm* is temperature corresponding to the point on the phase diagram that is the farthest to the right. It is the highest possible HC dew point at any pressure. The significance of this point is that if the gas is never exposed to this temperature or lower, then there is no chance of any HC condensation. The pressure at which *cricondetherm* occurs is called the *cricondetherm pressure*. For most of pipeline quality gas the *cricondetherm pressure* is between 350-500 psi (25-35 bar). It should also be noted that the phase diagram is almost vertical close to the *cricondetherm*.

In the United States, most pipeline operators measure the hydrocarbon dew point at the pipeline (process) pressure. The rationale is that the operators would like to prevent condensation at their operating pressure which may be higher or lower than the *cricondentherm pressure*. They are not concerned with other pressures.

In most of the rest of the world, hydrocarbon is measured at the *cricondentherm pressure*. The rationale for this is that if the gas can be kept at above the *cricondentherm* temperature, then there is no chance of condensation. The other rationale is that the pipeline pressure is not necessarily a constant as the pipeline loses pressure along its span. So if it has a pressure above the *cricondentherm pressure*, it may lose pressure during transport which may lead to encroaching into the phase envelope and creating liquids. Many operators have agreed to fix this pressure at 27 bar. The *cricondentherm* may not be exactly 27 bar, but since the phase diagram is almost vertical in this region, the exact pressure does not affect the *cricondentherm* by too much.

Of course, one can measure the HC dew point at other pressures. However, such measurements are not useful. For example, measuring the dew point at very low pressures does not provide any useful information in operation of gas facilities, unless the process (pipeline) is also at such a low pressure. Also, as it is evident from the phase diagram, hydrocarbon dew point rapidly declines at low pressures that may be below measurement range of most analyzers.

Conclusion

Hydrocarbon dew point can be measured at any pressure. However, only measurements at line pressure or the *cricondentherm pressure* provide useful information.