

What is it? Why is it important? How is it determined? These are some of the questions you might have about hydrocarbon dew point. This briefing note aims to answer your questions.

Definition: Hydrocarbon dew point is the temperature (at a stated pressure) at which natural gas components will start to condense out of the gaseous phase. The maximum temperature and the pressure at which this condensation takes place is called the cricondentherm.

EffecTech can help you decide which method meets your requirements.

We also have our own software solution DewCalc™ for calculating vapour liquid equilibrium.

We have vast experience in configuring gas chromatographs to give the most appropriate information for EOS solutions to hydrocarbon dew points.

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or visit our web site

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Consequences

If natural gas is allowed to cool below its dew point, in storage or use, then hydrocarbon liquids are formed. This can have deleterious consequences depending upon what the natural gas is being used for

- sampling – unrepresentative sample
- electricity generation – damage to turbines
- transportation – liquid in low points of system

Measurement

There are three commonly used ways of determining hydrocarbon dew point, the cold mirror method (*de facto* standard), the gravimetric method (based on ISO 6570) and calculation from composition data provided by chromatography.

Cold mirror (dewscope)

This method tends to be the benchmark against which other techniques are compared.

The principle is based on observation of the formation of a film of hydrocarbon condensate on the surface of an illuminated cooled mirror. Natural gas is passed over the mirror surface, at 27 bar, which is cooled by a coolant such as carbon dioxide.

Experience indicates that a dewscope measures a slightly lower temperature than the actual true dew point. This is due to the need to build up a finite amount of liquid on the mirror before it can be seen. During this time, the mirror is still cooling, and the temperature is read, not as the first molecule condenses, but a little later when an observable amount has accumulated. The nature of the liquid formation is unknown.

Gravimetric method

This method is designed to measure the mass of condensate that is separated from natural gas at a defined temperature and pressure. It can be a fully automated method, and is described in ISO 6570: Measurement of potential hydrocarbon liquid.

The gas pressure, the amount of gas flowed, the cooling bath and gas temperatures and the mass of condensate are logged. From this record, it is easy to plot the amount of condensate collected against time, or the amount of condensate per cubic metre of gas as a function of time.

The points to note about this method are

- it does not give a direct correlation to hydrocarbon dew point – although the amount of liquid produced at a given temperature is of more use for pipeline operations
- amounts of liquid being collected are usually very small so are averaged out over a longer period of time
- low rates of condensate collection can be measured, but only with hindsight, considering data averaged over an hour or longer
- slow response time for monitoring increases in hydrocarbon content.

DewCalc™ by EffecTech

In brief it provides

- dew temperature at any given pressure
- maximum dew temperature (cricondentherm)
- amount of liquid formed in two phase region
- choice of equation of state
- single phase EOS solutions
- 2-phase vapour-liquid equilibrium EOS solutions
- choice of pressure and temperature units
- 250+ component thermodynamic properties database

Calculation from analysis

This relies on analysing natural gas by chromatography then using a computer program (see side panel) to calculate the dew point by solving an equation of state.

Points to note about this approach

- ideally need to measure every component present (this is not possible due to the complexity of natural gas)
- analysis to n-pentane with a C₆+ backflush is not good enough
- some assumptions about grouping of hydrocarbons have to be made regarding the make up and treatment of carbon number six and above
- depending upon the assumptions made above the calculated dew point temperature can vary
- the quality of the chromatographic data is of **vital** importance in this method.

Which method is the correct one? This depends upon accuracy required, frequency of results, degree of automation and costs of operation.