

MOISTURE DEW POINT MEASUREMENT IN ETHYLENE FEED GAS

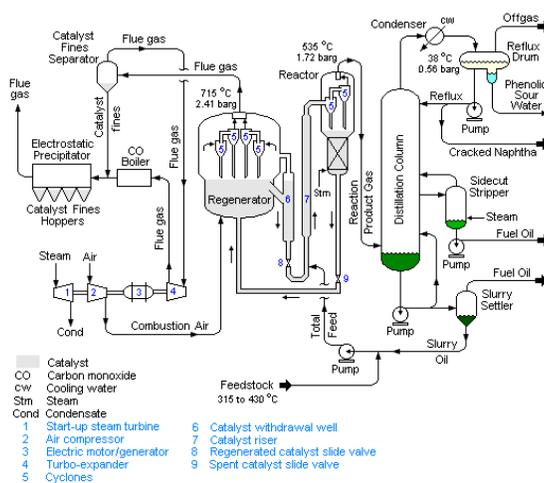


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Application Notes

Ethylene is a colorless, flammable gas used to produce a number of chemical products. Since the production of ethylene normally requires steam it drives the need to dry the resulting gas steam before introducing it into the downstream processes. Xentaur HTF™ based sensors provide the most accurate and robust method for monitoring the drying process.

Steam cracking of naphtha, ethane or natural gas is the most common method of ethylene production. By “cracking” with steam, heavier hydrocarbon molecules in the feedstocks break apart (“crack”) yielding gaseous and light liquid hydrocarbons that are then heated to an approximate range 750–950°C (1382–1742°F)[1]. After reaching a “critical” temperature the stream is immediately “quenched” to stop the various reactions. The result is the conversion of the “heavier” (larger) hydrocarbons into “lighter” (smaller) ones. Ethylene is then separated from the resulting complex mixture by a process of repeated compression and distillation. Propylene is also another product that is produced in the same stream. In general, the lighter the feedstock, the higher the yield of ethylene in the final stream.



(http://en.wikipedia.org/wiki/File:Fluid_Catalytic_Cracker.gif)

APPLICATION

Steam cracking requires a large amount of steam to be injected into the stream to be cracked. Therefore the resulting product stream will contain a high concentration of moisture (H₂O). The downstream processes of producing polyethylene, ethanol, ethylene oxide, vinyl acetate, 1,2-dichloroethane and other compounds all require catalysts that are sensitive to moisture. In the catalytic reactor, any moisture will reduce catalytic activity thereby decreasing the overall yield. High moisture can even permanently damage catalyst requiring an expensive turnaround of the process train to replace the spent catalyst.

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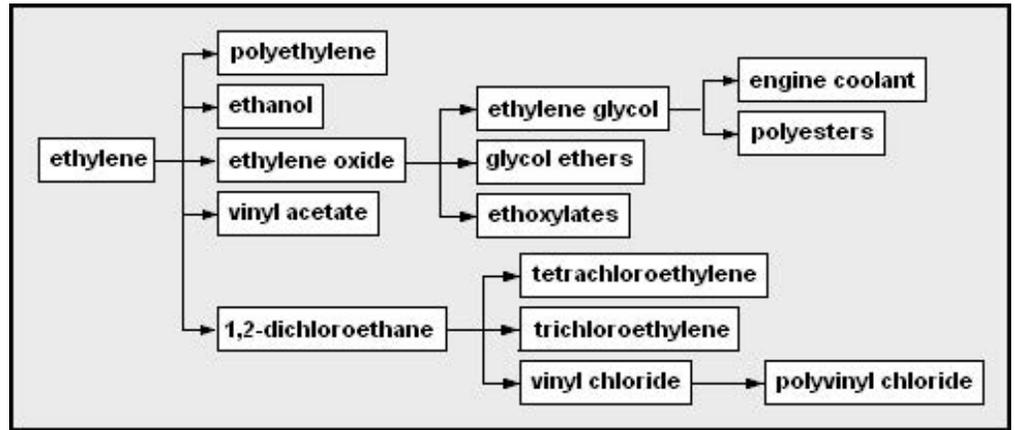
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Therefore, the ethylene stream is normally run through desiccant beds to remove moisture down to the single digit ppmv or ppmw levels depending on the phase of the stream.

INSTALLATION & METER CONFIGURATIONS

The moisture concentration measurement points are usually located just upstream and downstream of the ethylene dryers on a by-pass loop utilizing a flow-through design returning the ethylene to the main stream.

Configurations can consist of a simple base plate design sample system with display or just a sample cell and a blind transmitter. In some cases the measurement is made in-situ with a transmitter.



SPECIFICATIONS

Moisture Concentration Range:

0 - 23750 ppmv (gas phase)

0 - 1650 ppmw (liquid phase)

Temperature Range:

-10 C - 70 C

Pressure Range

0 - 5000 psig

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