KOCKEN

SISTEMAS DE ENERGIA INC.

HYDROCARBON DEWPOINT CONTROL

When gas is to be transported for long distances in pipelines, consideration must be given to the control of the formation of hydrocarbon liquids in the transmission system. To prevent formation of said hydrocarbon liquids, it is necessary to control the Hydrocarbon Dewpoint at a temperature below all conceivable operating temperatures.

Hydrocarbon dewpoint is the temperature, at a given pressure, at which the hydrocarbon components will start to condense out of the gaseous phase of the natural gas stream. The maximum temperature, and the pressure at which such condensation takes place, is the cricondentherm.

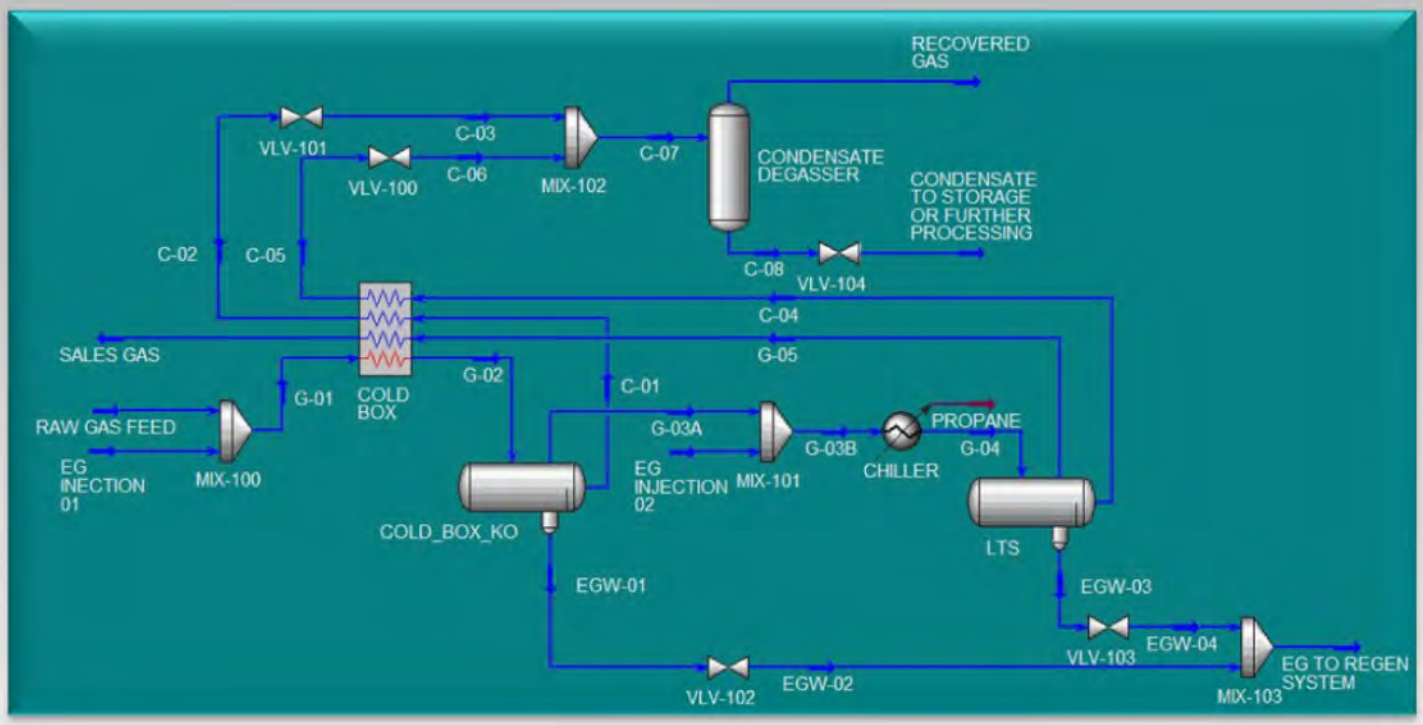
Several methods can be employed to reduce the hydrocarbon dewpoint. Kocken Sistemas de Energia Inc. designs the most common methods of Hydrocarbon Dewpoint Control. All systems are designed in accordance with GPSA Sections 7, 14 & 20; API 660 & 661; ASME Section VIII, Division 1; TEMA 'C' and 'R' requirements and applicable customer specifications.

MECHANICAL REFRIGERATION

In most cases, excess pressure is not available to implement a JT System. As such, one of the most common methods of HC Dewpoint Control is Mechanical Refrigeration. In a properly designed system, pipeline pressure is maintained without the use of compression by minimizing pressure drops across equipment.

There are three main components in the mechanically refrigerated dewpoint control system.

1) **Gas/Gas Heat Exchanger for pre-cooling of inlet stream and warming of sales gas stream.**
2) **Gas Chiller for final cooling of the inlet stream.**
3) **Low Temperature Separator (LTS) for separation of Hydrocarbon Liquids and Injected Hydrate inhibitor (usually Mono-Ethylene Glycol). If multi-pass exchangers (cold box) are used, a Cold Box Knockout Drum is also incorporated.**



PFD for Typical Mechanical Refrigeration Based Hydrocarbon Dewpoint Control Plant

JOULES THOMSON (JT) REFRIGERATION

If sufficient pressure is available, the removal can be accomplished by expansion refrigeration using a JT-Valve. This method relies on adiabatic expansion of the gas stream across a valve (referred to as the Joule-Thomson effect) and cools the gas stream. Generally a heat exchanger is installed upstream of the JT-Valve. Counter-current flow of warm inlet gas exchanges heat with the cool process gas thereby pre-cooling the inlet stream and warming the outlet stream back to pipeline temperature. A low temperature separator (LTS) is installed downstream of the JT-Valve to collect/separate the liquids "dropped" out of the gas stream in the expansion-cooling process across the JT-Valve.

APPLYING WORLD CLASS TECHNOLOGIES IN PURSUIT OF SUPERIOR EFFICIENCY

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