Linde Liquified Natural Gas Production Process

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Background & Description:

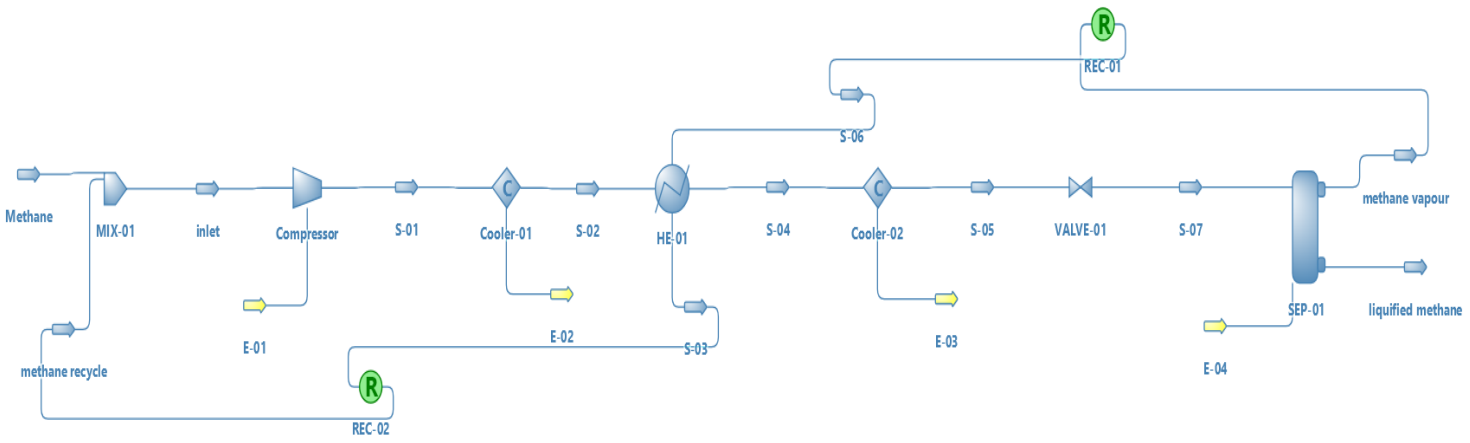
The Linde cycle is a process of liquefaction of gases by, regenerative cooling, which is a positive feedback cooling system. Natural gas is required to be liquified for its transportation and its use as a liquid fuel in aircrafts.

This process flowsheet depicts the production of liquified natural gas(LNG) using Hampson-Linde cycle.

Natural gas (methane) enters the process at 77^0F and 20 psia pressure. Then the gas is compressed in a compressor of 75% adiabatic efficiency to 3000 psia which is then cooled to 90^0F by a cooler. The natural gas is the sent to a counter current flow heat exchanger of 10 m^2 area for further cooling using the cooled vapors of liquified natural gas. After cooling the gas is passed through a throttle valve with outlet pressure of 20 psia. Then the liquified natural gas is obtained using a vapor liquid separator. The vapor stream of natural gas is recycled through the heat exchanger to the mixer along with the methane entering.

The obtained Liquified Natural Gas is at -251.793^{0}F and 20 psi.

Flowsheet:



Results:

Table 1: entry and exit material stream

Master Property Table					
Object	**methane vapour**	**liquified methane**	**inlet**	**Methane**	
Temperature	-251.793	-251.793	-203.209	77	**F**
Pressure	20	20	20	20	**psi**
Mass Flow	1.22044E+08	8.11878E+06	1.30163E+08	7.27674E+06	**kg/h**
Molar Flow	1.67719E+07	1.11572E+06	1.78876E+07	1E+06	**lbmol/h**

Master Property Table		
Object	**HE-01**	
Heat Exchange Area (A)	10	**m2**
Cold fluid outlet temperature	-220	**F**
Hot fluid outlet temperature	71.9821	**F**
Logarithmic mean temperature difference LMTD	176.021	**C.**
Thermal Efficiency	9.23959	**%**
Maximum Theoretical Heat Exchange	1.37965E+07	**kW**

Master Property Table		
Object	**Compressor**	
Pressure Increase	205.463	**bar**
Adiabatic Efficiency	75	**%**
Power Required	3.46166E+07	**kW**

Master Property Table			
Object	**Cooler-02**	**Cooler-01**	
Outlet Temperature	-35	90	**F**

Table 2: Properties of heat exchanger, compressor and coolers used

Reference: https://www.chegg.com/homework-help/questions-and-answers/natural-gas-methane-liquefaction-process-linde-liquified-natural-gas-lng-production-proces-q23871193