CARBON CAPTURE PROCESS FROM FLUE GAS BY USING MEA

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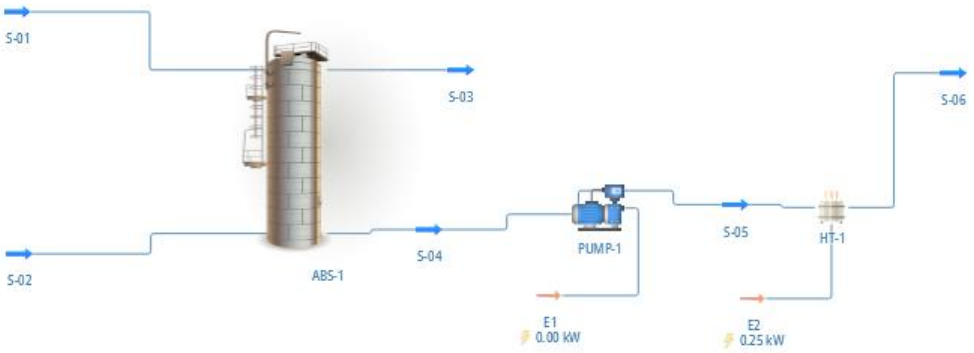
Background & Description:

The Carbon capture process is a type of natural gas sweetening in crude oil industry. With the help of carbon capture various industry can achieve NET ZERO EMMISSIONS by 2050. This process is widely used in various industrial applications, including the Crude industry, Cement industry, Ammonia production industry. There are various methods for storing carbon dioxide including different types of solvent such as monoethanolamine (MEA) and methyl diethanolamine (MDEA). Out of these solvent MEA is good which is easily available in industry. So with the help of (MEA) solvent i have made the flowsheet on DWSIM.

In this flowsheet, one absorption column (Co2 absorber-20 stages) is used. For bottom feed CO2 coming from the Lean gas with 20 stages and for top feed, Monoethanolamine (MEA) is the solvent which is used to capture CO2. Top product of this CO2 absorber is Gas out. And the bottom products are solvent rich out. The bottom product of the ABSORBER COLUMN is sent to a PUMP to increase the pressure, Then again sent to the Heater to outlet temperature of 82°C for better solubility.

Thermodynamic packages: For all the Material streams NRTL property is used. For 1 Absorption Columns (CO2 absorber), 1 Pump and 1 Heater is used.

Flowsheet:



Results: Summary of Simulation results are shown in Table 1

Table 1: Simulation Results

Object (Streams)	Feed(S-01)	Feed (S-02)	Outlet(S03)	Outlet(S06)	Units
Temperature	333	333	304.767	354.33	K
Pressure	101325	101325	101325	138000	Pa
Molar Flow	0.6	20	5.67452	0.0477028	mol/s
Monoethanolamine	0.3	0	0.0004243	0.9976	Mole fraction
Carbon dioxide	0	0.28	0.274129	8.8144E-05	Mole fraction
Sulfur dioxide	0	0.02	0.019562047	0.002221	Mole fraction
Nitrogen	0	0.7	0.68532493	5.3E-06	Mole fraction
water	0.7	0	0.02055969	1.51E-13	Mole fraction

References: https://pubs.acs.org/doi/epdf/10.1021/acs.iecr.2c00673