Project title: Booster Compression Model

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Abstract

Carbon dioxide (CO2) is extracted from coal flue gas, and syngas must be compressed before being transported through a pipeline for geologic storage, increased oil recovery, or CO2 usage. It's widely employed in a variety of industries. Beverage carbonation, food freezing and chilling, water purification, and chemical reaction control, among other things. In this project, I'll be using the DWSIM software to simulate air compressors compressing various gases. CO2 is utilised for compression in order to reduce carbon emissions into the atmosphere. Because a substantial pressure drop will occur while collecting CO2 from the gas, gas pressure must be increased before the gas products reach the CO2 removal process. The Peng-Robinson state package was used to simulate Booster Compression in this situation. Carbon dioxide, water, nitrogen, methane, ethane, propane, iso-butane, and N-butane are all components. In the open-source software DWSIM, compress only carbon dioxide in a step-by-step operation thermodynamic adiabatic process occurs.

Splitter:

To separate streams with a temperature of 30 degree C and a pressure of 20 barg and the mass flow is 980000 kg/h, add a splitter to a simulation with 1 inlet and 2 outlet streams operation mode.

Suction Scrubber (Gas-Liquid Separator):

In the attached gas-liquid separator file, the feed was initially at 30 degree C (complete liquid phase), therefore when the flash

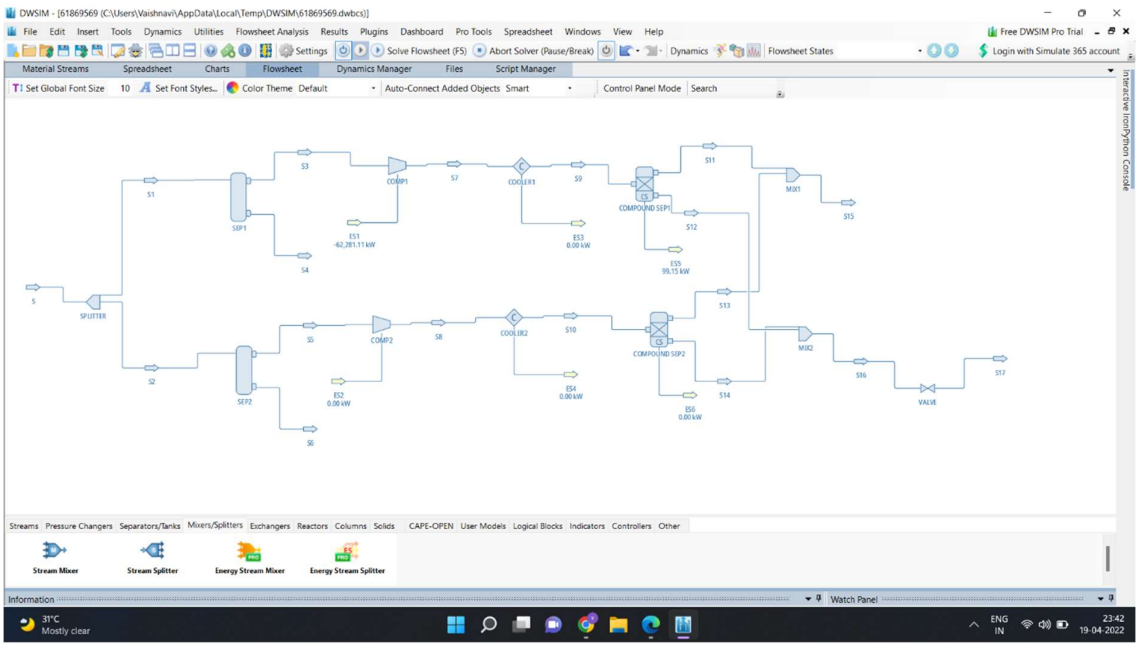
operation was performed, the entire feed came out as liquid, as expected. In this simulation, I'll be using two suction scrubbers, each of which will play the same duty. There is a splitter outlet for their incoming stream, and their outlets are connected to the COMP inlet.

Compressor:

A compressor is a device that uses pressure to supply energy to a vapour stream. The thermodynamic process of adiabatic. The flow energy is -62281.1 have been calculated. This is connected to an inlet for a cooler. In simulation, there are two compressors.

Cooler:

In the cooler, an energy balance is used to calculate enthalpy. With an energy flow of 6.14603E-05 kW, the molar enthalpy(mixture) and specific enthalpy are -7569.07 KJ/K mol and -244.302 KJ/Kg, respectively. The second cooler, on the other hand, produces no energy flow.



Booster Compression Model in DWSIM

Compound Separator:

When using a compound separator, it appears as if energy is being taken away from it rather than added. For the energy balance, two compound separators are added.

Mixture and Valve:

For liquid phase density, use the optimum mixing rule. Two mixtures are introduced, and the material stream S16 is used to connect MIX1 to VALVE in order to calculate pressure drop at 0 Pa. S18 is a material stream that serves as the simulation's output. This is a simulation process in its entirety.

Key words: DWSIM, Chemical process modelling, Hydrocarbon Compound, Compressor.