Vapor Compression Refrigeration Cycle

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Background and Description:

Vapor Compression Refrigeration system is one in which the refrigerant undergoes phase changes, is one of the many refrigeration cycles and it is widely used method for air conditioning and in automobiles. It is also used in domestic and commercial refrigerators, large-scale warehouses for chilled or frozen storage of foods and meats, refrigerated trucks and railroad cars, and host of other commercial and industrial services. Oil refineries, petrochemical and chemical processing plants and natural gas processing plants are among the many industrial plants that often utilize large vapor-compression refrigeration systems.In very basic terms, refrigeration systems are used to remove heat from one area and transfer it into another area.

The vapor compression system simulated here uses propane as the liquid refrigerant medium because of its favorable properties.Circulating refrigerant enters the adiabatic compressor in the thermodynamic state known as saturated vapor, the compressor increases it pressure and temperature and propane leaves the compressor in the super-heated vapor state.This super-heated vapor now enters the condenser which converts it to a saturated liquid at the same pressure. Now this saturated liquid is at a high pressure hence it is throttled with the help of a valve and a vapor-liquid mixture at atmospheric pressure is sent to an evaporator which converts the mixture to saturated vapor and the outlet stream from the evaporator is recycled and sent as the input to the adiabatic compressor

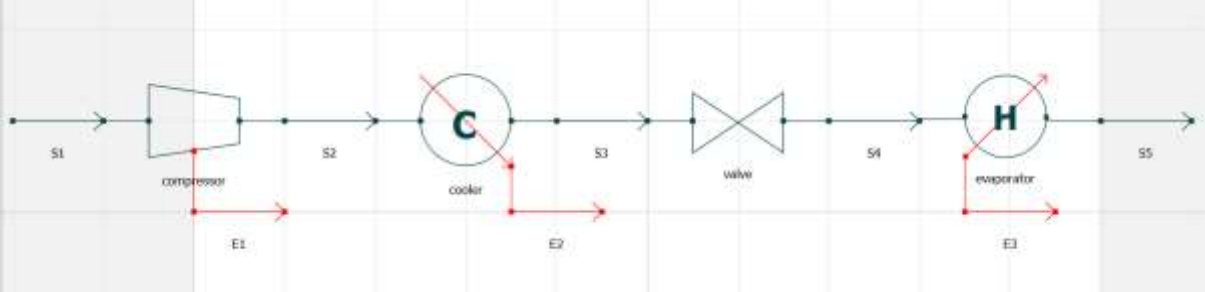
System of unit:

The system of units taken in this flowsheet are SI.

Thermodynamic package:

Raoult's law

Flowsheet:



Results:

OpenModelica results:

Object	S1	S2	S3	S4	S5
Pressure (Pa)	101325	960000	960000	101325	101325
Temperature(K)	230.945	447.519	298.149	298.149	230.945
Molar Flow (mol/s)	22.68	22.68	22.68	22.68	22.68
Mole fraction(Propane)	1	1	1	1	1

DWSIM results:

Object	S1	S2	S3	S4	S5
Pressure (Pa)	101325	960000	960000	101325	101325
Temperature(K)	230.945	312.744	298.149	230.945	230.945
Molar Flow (mol/s)	22.68	22.68	22.68	22.68	22.68
Mole fraction(Propane)	1	1	1	1	1