CoolPack

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SUB-DIAGRAM WINDOWS

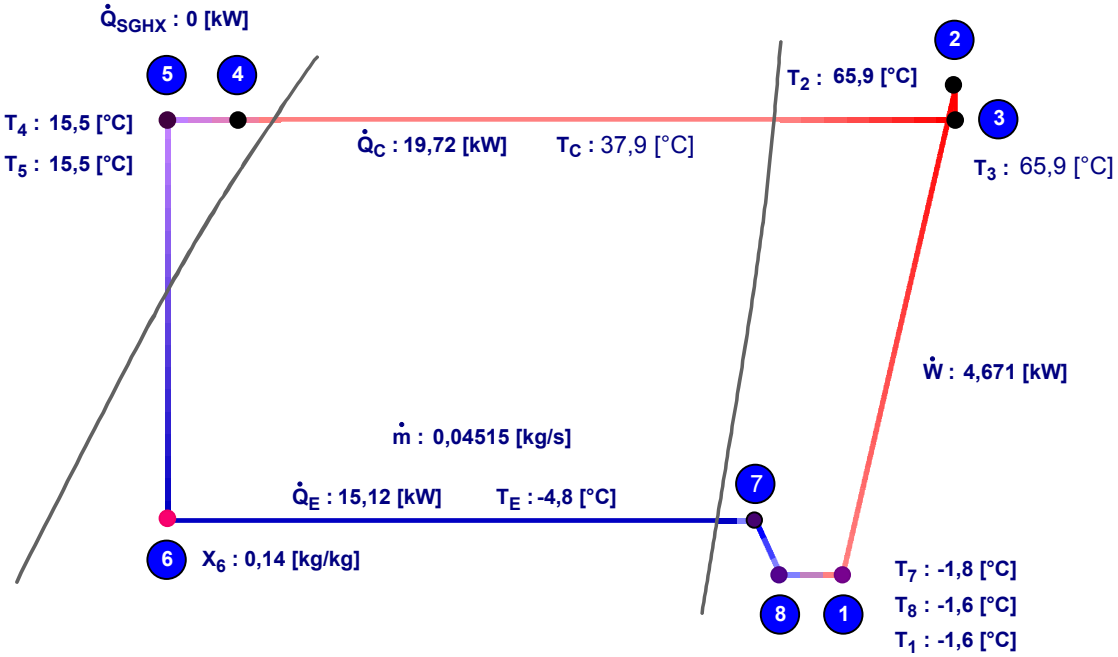
Cycle Spec.
State Points
Auxiliary

Department of Mechanical Engineering
Technical University of Denmark
Version 1.46
TOOL C.1

CYCLE ANALYSIS : ONE-STAGE CYCLE

> DX EVAPORATOR

LOG(p),h-DIAGRAM



REFRIGERANT R290	COP : 3,238	COP* : 3,244	η_{CARNOT} : 0,516

STATE POINTS

STATE POINT	TEMPERATURE [°C]	PRESSURE [kPa]	ENTHALPY [kJ/kg]	DENSITY [kg/m^3]
1	-1,6	405,1	476,4	8,7
2	65,9	1317,9	577,2	24,1
3	65,9	1302,8	577,6	23,8
4	15,5	1302,8	140,8	506,6
5	15,5	1302,8	140,8	506,6
6	-4,8	411,6	140,8	-----
7	-1,8	411,6	475,8	8,8
8	-1,6	405,1	476,4	8,7

Additional information

Pressure ratio (p_2 / p_1) : 3,253

$T_{2,IS}$: 45,4 [°C]

$T_{2,IS}$ is the temperature of the discharge gas assuming reversible and adiabatic compression

$T_{2,W}$: 67,2 [°C]

$T_{2,W}$ is the temperature of the discharge gas assuming real and adiabatic compression

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AUXILIARY

VOLUMETRIC EFFICIENCY

Volumetric efficiency η_{VOL} [-] 0,9 η_{VOL} : 0,900 [-] $\dot{V}_S$: 18,74 [m^3/h] $\dot{V}_D$: 20,82 [m^3/h]

$\dot{V}_S$ can be chosen as input in the cycle specification window.

UTILIZATION OF DISCHARGE GAS SUPERHEAT FOR HEATING OF WATER

Volume flow $\dot{V}_{WATER}$ [m^3/h] 0,01 ΔT_{WATER} : 235,1 [K] $\dot{V}_{WATER}$: 0,01 [m^3/h] $\dot{Q}_{DSH}$: 2,708 [kW]

$T_{DL,OUT}$: 65,9 [°C] T_C : 37,9 [°C]

Water in the desuperheating heat exchanger can only be heated to discharge temperature $T_{DL,OUT}$.
$\dot{Q}_C$ in the main diagram window includes both the heat load for both desuperheating and condensing of the refrigerant.

ENERGY CONSUMPTION

Hours of operation [h] 8760 Energy consumption 40921 [kWh]

PIPE DIMENSIONS

PIPE SECTION	VELOCITY [m/s]	PIPE DIAMETER (Internal) [mm]	Condition corresponds to
Suction line	10,0	25,7	State Point #1
Discharge line	13,0	13,5	State Point #2
Liquid line	0,9	11,2	State Point #5

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CYCLE SPECIFICATION

TEMPERATURE LEVELS	PRESSURE LOSSES	SUCTION GAS HEAT EXCHANGER	REFRIGERANT
T_E [°C] : -4,8 ΔT_{SH} [K] : 3	Δp_{SL} [K] : 0,5	No SGHX 0,20	R290
T_C [°C] : 37,9 ΔT_{SC} [K] : 22,4	Δp_{DL} [K] : 0,5		

CYCLE CAPACITY

Volume flow $\dot{V}_S$ [m³/h] 18,74 $\dot{Q}_E$: 15,12 [kW] $\dot{Q}_C$: 19,72 [kW] $\dot{m}$: 0,04515 [kg/s] $\dot{V}_S$: 18,74 [m³/h]

COMPRESSOR PERFORMANCE

Isentropic efficiency η_{IS} [-] 0,55 η_{IS} : 0,550 [-] $\dot{W}$: 4,671 [kW]

COMPRESSOR HEAT LOSS

Discharge temperature T_2 [°C] 65,9 f_Q : 2,6 [%] T_2 : 65,9 [°C] $\dot{Q}_{LOSS}$: 0,1209 [kW]

SUCTION LINE

Unuseful superheat $\Delta T_{SH,SL}$ [K] 0,2 $\dot{Q}_{SL}$: 28 [W] T_8 : -1,6 [°C] $\Delta T_{SH,SL}$: 0,2 [K]

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