System 010 - Site 501601, Mercer Island, WA

Site 501601 is a grocery store located in Mercer Island, WA.

Circuits 10 & 11, Medium and Low Temperature Racks

This system is a transcritical CO2 booster system with the low temperature stage compressing to the medium temperature level to achieve a two-stage compression. Circuit 10 is the medium temperature rack with four Copeland scroll compressors. Circuit 11 is a low temperature rack with three Bitzer compressors. A desuperheater recovers heat from the hot discharge gas from Circuit 10 to heat hot water, which also decreases the gas temperature before entering the gas cooler, increasing refrigeration efficiency. The gas cooler is a RefPlus Inc., model TVD 141/Low Speed.

Table 1. Measured data on Circuit 10

Measured Data	Variable Name(s)	Point Number
Outdoor Temperature	TT_OUTDOOR	--
Discharge Temperatures after Compressors	MISC1 to MISC4	2
Common Discharge Temperature	TT_RCOMP_OUT	--
Compressor Power, Comp 1 to 4	EP_COMP	--
Low Pressure, Suction Manifold	PT_RLP	1
High Pressure, Discharge Manifold	PT_RHP	2
Desuperheater Water Supply Temperature	AI_X13	--
Desuperheater Water Return Temperature	AI_X14	
Gas Cooler Entering Temperature	TT_RCOND_IN	3
Gas Cooler Leaving Temperature	TT_RCOND_OUT	6
Condenser Fan Power	EP_AUX_SECW	--
Liquid Line Temperature entering expansion device	TT_REXP_IN	7
Temperature Entering MT Subcooler	RHP_TCOND_VAP	
CO2 Tank Pressure	AI_X12	
Evaporator Entering Temperature	TT_X8	
Evaporator Leaving Temperature	TT_REVAP_OUT	
MT Comp Suction Temp	TT_RCOMP_IN	

Table 2. Calculated values on Circuits 10

Calculated Values	Variable Name	Measured Temperatures Used in Calculations	Point Number/ Process
Isentropic Compressor Efficiency	COMP_EFF_ISEN	Discharge and suction manifold conditions	1 to 2
Condensing Temperature	RHP_TCOND_MID	Dew point and bubble point temperatures at PT_RHP	c
Evaporator Temperature	RLP_TEVAP_MID	Dew point and bubble point temperatures temperature at PT_RLP	e

Desuperheater Capacity	RCAP_DESUPERHEAT	TT_RCOMP_OUT, TT_RCOND_IN and AI_X13, AI_X14	--
Heating COP	RCOP_HEAT	TT_RCOND_IN, TT_RCOND_OUT, Discharge and suction manifold conditions	3 to 6
Condenser Capacity	RCAP_HEAT_COND	TT_RCOND_IN, TT_RCOND_OUT	
Heating Capacity	RCAP_HEAT	TT_RCOND_IN, TT_RCOND_OUT	
Cooling COP	RCOP_COOL	TT_X8, TT_REVAP_OUT, Discharge and Suction conditions	8 to 1
Cooling Capacity	RCAP_COOL	TT_X8, Suction conditions	
Subcooling	RSUBCOOL	RHP_TCOND_OUT, Bubble point temperature at PT_RHP	5 to 7
Superheat	Circuit 10: RSUPERHEAT	Suction temperatures, Dew point temperature at PT_RLP	9 to 1

Figure 1. Pressure-enthalpy diagram for basic refrigeration cycle, neglecting pressure losses.

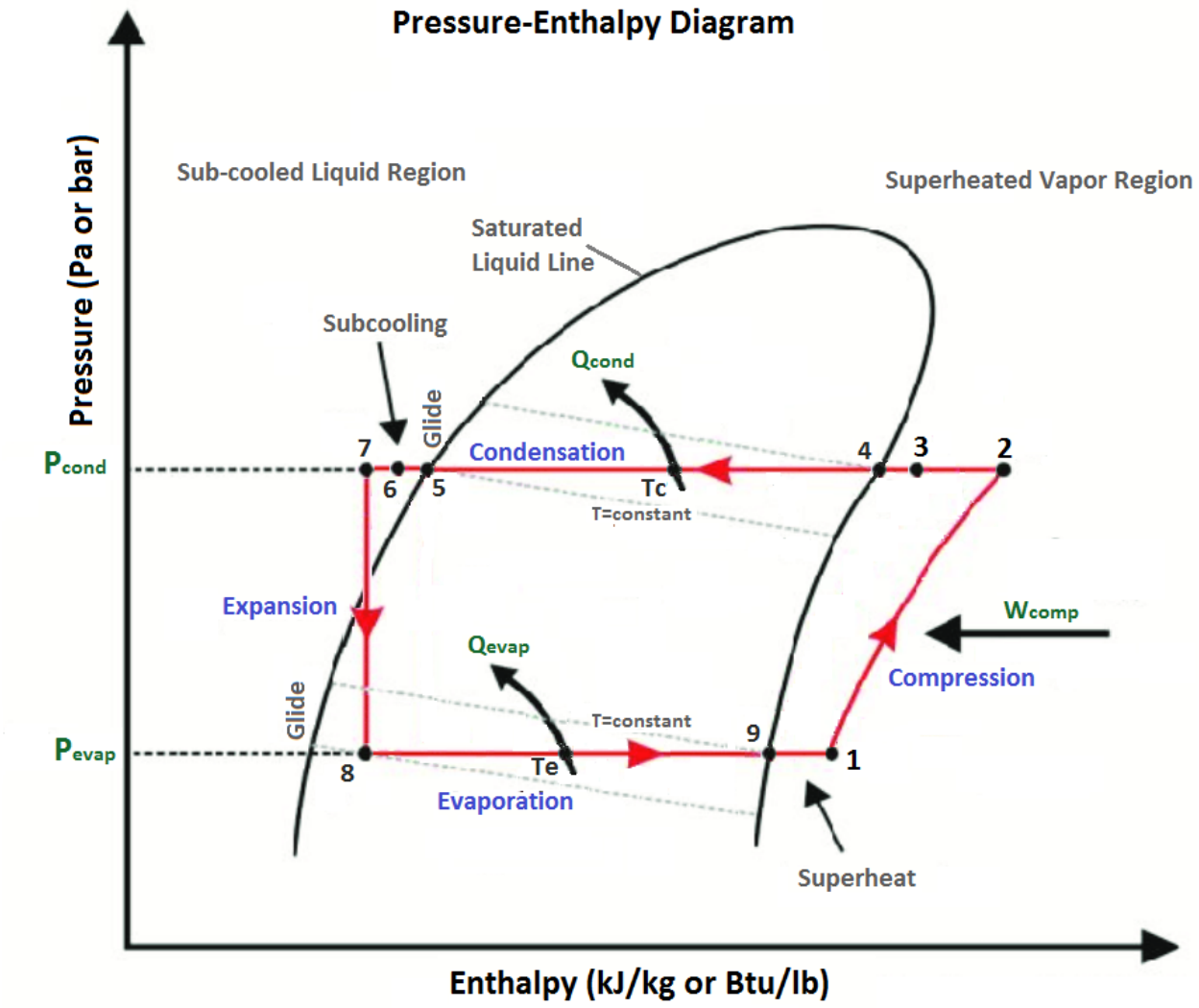

Figure 2. Circuits 10 and 11 ClimaCheck system diagram

CIRCUIT 10 (501601), MEDIUM TEMPERATURE
CIRCUIT 11 (501601), LOW TEMPERATURE

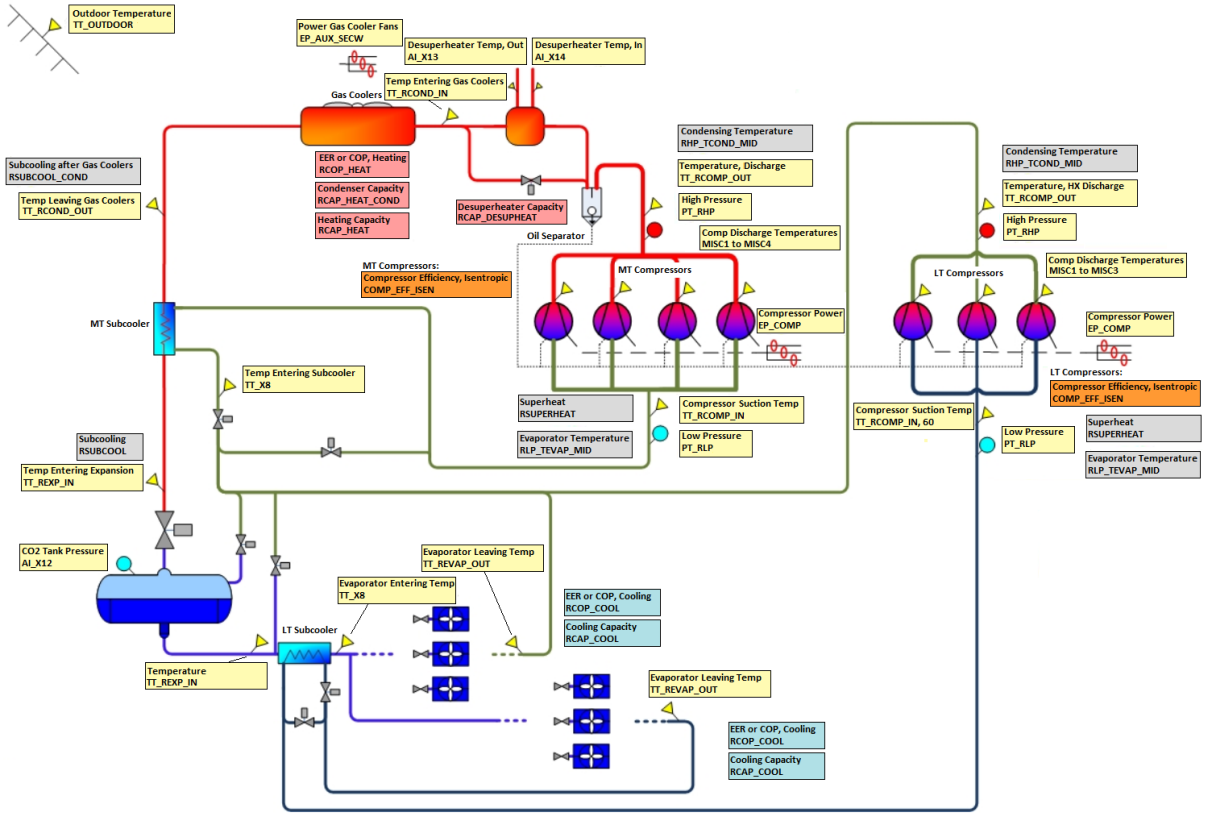

Table 3. Compressor design data, Circuits 10 and11

COMPRESSOR DATA, Medium Temperature Circuit 10 and Low Temperature Circuit 11	
Compressor Model Number	**Type**
MEDIUM TEMPERATURE	
Bitzer 4CTC-30K w/VFG	
Bitzer 4DTC-25K	
Bitzer 4FTC-30K	
Bitzer 4FTC-25K	
LOW TEMPERATURE	
Copeland ZOD34K3E-TFD Digital	Digital Scroll
Copeland ZO34K3E-TFD	Scroll
Copeland ZO58K3E-TFD	Scroll