System 015 - Site 501529, Pasco, WA

Site 501529 is a grocery store located in Pasco WA. There are four refrigeration circuits--a low temperature Circuits 16 and 17 and medium temperature Circuit 14 and 15 – installed in approximately 2000. Both racks share a single Emerson E2 refrigeration system controller.

Circuit 14 and 15, Medium Temperature

Circuits 14 and 15 is a medium temperature multiplex system with six semi-hermetic screw compressors and R22 refrigerant. Compressors 1 and 2 on Circuit 14 is controlled by a suction pressure setpoint with a sensor located on one end of the suction manifold. Compressors 3 to 6 on Circuit 15 are controlled by a suction pressure setpoint measured at the opposite end of the suction manifold. All six compressors discharge into a common discharge manifold. The circuits share a heat recovery desuperheater, condenser and common liquid manifold. The desuperheater recovers heat from the hot discharge gas to heat hot water, which also decreases the gas temperature before entering the condenser, increasing refrigeration efficiency. The medium temperature rack serves 6 evaporator circuits.

Table 1. Measured data on Circuit 15

Measured Data	Variable Name(s)	Point Number
Outdoor Temperature	TT_OUTDOOR	--
Discharge Temperatures after each Compressor	MISC3 to MISC6	2
Common Discharge Temperature	TT_RCOMP_OUT	2
Suction Temperatures before each Compressor	MISC9, MISC10, AI_X13, AI_X14	1
Compressor Power	EP_COMP	--
Low Pressure, Suction Manifold	PT_RLP	1
High Pressure, Discharge Manifold	PT_RHP	2
Condenser Entering Temperature	TT_RCOND_IN	3
Condenser Fan Power	EP_AUX_SECW	--
Condenser Leaving Temperature	TT_RCOND_OUT	6
Temperature Leaving Subcooler	TT_RMP_OUT	--
Temperature Entering Subcooler	TT_RCOMP_IN_MP	--
Liquid Line Temperature entering expansion device	TT_REXP_IN	7

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

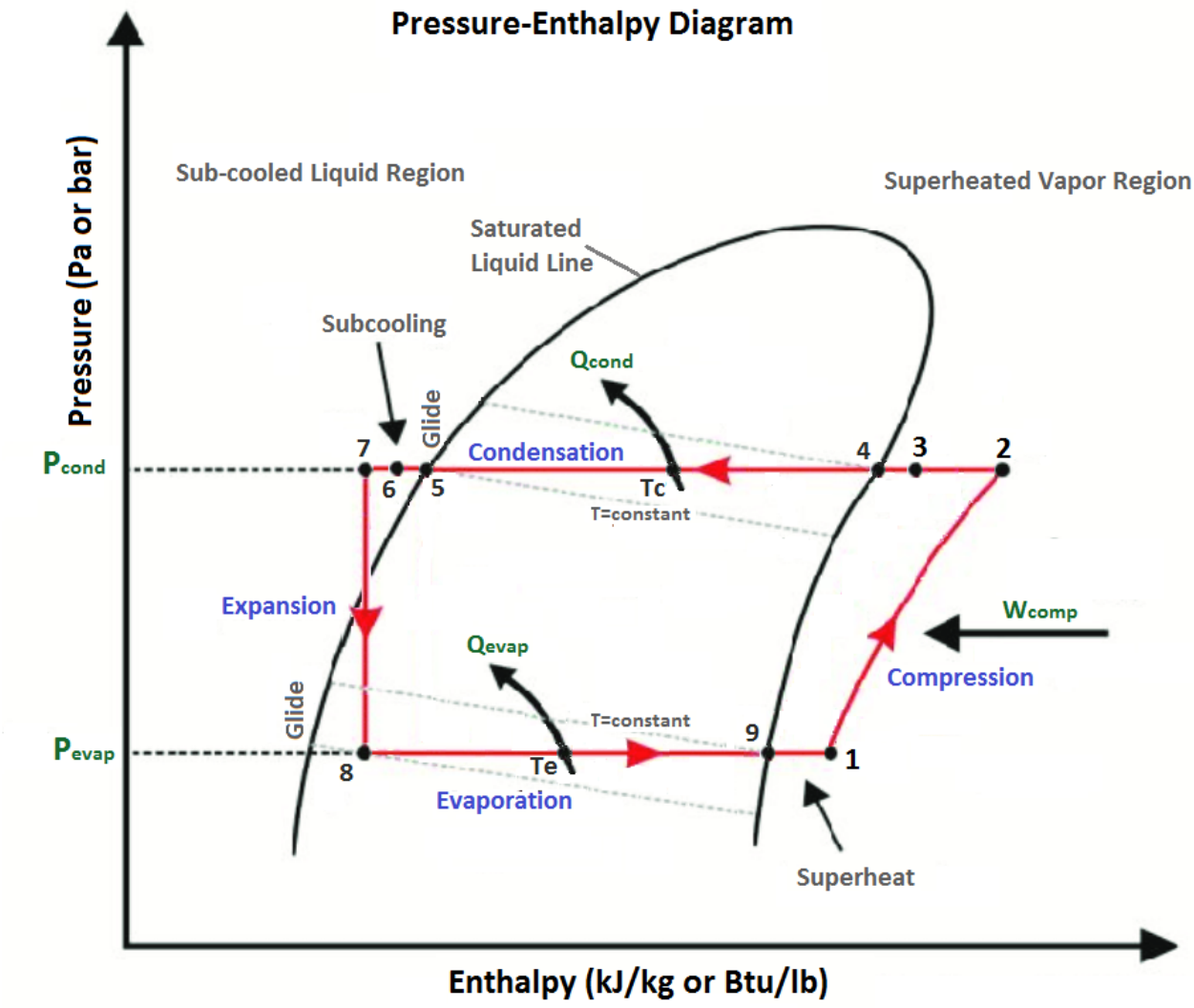

Figure 2. Circuits 14 and 15 ClimaCheck system diagram

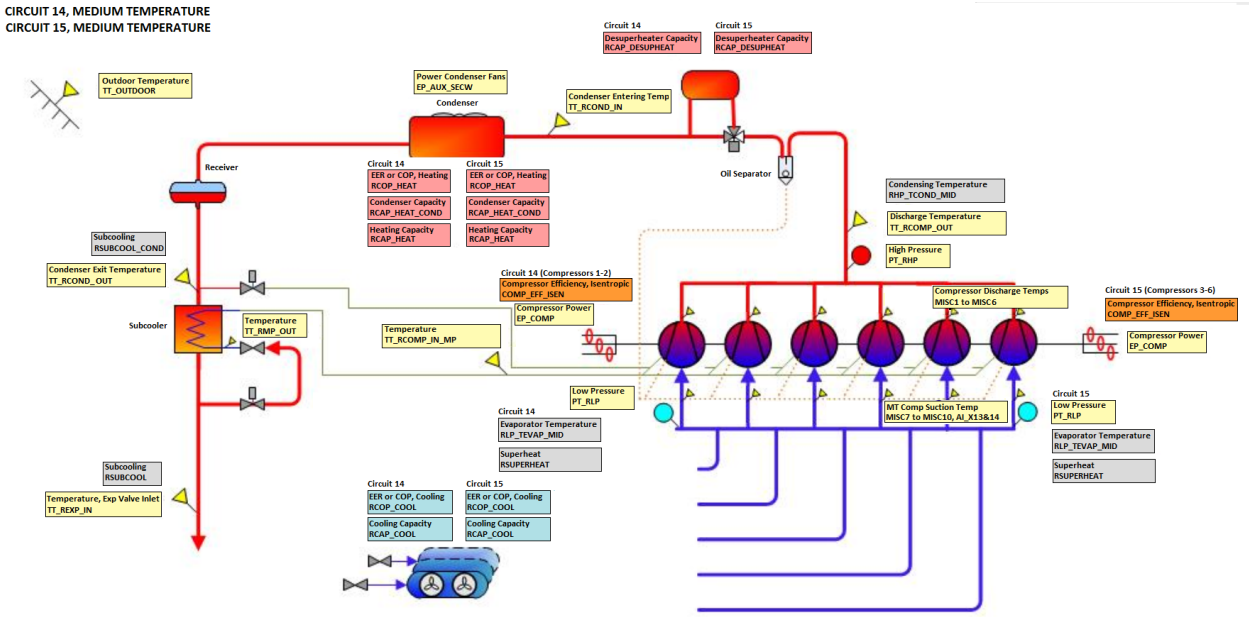

Table 2. Calculated values on Circuit 15

Calculated/Derived 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
Heating COP	RCOP_HEAT	TT_REXP_IN, Discharge and suction manifold temperatures	3 to 6
Condenser Capacity	RCAP_HEAT_COND	TT_RCOND_IN, TT_REXP_IN	
Heating Capacity	RCAP_HEAT	TT_RCOND_IN, TT_REXP_IN	
Cooling COP	RCOP_COOL	TT_RCOND_IN, TT_REXP_IN, Discharge and Suction Temperatures	8 to 1
Cooling Capacity	RCAP_COOL	TT_REXP_IN, Suction Temperatures	
Subcooling	RSUBCOOL	TT_REXP_IN, , Bubble point temperature at PT_RHP	5 to 7
Superheat	RSUPERHEAT	Suction temperatures, Dew point temperature at PT_RLP	9 to 1