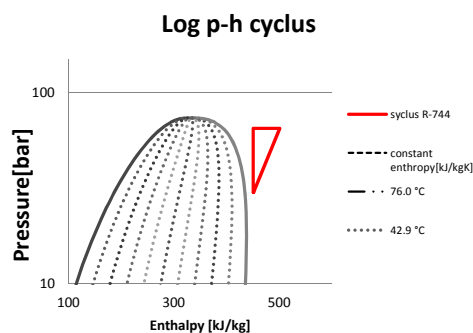


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 1500 rpm
Measured points 91

Components		Description
Compressor		Piston compressor
Gascooler/condenser		Air fan
Gasscooler condenser		Water to sink
Gascooler/condenser	4a/b	Heat to glycol
Internal heat exchanger		
Evaporator	6a/b	R-774/glycol
Separator		
Oil separator		



System performance

			Total Deviation	Total uncertainty	Comment
COP	-	1.1	± 0.01	1.29 %	
Compressor Speed	[rpm]	1500	± 3.00	0.2 %	
Mass flow R744	[kg/h]	1983	± 4.02	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	17.5 %	
Ambient temperature	[°C]	20.2	± 0.03	0.2 %	
Supply power	[kW]	30.8	± 0.06	0.2 %	
Power consumption compressor	[kW]	26.3	± 0.20	0.8 %	
Danfoss VSD efficiency		85.60 %	± 0.01	0.80 %	
Volumetric efficiency		79.1 %	± 0.32 %	0.41 %	
Isentropic efficiency		72.7 %	± 0.64 %	0.89 %	
Oil circulation rate (OCR)		0.4981 %	± 0.644 %	66.08 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	27.8	± 0.12	0.4 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	62.3	± 0.16 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	64.5	± 0.16	0.3 %	
Temperature, throttle valve, in	[°C]	42.9	± 0.04	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor

			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	30.0	± 0.08	0.3 %	
Inlet temperature	[°C]	5.7	± 0.02	0.4 %	
Inlet super heat	[K]	11.2	± 0.02	0.2 %	
Outlet pressure	[bar]	65.0	± 0.16	0.3 %	
Outlet temperature	[°C]	76.0	± 0.03	0.03 %	
Pressure ratio	[-]	2.2	± 0.008	0.4 %	
Lubricant return mass flow rate:	[kg/h]	9.9	± 6.59	66.4 %	on/off valve
Temperature, lubricant return:	[°C]	58.4	± 0.29	0.5 %	
Compressor Speed	[rpm]	1500	± 3.00	0.2 %	
Torque	[Nm]	168	± 1.33	0.8 %	
Power consumption	[kW]	26.3	± 0.20	0.8 %	
Massflow R-744	[kg/h]	1983	± 4.02	0.2 %	
Specific volume (suction line)	[m³/kg]	0.01	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m³]	73.6	± 0.05	0.1 %	
Volumetric efficiency	[%]	<u>79.1 %</u>	± 0.32 %	0.41 %	
Isentropic efficiency	[%]	<u>72.7 %</u>	± 0.64 %	0.89 %	

Aircooler						
Gascooler TAG 2				Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	47.9	±	0.36	0.7 %	
Capacity	<i>[kW]</i>	26.4	±	0.20	0.8 %	
Temperature difference R-744	<i>°C</i>	30.9	±	0.08	0.3 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.1	±	0.00	1.4 %	
Mass flow R744	<i>kg/h</i>	1983	±	4.02	0.2 %	
Inlet temperature		74.8	±			
Outlet temperature		43.87				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Specific heat difference	<i>kJ/kg</i>	0.2		0.00	0.0 %	
Cooling capacity	<i>kW</i>	0.1	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	0.2		0.09	39.4 %	
Pressure drop	<i>bar</i>	0.0		0.00	0.9 %	
Mass flow R-744	<i>kg/h</i>	1983	±	4.02	0.2 %	
Temperature difference water	<i>°C</i>	2.4		0.10	4.3 %	
Gascooler 4a						
R744 side				Total Deviation	Total uncertainty	Comment
Inlet temperature	<i>°C</i>	43.6	±	0.05	0.1 %	
Outlet temperature	<i>°C</i>	39.6	±	0.04	0.1 %	
Specific heat difference	<i>kJ/kg</i>	0.01	±	0.00	5.7 %	
Temperature difference	<i>°C</i>	4.0	±	0.07	1.7 %	
Mass flow R744	<i>Kg/h</i>	1983	±	4.02	0.2 %	
Cooling capacity	<i>kW</i>	4.3	±	0.25	5.7 %	
Pressure drop	<i>bar</i>	0.04	±	0.00	2.6 %	
Glycol side						
Specific heat difference	<i>kJ/kg</i>	0.04	±	0.37	836.2 %	
Temperature difference	<i>°C</i>	12.8	±	0.11	0.8 %	
Mass flow glycol	<i>Kg/h</i>	-4	±	0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.04	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	1.2 %	

Gascooler 4b							
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R744 side

Inlet temperature	°C	43.6	±	0.1 %
Outlet temperature	°C	43.2	±	0.1 %
Specific heat difference	<i>kJ/kg</i>	0.1	±	341.8 %
Temperature difference	°C	0.4	±	14.4 %
Mass flow R744	<i>kg/h</i>	1983	±	0.2 %
Cooling capacity	<i>kW</i>	0.00	±	341.9 %
Pressure drop	<i>Bar</i>	0.04	±	3.7 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	91.3	±	196.7 %
Temperature difference	°C	26.0	±	0.5 %
Mass flow glycol	<i>Kg/h</i>	-2	±	0.1 %
Cooling capacity	<i>kW</i>	-328	±	0.1 %
Pressure drop	<i>bar</i>	0.01	±	2.7 %

IHX						
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HP side

			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	1.3	±	0.41	31.5 %
Temperature difference	°C	0.0	±	0.05	124.3 %
Mass flow R744	<i>kg/h</i>	1983	±	4.02	0.2 %
Cooling capacity	<i>kW</i>	0.7	±	0.00	0.0 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.0 %

LP side

Specific heat difference	<i>kJ/kg</i>	31.2	±	0.57	1.8 %
Temperature difference	°C	22.4	±	0.03	0.1 %
Mass flow R744	<i>Kg/h</i>	1983	±	4.02	0.2 %
Cooling capacity	<i>kW</i>	0.1	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.04	±	0.00	5.9 %
Superheat IHX inlet	[°C]	4.7			

Evaporator 6a						
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R744 side

			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	62.3	±	0.16	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	1983	±	4.02	0.2 %
Heat difference R744	<i>kJ/kg</i>	-206	±	-0.09	0.0 %
Cooling capacity	<i>kW</i>	-113.73	±	-0.05	0.0 %
Pressure drop	<i>bar</i>	0.05	±	0.00	1.0 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	8.02	±	92	1149.3 %
Temperature difference	°C	2.29	±	0.08	3.6 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	17.5 %
Cooling capacity	<i>kW</i>	0.00	±	1	12934542.8 %
Pressure drop	<i>bar</i>	0.01	±	0.00	3.8 %

Evaporator 6b						
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R744 side

Pressure inlet	<i>bar</i>	62.3	±	0.16	0.25 %
Specific heat to R744	<i>kJ/kg</i>	0.3	±	0.00	0.0 %
Temperature difference	°C	19.1	±	0.03	0.2 %
Mass flow R744	<i>kg/h</i>	1983	±	4.0	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.05	±	0.00	1.0 %

Glycol side

Specific heat out	<i>kJ/kg</i>	18945.2	±	66873.0	353.0 %
Temperature difference	°C	3255.5	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	17.5 %
Cooling capacity	<i>kW</i>	0.1	±	0.34	353.4 %
Pressure drop	<i>bar</i>	0.01	±	0.00	3.4 %