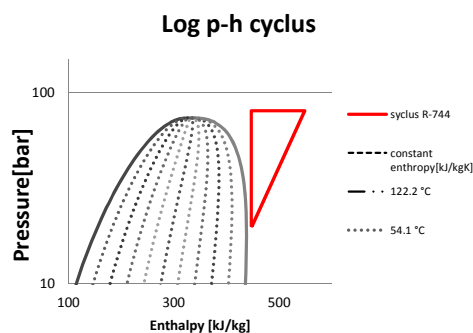


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 3000 rpm
Measured points 37

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	-	1.0	± 0.01	0.76 %	
Compressor Speed	[rpm]	3000	± 6.00	0.2 %	
Mass flow R744	[kg/h]	2287	± 4.68	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	36.5 %	
Ambient temperature	[°C]	21.7	± 0.22	1.0 %	
Supply power	[kW]	70.1	± 0.14	0.2 %	
Power consumption compressor	[kW]	62.2	± 0.28	0.4 %	
Danfoss VSD efficiency		88.66 %	± 0.00	0.48 %	
Volumetric efficiency		68.4 %	± 0.44 %	0.65 %	
Isentropic efficiency		68.2 %	± 0.35 %	0.51 %	
Oil circulation rate (OCR)		0.6787 %	± 0.345 %	88.74 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	64.2	± 0.27	0.4 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	56.3	± 0.14 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	79.9	± 0.20	0.3 %	
Temperature, throttle valve, in	[°C]	54.1	± 0.06	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor					
			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	20.1	± 0.05	0.3 %	
Inlet temperature	[°C]	-10.4	± -0.03	0.3 %	
Inlet super heat	[K]	8.9	± 0.03	0.3 %	
Outlet pressure	[bar]	80.5	± 0.20	0.3 %	
Outlet temperature	[°C]	122.2	± 0.05	0.04 %	
Pressure ratio	[-]	4.0	± 0.014	0.4 %	
Lubricant return mass flow rate:	[kg/h]	15.6	± 13.96	89.3 %	on/off valve
Temperature, lubricant return:	[°C]	98.4	± 0.72	0.7 %	
Compressor Speed	[rpm]	3000	± 6.00	0.2 %	
Torque	[Nm]	198	± 0.97	0.5 %	
Power consumption	[kW]	62.2	± 0.28	0.4 %	
Massflow R-744	[kg/h]	2287	± 4.68	0.2 %	
Specific volume (suction line)	[m³/kg]	0.02	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m³]	49.2	± 0.04	0.1 %	
Volumetric efficiency	[%]	<u>68.4 %</u>	± 0.44 %	0.65 %	
Isentropic efficiency	[%]	<u>68.2 %</u>	± 0.35 %	0.51 %	

Aircooler						
Gascooler TAG 2			Total Deviation	Total uncertainty	Comment	
Specific heat difference	<i>kJ/kg</i>	96.0	±	0.48	0.5 %	
Capacity	<i>[kW]</i>	61.0	±	0.33	0.5 %	
Temperature difference R-744	<i>°C</i>	64.1	±	0.15	0.2 %	
Mass flow air	<i>kg/h</i>					
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.1	±	0.00	3.0 %	
Mass flow R744	<i>kg/h</i>	2287	±	4.68	0.2 %	
Inlet temperature		119.8	±			
Outlet temperature		55.76				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Specific heat difference	<i>kJ/kg</i>	0.4		0.00	0.0 %	
Cooling capacity	<i>kW</i>	0.2	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	0.5		0.17	30.6 %	
Pressure drop	<i>bar</i>	0.0		0.00	2.5 %	
Mass flow R-744	<i>kg/h</i>	2287	±	4.68	0.2 %	
Temperature difference water	<i>°C</i>	2.4		0.11	4.7 %	
Gascooler 4a						
R744 side			Total Deviation	Total uncertainty	Comment	
Inlet temperature	<i>°C</i>	55.2	±	0.08	0.1 %	
Outlet temperature	<i>°C</i>	46.0	±	0.07	0.2 %	
Specific heat difference	<i>kJ/kg</i>	0.02	±	0.00	2.9 %	
Temperature difference	<i>°C</i>	9.2	±	0.11	1.2 %	
Mass flow R744	<i>Kg/h</i>	2287	±	4.68	0.2 %	
Cooling capacity	<i>kW</i>	14.6	±	0.42	2.9 %	
Pressure drop	<i>bar</i>	0.04	±	0.01	15.7 %	
Glycol side						
Specific heat difference	<i>kJ/kg</i>	0.05	±	0.36	715.5 %	
Temperature difference	<i>°C</i>	14.6	±	0.10	0.7 %	
Mass flow glycol	<i>Kg/h</i>	-3	±	0.00	0.1 %	
Cooling capacity	<i>kW</i>	-0.04	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	2.0 %	

Gascooler 4b							
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R744 side

Inlet temperature	°C	55.2	±	0.2 %
Outlet temperature	°C	53.8	±	0.0 %
Specific heat difference	<i>kJ/kg</i>	2.7	±	24.0 %
Temperature difference	°C	1.5	±	5.7 %
Mass flow R744	<i>kg/h</i>	2287	±	0.2 %
Cooling capacity	<i>kW</i>	0.00	±	24.1 %
Pressure drop	<i>Bar</i>	0.04	±	6.7 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	108.2	±	207.9 %
Temperature difference	°C	30.9	±	0.4 %
Mass flow glycol	<i>Kg/h</i>	-1	±	0.1 %
Cooling capacity	<i>kW</i>	-272	±	0.1 %
Pressure drop	<i>bar</i>	0.01	±	4.8 %

IHX							
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HP side

			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	1.7	±	0.51	30.4 %
Temperature difference	°C	0.3	±	0.07	26.5 %
Mass flow R744	<i>kg/h</i>	2287	±	4.68	0.2 %
Cooling capacity	<i>kW</i>	1.1	±	0.33	30.4 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.1 %

LP side

Specific heat difference	<i>kJ/kg</i>	4.3	±	0.42	9.8 %
Temperature difference	°C	42.5	±	0.03	0.1 %
Mass flow R744	<i>Kg/h</i>	2287	±	4.68	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.03	±	0.00	8.7 %
Superheat IHX inlet	<i>[°C]</i>	12.9			

Evaporator 6a							
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R744 side

			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	56.3	±	0.14	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	2287	±	4.68	0.2 %
Heat difference R744	<i>kJ/kg</i>	-201	±	-0.10	0.0 %
Cooling capacity	<i>kW</i>	-127.66	±	-0.06	0.0 %
Pressure drop	<i>bar</i>	0.03	±	0.00	1.9 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	6.58	±	77	1163.5 %
Temperature difference	°C	1.90	±	0.07	4.0 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	36.5 %
Cooling capacity	<i>kW</i>	0.00	±	1	14242794.0 %
Pressure drop	<i>bar</i>	0.01	±	0.00	4.9 %

Evaporator 6b							
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R744 side

Pressure inlet	<i>bar</i>	56.3	±	0.14	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>	2287	±	4.7	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.03	±	0.00	2.3 %

Glycol side

Specific heat out	<i>kJ/kg</i>	18955.2	±	66873.1	352.8 %
Temperature difference	°C	3258.3	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	36.5 %
Cooling capacity	<i>kW</i>	0.1	±	0.29	354.7 %
Pressure drop	<i>bar</i>	0.01	±	0.00	5.0 %