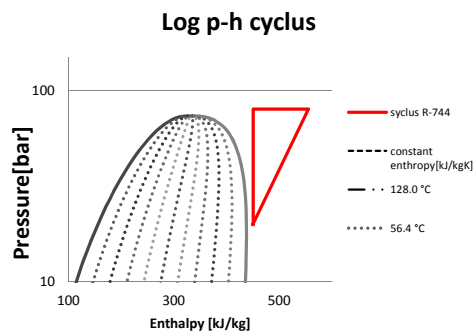


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 800 rpm
Measured points 25

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	-	0.8	± 0.01	1.64 %	
Compressor Speed	[rpm]	800	± 1.60	0.2 %	
Mass flow R744	[kg/h]	475	± 1.47	0.3 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	40.1 %	
Ambient temperature	[°C]	18.8	± 0.04	0.2 %	
Supply power	[kW]	19.4	± 0.04	0.2 %	
Power consumption compressor	[kW]	16.9	± 0.18	1.1 %	
Danfoss VSD efficiency		87.08 %	± 0.01	1.11 %	
Volumetric efficiency		53.7 %	± 0.20 %	0.36 %	
Isentropic efficiency		52.4 %	± 0.59 %	1.12 %	
Oil circulation rate (OCR)		0.0051 %	± 0.585 %	79.34 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	13.8	± 0.07	0.5 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	55.1	± 0.14 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	80.6	± 0.21	0.3 %	
Temperature, throttle valve, in	[°C]	56.4	± 0.15	0.3 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.02	1.9 %	

Compressor

			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	19.9	± 0.05	0.3 %	
Inlet temperature	[°C]	-10.1	± -0.12	1.2 %	
Inlet super heat	[K]	9.6	± 0.12	1.3 %	
Outlet pressure	[bar]	80.1	± 0.21	0.3 %	
Outlet temperature	[°C]	128.0	± 0.09	0.07 %	
Pressure ratio	[-]	4.0	± 0.015	0.4 %	
Lubricant return mass flow rate:	[kg/h]	0.0	± 0.02	79.3 %	on/off valve
Temperature, lubricant return:	[°C]	22.2	± 0.00	0.0 %	
Compressor Speed	[rpm]	800	± 1.60	0.2 %	
Torque	[Nm]	201	± 2.23	1.1 %	
Power consumption	[kW]	16.9	± 0.18	1.1 %	
Massflow R-744	[kg/h]	475	± 1.47	0.3 %	
Specific volume (suction line)	[m³/kg]	0.02	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m³]	48.4	± 0.06	0.1 %	
Volumetric efficiency	[%]	<u>53.7 %</u>	± 0.20 %	0.36 %	
Isentropic efficiency	[%]	<u>52.4 %</u>	± 0.59 %	1.12 %	

Aircooler						
Gascooler TAG 2				Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	71.6	±	0.49	0.7 %	
Capacity	<i>[kW]</i>	9.4	±	0.07	0.8 %	
Temperature difference R-744	<i>°C</i>	50.3	±	0.23	0.5 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.0	±	0.00	9.5 %	
Mass flow R744	<i>kg/h</i>	475	±	1.47	0.3 %	
Inlet temperature		115.9	±			
Outlet temperature		65.61				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Specific heat difference	<i>kJ/kg</i>	4.7		0.58	12.2 %	
Cooling capacity	<i>kW</i>	0.6	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	2.7		0.25	9.0 %	
Pressure drop	<i>bar</i>	0.0		0.00	12.2 %	
Mass flow R-744	<i>kg/h</i>	475	±	1.47	0.3 %	
Temperature difference water	<i>°C</i>	1.8		0.07	4.0 %	
Gascooler 4a						
R744 side				Total Deviation	Total uncertainty	Comment
Inlet temperature	<i>°C</i>	62.9	±	0.11	0.2 %	
Outlet temperature	<i>°C</i>	39.1	±	0.25	0.6 %	
Specific heat difference	<i>kJ/kg</i>	0.07	±	0.00	2.7 %	
Temperature difference	<i>°C</i>	23.8	±	0.27	1.1 %	
Mass flow R744	<i>Kg/h</i>	475	±	1.47	0.3 %	
Cooling capacity	<i>kW</i>	8.9	±	0.25	2.8 %	
Pressure drop	<i>bar</i>	0.02	±	0.00	7.0 %	
Glycol side						
Specific heat difference	<i>kJ/kg</i>	0.05	±	0.31	686.3 %	
Temperature difference	<i>°C</i>	13.0	±	0.09	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	9.0 %	

Gascooler 4b							
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R744 side

Inlet temperature	°C	62.9	±	0.6 %
Outlet temperature	°C	54.6	±	0.0 %
Specific heat difference	<i>kJ/kg</i>	16.4	±	11.4 %
Temperature difference	°C	8.3	±	1.3 %
Mass flow R744	<i>kg/h</i>	475	±	0.3 %
Cooling capacity	<i>kW</i>	0.00	±	11.4 %
Pressure drop	<i>Bar</i>	0.05	±	3.2 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	123.1	±	82.4 %
Temperature difference	°C	35.2	±	0.4 %
Mass flow glycol	<i>Kg/h</i>	-2	±	0.1 %
Cooling capacity	<i>kW</i>	-382	±	0.1 %
Pressure drop	<i>bar</i>	0.00	±	42.5 %

IHX							
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HP side

			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	3.6	±	0.62	17.2 %
Temperature difference	°C	1.7	±	0.19	11.1 %
Mass flow R744	<i>kg/h</i>	475	±	1.47	0.3 %
Cooling capacity	<i>kW</i>	0.5	±	0.00	0.0 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.0 %
			±		

LP side

Specific heat difference	<i>kJ/kg</i>	15.9	±	0.54	3.4 %
Temperature difference	°C	35.8	±	0.13	0.4 %
Mass flow R744	<i>Kg/h</i>	475	±	1.47	0.3 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.02	±	0.00	5.1 %
Superheat IHX inlet	[°C]	7.4			

Evaporator 6a							
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R744 side

			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	55.1	±	0.14	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	475	±	1.47	0.3 %
Heat difference R744	<i>kJ/kg</i>	-202	±	-0.09	0.0 %
Cooling capacity	<i>kW</i>	-26.63	±	-0.01	0.0 %
Pressure drop	<i>bar</i>	0.02	±	0.00	4.4 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	5.90	±	66	1116.9 %
Temperature difference	°C	1.70	±	0.07	3.9 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	40.1 %
Cooling capacity	<i>kW</i>	0.00	±	1	1391096.0 %
Pressure drop	<i>bar</i>	0.01	±	0.00	8.5 %

Evaporator 6b							
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R744 side

Pressure inlet	<i>bar</i>	55.1	±	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>	475	±	1.5	0.3 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.03	±	0.00	2.9 %

Glycol side

Specific heat out	<i>kJ/kg</i>	18962.2	±	66873.1	352.7 %
Temperature difference	°C	3260.3	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	40.1 %
Cooling capacity	<i>kW</i>	0.1	±	0.29	354.9 %
Pressure drop	<i>bar</i>	0.01	±	0.00	4.3 %