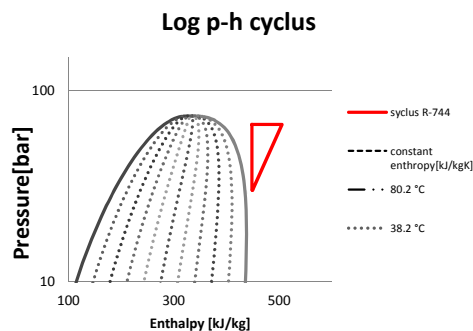


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 3800 rpm
Measured points 26

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	0.81 %	
Compressor Speed	[rpm]	3800	± 7.60	0.2 %	
Mass flow R744	[kg/h]	5202	± 10.88	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	35.9 %	
Ambient temperature	[°C]	26.8	± 0.50	1.9 %	
Supply power	[kW]	92.4	± 0.49	0.5 %	
Power consumption compressor	[kW]	86.2	± 0.40	0.5 %	
Danfoss VSD efficiency		93.28 %	± 0.00	0.42 %	
Volumetric efficiency		81.1 %	± 0.39 %	0.49 %	
Isentropic efficiency		59.2 %	± 0.36 %	0.60 %	
Oil circulation rate (OCR)		1.1645 %	± 0.357 %	31.41 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	82.2	± 0.34	0.4 %	
Cooling capacity	[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	[bar]	61.9	± 0.16 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	60.6	± 0.15	0.3 %	
Temperature, throttle valve, in	[°C]	38.2	± 0.02	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor

			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	30.2	± 0.08	0.3 %	
Inlet temperature	[°C]	4.5	± 0.05	1.0 %	
Inlet super heat	[K]	9.8	± 0.05	0.5 %	
Outlet pressure	[bar]	66.5	± 0.17	0.3 %	
Outlet temperature	[°C]	80.2	± 0.04	0.06 %	
Pressure ratio	[-]	2.2	± 0.008	0.4 %	
Lubricant return mass flow rate:	[kg/h]	61.3	± 19.48	31.8 %	on/off valve
Temperature, lubricant return:	[°C]	72.4	± 0.11	0.2 %	
Compressor Speed	[rpm]	3800	± 7.60	0.2 %	
Torque	[Nm]	217	± 1.10	0.5 %	
Power consumption	[kW]	86.2	± 0.40	0.5 %	
Massflow R-744	[kg/h]	5202	± 10.88	0.2 %	
Specific volume (suction line)	[m³/kg]	0.01	± 0.00	0.2 %	
Density CO2 (suction line)	[kg/m³]	74.9	± 0.13	0.2 %	
Volumetric efficiency	[%]	<u>81.1 %</u>	± 0.39 %	0.49 %	
Isentropic efficiency	[%]	<u>59.2 %</u>	± 0.36 %	0.60 %	

Aircooler						
Gascooler TAG 2				Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	55.9	±	0.36	0.6 %	
Capacity	<i>[kW]</i>	80.8	±	0.55	0.7 %	
Temperature difference R-744	<i>°C</i>	36.4	±	0.09	0.2 %	
Mass flow air	<i>kg/h</i>					
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.5	±	0.00	0.7 %	
Mass flow R744	<i>kg/h</i>	5202	±	10.88	0.2 %	
Inlet temperature		78.4	±			
Outlet temperature		41.94				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Specific heat difference	<i>kJ/kg</i>	-0.2		0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.3	±		0.0 %	
Mass flow water	<i>Kg/h</i>		±			
Temperature difference R-744	<i>°C</i>	1.0		0.04	4.2 %	
Pressure drop	<i>bar</i>	0.0		0.00	0.6 %	
Mass flow R-744	<i>kg/h</i>	5202	±	10.88	0.2 %	
Temperature difference water	<i>°C</i>	1.9		0.10	5.3 %	

Gascooler 4a						
R744 side				Total Deviation	Total uncertainty	Comment
Inlet temperature	<i>°C</i>	40.9	±	0.02	0.0 %	
Outlet temperature	<i>°C</i>	38.9	±	0.03	0.1 %	
Specific heat difference	<i>kJ/kg</i>	0.00	±	0.00	14.9 %	
Temperature difference	<i>°C</i>	2.0	±	0.04	1.9 %	
Mass flow R744	<i>Kg/h</i>	5202	±	10.88	0.2 %	
Cooling capacity	<i>kW</i>	4.2	±	0.63	14.9 %	
Pressure drop	<i>bar</i>	0.04	±	0.01	16.8 %	
Glycol side						
Specific heat difference	<i>kJ/kg</i>	0.04	±	0.37	904.6 %	
Temperature difference	<i>°C</i>	11.6	±	0.10	0.9 %	
Mass flow glycol	<i>Kg/h</i>	-3	±	0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.04	±	0.00	0.3 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	2.6 %	

Gascooler 4b							
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R744 side

Inlet temperature	°C	40.9	±	0.1 %
Outlet temperature	°C	39.8	±	0.0 %
Specific heat difference	<i>kJ/kg</i>	1.1	±	40.4 %
Temperature difference	°C	1.1	±	2.3 %
Mass flow R744	<i>kg/h</i>	5202	±	0.2 %
Cooling capacity	<i>kW</i>	0.00	±	40.4 %
Pressure drop	<i>Bar</i>	0.07	±	7.5 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	76.9	±	209.0 %
Temperature difference	°C	22.0	±	0.6 %
Mass flow glycol	<i>Kg/h</i>	-2	±	0.1 %
Cooling capacity	<i>kW</i>	-258	±	0.1 %
Pressure drop	<i>bar</i>	0.01	±	12.1 %

IHX							
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HP side

			Total Deviation	Total uncertainty	Comment
Specific heat difference	<i>kJ/kg</i>	7.9	±	0.42	5.3 %
Temperature difference	°C	1.1	±	0.03	3.1 %
Mass flow R744	<i>kg/h</i>	5202	±	10.88	0.2 %
Cooling capacity	<i>kW</i>	11.4	±	0.61	5.3 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.1 %

LP side

Specific heat difference	<i>kJ/kg</i>	29.4	±	0.58	2.0 %
Temperature difference	°C	23.3	±	0.05	0.2 %
Mass flow R744	<i>Kg/h</i>	5202	±	10.88	0.2 %
Cooling capacity	<i>kW</i>	0.5	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.04	±	0.01	24.1 %
Superheat IHX inlet	[°C]	4.5			

Evaporator 6a							
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R744 side

			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	61.9	±	0.16	0.25 %
Temperature difference	°C	-4.1	±	0.00	
Mass flow R744	<i>kg/h</i>	5202	±	10.88	0.2 %
Heat difference R744	<i>kJ/kg</i>	-204	±	-0.09	0.0 %
Cooling capacity	<i>kW</i>	-295.20	±	-0.13	0.0 %
Pressure drop	<i>bar</i>	0.04	±	0.00	3.6 %

Glycol side

Specific heat difference	<i>kJ/kg</i>	7.64	±	103	1342.8 %
Temperature difference	°C	2.19	±	0.09	3.9 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	35.9 %
Cooling capacity	<i>kW</i>	0.00	±	2	14140982.2 %
Pressure drop	<i>bar</i>	0.01	±	0.00	6.0 %

Evaporator 6b							
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R744 side

Pressure inlet	<i>bar</i>	61.9	±	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>	5202	±	10.9	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.04	±	0.00	3.3 %

Glycol side

Specific heat out	<i>kJ/kg</i>	18944.5	±	66873.0	353.0 %
Temperature difference	°C	3255.2	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	35.9 %
Cooling capacity	<i>kW</i>	0.1	±	0.35	354.8 %
Pressure drop	<i>bar</i>	0.01	±	0.00	7.5 %