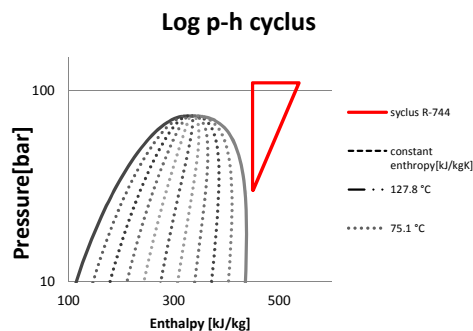


Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 1500 rpm
Measured points 47

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	0.92 %	
Compressor Speed	[rpm]	1500	± 3.00	0.2 %	
Mass flow R744	[kg/h]	1754	± 3.56	0.2 %	
Mass flow water/ethyleneglycol	[kg/h]	0.0	± 0.00	21.9 %	
Ambient temperature	[°C]	20.3	± 0.05	0.2 %	
Supply power	[kW]	48.7	± 0.10	0.2 %	
Power consumption compressor	[kW]	44.1	± 0.24	0.5 %	
Danfoss VSD efficiency		90.64 %	± 0.01	0.58 %	
Volumetric efficiency		69.1 %	± 0.25 %	0.37 %	
Isentropic efficiency		68.4 %	± 0.42 %	0.62 %	
Oil circulation rate (OCR)		0.0011 %	± 0.424 %	84.05 %	Uncertainty high due to on/off valve
Heat rejection	[kW]	42.8	± 0.40	0.9 %	
Cooling capacity	[kW]	6.7	± 0.05	0.8 %	
Pressure, evaporator, inlet	[bar]	31.8	± 0.08 0.00	0.3 %	
Pressure, throttle valve,in	[bar]	110.2	± 0.28	0.3 %	
Temperature, throttle valve, in	[°C]	75.1	± 0.05	0.1 %	
Temperature, throttle valve out	[°C]	-1.3	± 0.03	2.0 %	

Compressor

			Total Deviation	Total uncertainty	Comment
Inlet suction pressure	[bar]	30.1	± 0.08	0.3 %	
Inlet temperature	[°C]	5.1	± 0.07	1.4 %	
Inlet super heat	[K]	10.5	± 0.07	0.7 %	
Outlet pressure	[bar]	110.3	± 0.28	0.3 %	
Outlet temperature	[°C]	127.8	± 0.06	0.05 %	
Pressure ratio	[-]	3.7	± 0.013	0.4 %	
Lubricant return mass flow rate:	[kg/h]	0.0	± 0.02	84.1 %	on/off valve
Temperature, lubricant return:	[°C]	45.5	± 0.96	2.1 %	
Compressor Speed	[rpm]	1500	± 3.00	0.2 %	
Torque	[Nm]	281	± 1.62	0.6 %	
Power consumption	[kW]	44.1	± 0.24	0.5 %	
Massflow R-744	[kg/h]	1754	± 3.56	0.2 %	
Specific volume (suction line)	[m³/kg]	0.01	± 0.00	0.2 %	
Density CO2 (suction line)	[kg/m³]	74.3	± 0.16	0.2 %	
Volumetric efficiency	[%]	<u>69.1 %</u>	± 0.25 %	0.37 %	
Isentropic efficiency	[%]	<u>68.4 %</u>	± 0.42 %	0.62 %	

Aircooler						
Gascooler TAG 2			Total Deviation	Total uncertainty	Comment	
Spesific heat difference	<i>kJ/kg</i>	78.7	±	0.42	0.5 %	
Capacity	<i>[kW]</i>	38.3	±	0.22	0.6 %	
Temperature difference R-744	<i>°C</i>	47.4	±	0.08	0.2 %	
Mass flow air	<i>kg/h</i>	-				
Effect	<i>%</i>		±			
Pressure drop	<i>bar</i>	0.1	±	0.00	1.9 %	
Mass flow R744	<i>kg/h</i>	1754	±	3.56	0.2 %	
Inlet temperature		124.5	±			
Outlet temperature		77.08				
			±			
			±			
Watercooler						
Gascooler TAG 3			±			
Spesific 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 differenca R-744	<i>°C</i>	0.3		0.10	33.7 %	
Pressure drop	<i>bar</i>	0.0		0.00	5.4 %	
Mass flow R-744	<i>kg/h</i>	1754	±	3.56	0.2 %	
Temperature difference water	<i>°C</i>	2.4		0.10	4.1 %	

Gascooler 4a						
R744 side			Total Deviation	Total uncertainty	Comment	
Inlet temperature	<i>°C</i>	76.8	±	0.06	0.1 %	
Outlet temperature	<i>°C</i>	54.8	±	0.02	0.0 %	
Spesific heat difference	<i>kJ/kg</i>	0.07	±	0.00	1.2 %	
Temperature difference	<i>°C</i>	22.0	±	0.07	0.3 %	
Mass flow R744	<i>Kg/h</i>	1754	±	3.56	0.2 %	
Cooling capacity	<i>kW</i>	35.1	±	0.41	1.2 %	
Pressure drop	<i>bar</i>	0.03	±	0.00	13.4 %	
Glycol side						
Spesific heat difference	<i>kJ/kg</i>	0.06	±	0.46	803.0 %	
Temperature difference	<i>°C</i>	16.4	±	0.13	0.8 %	
Mass flow glycol	<i>Kg/h</i>	-3	±	0.00	0.0 %	
Cooling capacity	<i>kW</i>	-0.05	±	0.00	0.2 %	
Pressure drop	<i>Pa</i>	0.00	±	0.00	1.8 %	

Gascooler 4b					
R744 side					
Inlte temperature	°C	76.8	±	0.0 %	
Outlet temperature	°C	74.7	±	0.0 %	
Spesific heat difference	<i>kJ/kg</i>	5.3	±	15.6 %	
Temperature difference	°C	2.1	±	3.8 %	
Mass flow R744	<i>kg/h</i>	1754	±	0.2 %	
Cooling capacity	<i>kW</i>	0.00	±	15.6 %	
Pressure drop	<i>Bar</i>	0.05	±	4.8 %	
Glycol side					
Spesific heat difference	<i>kJ/kg</i>	163.8	±	89.3 %	
Temperature difference	°C	46.6	±	0.4 %	
Mass flow glycol	<i>Kg/h</i>	-2	±	0.1 %	
Cooling capacity	<i>kW</i>	-506	±	0.1 %	
Pressure drop	<i>bar</i>	0.01	±	3.2 %	

IHX					
HP side			Total Deviation	Total uncertainty	Comment
Spesific heat difference	<i>kJ/kg</i>	2.1	±	0.53	26.1 %
Temperature difference	°C	0.8	±	0.07	8.0 %
Mass flow R744	<i>kg/h</i>	1754	±	3.56	0.2 %
Cooling capacity	<i>kW</i>	1.0	±	0.00	0.0 %
Pressure loss	<i>bar</i>	1.8	±	0.00	0.0 %
LP side					
Spesific heat difference	<i>kJ/kg</i>	37.3	±	0.35	0.9 %
Temperature difference	°C	32.8	±	0.07	0.2 %
Mass flow R744	<i>Kg/h</i>	1754	±	3.56	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure loss	<i>bar</i>	0.04	±	0.00	4.6 %
Superheat IHX inlet	<i>[°C]</i>	34.5			

Evaporator 6a					
R744 side			Total Deviation	Total uncertainty	Comment
Pressure inlet	<i>bar</i>	31.8	±	0.08	0.25 %
Temperature difference	°C	-4.1	±	0.00	0.0 %
Mass flow R744	<i>kg/h</i>	1754	±	3.56	0.2 %
Heat difference R744	<i>kJ/kg</i>	14	±	0.09	0.7 %
Cooling capacity	<i>kW</i>	6.73	±	0.05	0.7 %
Pressure drop	<i>bar</i>	0.02	±	0.00	3.4 %
Glycol side					
Spesific heat difference	<i>kJ/kg</i>	9.11	±	98	1072.8 %
Temperature difference	°C	2.61	±	0.08	3.2 %
Mass flow glycol	<i>Kg/h</i>	0	±	0.00	21.9 %
Cooling capacity	<i>kW</i>	0.00	±	2	11348711.0 %
Pressure drop	<i>bar</i>	0.01	±	0.00	5.5 %

Evaporator 6b					
R744 side					
Pressure inlet	<i>bar</i>	31.8	±	0.08	0.25 %
Spesific 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>	1754	±	3.6	0.2 %
Cooling capacity	<i>kW</i>	0.0	±	0.00	0.0 %
Pressure drop	<i>bar</i>	0.02	±	0.00	2.0 %
Glycol side					
Spesific heat out	<i>kJ/kg</i>	18945.8	±	66873.0	353.0 %
Temperature difference	°C	3255.6	±	8.19	0.3 %
Mass flow glycol	<i>Kg/h</i>	-0	±	0.00	21.9 %
Cooling capacity	<i>kW</i>	0.1	±	0.36	353.7 %
Pressure drop	<i>bar</i>	0.01	±	0.00	3.7 %