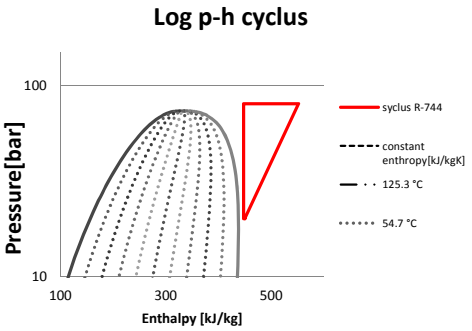
Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 2000 rpm
Measured points 33



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

System performance

			Total Deviation	Total uncertainty	Comment
COP	-	1.0	± 0.01	0.90 %	
Compressor Speed	*[rpm]*	2000	± 4.00	0.2 %	
Mass flow R744	*[kg/h]*	1491	± 3.10	0.2 %	
Mass flow water/ethyleneglycol	*[kg/h]*	0.0	± 0.00	19.6 %	
Ambient temperature	*[°C]*	20.1	± 0.01	0.1 %	
Supply power	*[kW]*	47.8	± 0.10	0.2 %	
Power consumtion compressor	*[kW]*	42.1	± 0.24	0.6 %	
Danfoss VSD efficiency		88.00 %	± 0.01	0.59 %	
Volumetric efficiency		66.7 %	± 0.16 %	0.24 %	
Isentropic efficiency		65.5 %	± 0.40 %	0.61 %	
Oil cirkulation rate (OCR)		0.0021 %	± 0.399 %	43.23 %	Uncertainty high due to on/off valve
Heat rejection	*[kW]*	43.4	± 0.18	0.4 %	
Cooling capasity	*[kW]*	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet	*[bar]*	55.6	± 0.14 0.00	0.3 %	
Pressure, throttle valve,in	*[bar]*	80.4	± 0.20	0.3 %	
Temperature, throttle valve, in	*[°C]*	54.7	± 0.07	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]*	-9.9	± -0.01	0.1 %	
Inlet super heat	*[K]*	9.5	± 0.01	0.1 %	
Outlet pressure	*[bar]*	80.4	± 0.21	0.3 %	
Outlet temperature	*[°C]*	125.3	± 0.04	0.03 %	
Pressure ratio	*[-]*	4.0	± 0.015	0.4 %	
Lubricant return mass flow rate:	*[kg/h]*	0.0	± 0.01	43.2 %	on/off valve
Temperature, lubricant return:	*[°C]*	60.0	± 0.89	1.5 %	
Compressor Speed	*[rpm]*	2000	± 4.00	0.2 %	
Torque	*[Nm]*	201	± 1.20	0.6 %	
Power consumption	*[kW]*	42.1	± 0.24	0.6 %	
Massflow R-744	*[kg/h]*	1491	± 3.10	0.2 %	
Specific volume (suction line)	*[m3/kg]*	0.02	± 0.00	0.1 %	
Density CO2 (suction line)	*[kg/m3]*	49.0	± 0.04	0.1 %	
Volumetric efficiency	*[%]*	66.7 %	± 0.16 %	0.24 %	
Isentropic efficiency	*[%]*	65.5 %	± 0.40 %	0.61 %	

Aircooler

Gascooler TAG 2				Total Deviation		Total uncertainty	Comment
Spesific heat difference	kJ/kg	96.9	±	0.62	0.6 %		
Capacity	[kW]	40.1	±	0.27	0.7 %		
Temperature difference R-744	°C	65.3	±	0.25	0.4 %		
Mass flow air	kg/h	-					
Effect	%		±				
Pressure drop	bar	0.1	±	0.00	5.3 %		
Mass flow R744	kg/h	1491	±	3.10	0.2 %		
Inlet temperature		121.8	±				
Outlet temperature		56.58					
			±				
			±				

Watercooler

Gascooler TAG 3							
			±				
Spesific heat difference	kJ/kg	1.5		0.76	50.1 %		
Cooling capasity	kW	0.6	±		0.0 %		
Mass flow water	Kg/h		±				
Temperature differenca R-744	°C	1.0		0.28	29.4 %		
Pressure drop	bar	0.0		0.00	9.2 %		
Mass flow R-744	kg/h	1491	±	3.10	0.2 %		
Temperature difference water	°C	2.1		0.10	4.7 %		

Gascooler 4a

R744 side				Total Deviation		Total uncertainty	Comment
Inlet temperature	°C	55.6	±	0.15	0.3 %		
Outlet temperature	°C	44.1	±	0.06	0.1 %		
Spesific heat difference	kJ/kg	0.03	±	0.00	2.6 %		
Temperature difference	°C	11.5	±	0.16	1.4 %		
Mass flow R744	Kg/h	1491	±	3.10	0.2 %		
Cooling capasity	kW	12.4	±	0.32	2.6 %		
Pressure drop	bar	0.03	±	0.00	7.9 %		
Glycol side							
Spesific heat difference	kJ/kg	0.05	±	0.34	715.1 %		
Temperature difference	°C	13.8	±	0.10	0.7 %		
Mass flow glycol	Kg/h	-4	±	0.00	0.0 %		
Cooling capasity	kW	-0.05	±	0.00	0.2 %		
Pressure drop	Pa	0.00	±	0.00	2.5 %		

Gascooler 4b

R744 side

Inlte temperature	°C	55.6	±	0.1 %	
Outlet temperature	°C	54.8	±	0.1 %	
Spesific heat difference	kJ/kg	1.1	±	66.9 %	
Temperature difference	°C	0.8	±	19.6 %	
Mass flow R744	kg/h	1491	±	0.2 %	
Cooling capasity	kW	0.00	±	67.0 %	
Pressure drop	Bar	0.04	±	6.9 %	

Glycol side

Spesific heat difference	kJ/kg	115.9	±	174.9 %	
Temperature difference	°C	33.2	±	0.4 %	
Mass flow glycol	Kg/h	-2	±	0.1 %	
Cooling capasity	kW	-433	±	0.1 %	
Pressure drop	bar	0.01	±	6.6 %	

IHX

HP side			**Total Deviation**		**Total uncertainty**	**Comment**
Spesific heat difference	kJ/kg	1.3	±	0.54	42.1 %	
Temperature difference	°C	0.4	±	0.10	21.6 %	
Mass flow R744	kg/h	1491	±	3.10	0.2 %	
Cooling capasity	kW	0.5	±	0.00	0.0 %	
Pressure loss	bar	1.8	±	0.00	0.1 %	
			±			

LP side

Spesific heat difference	kJ/kg	6.0	±	0.46	7.7 %	
Temperature difference	°C	40.8	±	0.02	0.1 %	
Mass flow R744	Kg/h	1491	±	3.10	0.2 %	
Cooling capasity	kW	0.0	±	0.00	0.0 %	
Pressure loss	bar	0.03	±	0.00	8.2 %	
Superheat IHX inlet	[°C]	12.2				

Evaporator 6a

R744 side			**Total Deviation**		**Total uncertainty**	**Comment**
Pressure inlet	bar	55.6	±	0.14	0.25 %	
Temperature difference	°C	-4.1	±	0.00	0.0 %	
Mass flow R744	kg/h	1491	±	3.10	0.2 %	
Heat difference R744	kJ/kg	-201	±	-0.10	0.0 %	
Cooling capasity	kW	-83.19	±	-0.04	0.0 %	
Pressure drop	bar	0.03	±	0.00	9.8 %	

Glycol side

Spesific heat difference	kJ/kg	5.81	±	69	1182.8 %	
Temperature difference	°C	1.65	±	0.07	4.3 %	
Mass flow glycol	Kg/h	0	±	0.00	19.6 %	
Cooling capasity	kW	0.00	±	1	15311819.2 %	
Pressure drop	bar	0.01	±	0.00	6.8 %	

Evaporator 6b

R744 side

Pressure inlet	bar	55.6	±	0.14	0.25 %
Spesific heat to R744	kJ/kg	0.3	±	0.00	0.0 %
Temperature difference	°C	19.1	±	0.03	0.2 %
Mass flow R744	kg/h	1491	±	3.1	0.2 %
Cooling capasity	kW	0.0	±	0.00	0.0 %
Pressure drop	bar	0.03	±	0.00	9.7 %

Glycol side

Spesific heat out	kJ/kg	18958.5	±	66873.1	352.7 %
Temperature difference	°C	3259.3	±	8.19	0.3 %
Mass flow glycol	Kg/h	-0	±	0.00	19.6 %
Cooling capasity	kW	0.1	±	0.33	353.3 %
Pressure drop	bar	0.01	±	0.00	4.5 %