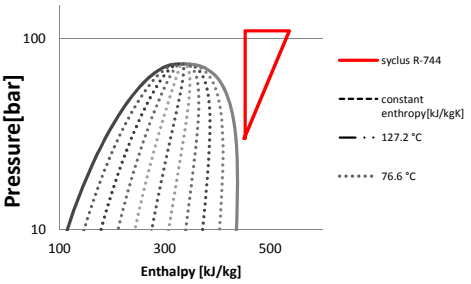
Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 800 rpm
Measured points 53

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		

Log p-h cyclus



System performance

				Total Deviation	Total uncertainty	Comment
COP	-		0.8	± 0.01	1.31 %	
Compressor Speed		*[rpm]*	800	± 1.60	0.2 %	
Mass flow R744		*[kg/h]*	848	± 2.92	0.3 %	
Mass flow water/ethyleneglycol		*[kg/h]*	0.0	± 0.00	20.4 %	
Ambient temperature		*[°C]*	19.7	± 0.01	0.0 %	
Supply power		*[kW]*	27.0	± 0.06	0.2 %	
Power consumtion compressor		*[kW]*	24.5	± 0.20	0.8 %	
Danfoss VSD efficiency			90.75 %	± 0.01	0.84 %	
Volumetric efficiency			63.3 %	± 0.46 %	0.72 %	
Isentropic efficiency			59.9 %	± 0.52 %	0.86 %	
Oil cirkulation rate (OCR)			0.0008 %	± 0.518 %	418.98 %	Uncertainty high due to on/off valve
Heat rejection		*[kW]*	19.9	± 0.21	1.1 %	
Cooling capasity		*[kW]*	3.0	± 0.03	0.9 %	
Pressure, evaporator, inlet		*[bar]*	30.8	± 0.08 0.00	0.3 %	
Pressure, throttle valve,in		*[bar]*	110.2	± 0.29	0.3 %	
Temperature, throttle valve, in		*[°C]*	76.6	± 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]*	30.0	± 0.09	0.3 %	
Inlet temperature	*[°C]*	5.3	± 0.12	2.4 %	
Inlet super heat	*[K]*	10.9	± 0.12	1.1 %	
Outlet pressure	*[bar]*	109.9	± 0.31	0.3 %	
Outlet temperature	*[°C]*	127.2	± 0.08	0.06 %	
Pressure ratio	*[-]*	3.7	± 0.016	0.4 %	
Lubricant return mass flow rate:	*[kg/h]*	0.0	± 0.03	419.0 %	on/off valve
Temperature, lubricant return:	*[°C]*	25.8	± 0.03	0.1 %	
Compressor Speed	*[rpm]*	800	± 1.60	0.2 %	
Torque	*[Nm]*	293	± 2.45	0.8 %	
Power consumption	*[kW]*	24.5	± 0.20	0.8 %	
Massflow R-744	*[kg/h]*	848	± 2.92	0.3 %	
Specific volume (suction line)	*[m3/kg]*	0.01	± 0.00	0.4 %	
Density CO2 (suction line)	*[kg/m3]*	73.8	± 0.32	0.4 %	
Volumetric efficiency	*[%]*	63.3 %	± 0.46 %	0.72 %	
Isentropic efficiency	*[%]*	59.9 %	± 0.52 %	0.86 %	

Aircooler

Gascooler TAG 2				Total Deviation		Total uncertainty	Comment
Spesific heat difference	kJ/kg	54.3	±	0.97	1.8 %		
Capacity	[kW]	12.8	±	0.23	1.8 %		
Temperature difference R-744	°C	34.9	±	0.46	1.3 %		
Mass flow air	kg/h	-					
Effect	%		±				
Pressure drop	bar	0.1	±	0.00	5.5 %		
Mass flow R744	kg/h	848	±	2.92	0.3 %		
Inlet temperature		118.4	±				
Outlet temperature		83.45					
			±				
			±				

Watercooler

Gascooler TAG 3			±				
Spesific heat difference	kJ/kg	3.3		1.02	30.6 %		
Cooling capasity	kW	0.8	±		0.0 %		
Mass flow water	Kg/h		±				
Temperature differenca R-744	°C	0.7		0.47	67.8 %		
Pressure drop	bar	0.0		0.00	4.3 %		
Mass flow R-744	kg/h	848	±	2.92	0.3 %		
Temperature difference water	°C	2.3		0.10	4.2 %		

Gascooler 4a

R744 side				Total Deviation		Total uncertainty	Comment
Inlet temperature	°C	82.8	±	0.11	0.1 %		
Outlet temperature	°C	51.7	±	0.11	0.2 %		
Spesific heat difference	kJ/kg	0.10	±	0.00	1.1 %		
Temperature difference	°C	31.0	±	0.16	0.5 %		
Mass flow R744	Kg/h	848	±	2.92	0.3 %		
Cooling capasity	kW	23.4	±	0.26	1.1 %		
Pressure drop	bar	0.03	±	0.01	41.2 %		
Glycol side							
Spesific heat difference	kJ/kg	0.05	±	0.41	831.0 %		
Temperature difference	°C	14.2	±	0.12	0.8 %		
Mass flow glycol	Kg/h	-3	±	0.00	0.0 %		
Cooling capasity	kW	-0.04	±	0.00	0.2 %		
Pressure drop	Pa	0.00	±	0.00	3.9 %		

Gascooler 4b

R744 side

Inlte temperature	°C	82.8	±	0.2 %			
Outlet temperature	°C	72.7	±	0.1 %			
Spesific heat difference	kJ/kg	22.7	±	4.8 %			
Temperature difference	°C	10.1	±	1.3 %			
Mass flow R744	kg/h	848	±	0.3 %			
Cooling capasity	kW	0.00	±	4.9 %			
Pressure drop	Bar	0.05	±	2.5 %			

Glycol side

Spesific heat difference	kJ/kg	154.2	±	95.6 %			
Temperature difference	°C	44.1	±	0.4 %			
Mass flow glycol	Kg/h	-1	±	0.1 %			
Cooling capasity	kW	-409	±	0.1 %			
Pressure drop	bar	0.01	±	32.2 %			

IHX

HP side			**Total Deviation**		**Total uncertainty**	**Comment**	
Spesific heat difference	kJ/kg	3.4	±	0.54	15.9 %		
Temperature difference	°C	1.5	±	0.06	4.2 %		
Mass flow R744	kg/h	848	±	2.92	0.3 %		
Cooling capasity	kW	0.8	±	0.00	0.0 %		
Pressure loss	bar	1.8	±	0.00	0.0 %		
			±				

LP side

Spesific heat difference	kJ/kg	35.8	±	0.40	1.1 %		
Temperature difference	°C	30.3	±	0.14	0.5 %		
Mass flow R744	Kg/h	848	±	2.92	0.3 %		
Cooling capasity	kW	0.0	±	0.00	0.0 %		
Pressure loss	bar	0.04	±	0.00	5.1 %		
Superheat IHX inlet	[°C]	31.0					

Evaporator 6a

R744 side			**Total Deviation**		**Total uncertainty**	**Comment**	
Pressure inlet	bar	30.8	±	0.08	0.25 %		
Temperature difference	°C	-4.1	±	0.00	0.0 %		
Mass flow R744	kg/h	848	±	2.92	0.3 %		
Heat difference R744	kJ/kg	13	±	0.09	0.7 %		
Cooling capasity	kW	3.01	±	0.02	0.7 %		
Pressure drop	bar	0.02	±	0.00	4.2 %		

Glycol side

Spesific heat difference	kJ/kg	9.04	±	95	1054.2 %		
Temperature difference	°C	2.60	±	0.08	3.1 %		
Mass flow glycol	Kg/h	0	±	0.00	20.4 %		
Cooling capasity	kW	0.00	±	1	11229335.8 %		
Pressure drop	bar	0.01	±	0.00	3.6 %		

Evaporator 6b

R744 side

Pressure inlet	bar	30.8	±	0.08	0.25 %		
Spesific heat to R744	kJ/kg	0.4	±	0.00	0.0 %		
Temperature difference	°C	19.1	±	0.03	0.2 %		
Mass flow R744	kg/h	848	±	2.9	0.3 %		
Cooling capasity	kW	0.0	±	0.00	0.0 %		
Pressure drop	bar	0.02	±	0.00	2.5 %		

Glycol side

Spesific heat out	kJ/kg	18945.8	±	66873.0	353.0 %		
Temperature difference	°C	3255.6	±	8.19	0.3 %		
Mass flow glycol	Kg/h	-0	±	0.00	20.4 %		
Cooling capasity	kW	0.1	±	0.33	353.6 %		
Pressure drop	bar	0.01	±	0.00	3.9 %		