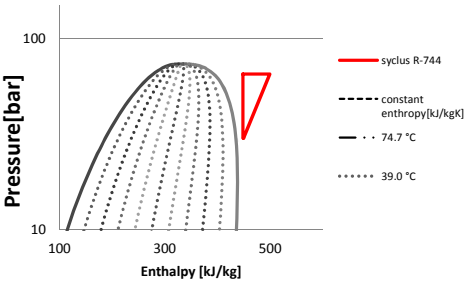
Experiment no: 4
Date: 22.05.2012
Operator: Obrist/Roman
Mode: comp.test 3000 rpm
Measured points 32

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	-		1.0	± 0.01	0.95 %	
Compressor Speed		[rpm]	3000	± 6.00	0.2 %	
Mass flow R744		[kg/h]	4164	± 8.98	0.2 %	
Mass flow water/ethyleneglycol		[kg/h]	0.0	± 0.00	26.4 %	
Ambient temperature		[°C]	20.7	± 0.08	0.4 %	
Supply power		[kW]	64.7	± 0.13	0.2 %	
Power consumtion compressor		[kW]	56.9	± 0.27	0.5 %	
Danfoss VSD efficiency			88.03 %	± 0.00	0.50 %	
Volumetric efficiency			82.2 %	± 0.40 %	0.48 %	
Isentropic efficiency			69.9 %	± 0.46 %	0.66 %	
Oil cirkulation rate (OCR)			1.0900 %	± 0.462 %	38.35 %	Uncertainty high due to on/off valve
Heat rejection		[kW]	58.7	± 0.27	0.5 %	
Cooling capasity		[kW]	0.0	± 0.00	0.0 %	
Pressure, evaporator, inlet		[bar]	62.1	± 0.16	0.3 %	
				0.00		
Pressure, throttle valve,in		[bar]	61.5	± 0.15	0.3 %	
Temperature, throttle valve, in		[°C]	39.0	± 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]	4.4	± 0.01	0.2 %	
Inlet super heat	[K]	9.8	± 0.01	0.1 %	
Outlet pressure	[bar]	65.2	± 0.16	0.3 %	
Outlet temperature	[°C]	74.7	± 0.03	0.04 %	
Pressure ratio	[-]	2.2	± 0.008	0.4 %	
Lubricant return mass flow rate:	[kg/h]	45.9	± 17.79	38.8 %	on/off valve
Temperature, lubricant return:	[°C]	68.4	± 0.11	0.2 %	
Compressor Speed	[rpm]	3000	± 6.00	0.2 %	
Torque	[Nm]	181	± 0.93	0.5 %	
Power consumption	[kW]	56.9	± 0.27	0.5 %	
Massflow R-744	[kg/h]	4164	± 8.98	0.2 %	
Specific volume (suction line)	[m3/kg]	0.01	± 0.00	0.1 %	
Density CO2 (suction line)	[kg/m3]	74.9	± 0.05	0.1 %	
Volumetric efficiency	[%]	82.2 %	± 0.40 %	0.48 %	
Isentropic efficiency	[%]	69.9 %	± 0.46 %	0.66 %	

Aircooler

Gascooler TAG 2				Total Deviation		Total uncertainty	Comment
Spesific heat difference	kJ/kg	50.3	±	0.35	0.7 %		
Capacity	[kW]	58.1	±	0.42	0.7 %		
Temperature difference R-744	°C	32.2	±	0.05	0.1 %		
Mass flow air	kg/h	-					
Effect	%		±				
Pressure drop	bar	0.3	±	0.00	0.7 %		
Mass flow R744	kg/h	4164	±	8.98	0.2 %		
Inlet temperature		73.5	±				
Outlet temperature		41.36					
			±				
			±				

Watercooler

Gascooler TAG 3							
			±				
Spesific heat difference	kJ/kg	-0.1		0.00	0.0 %		
Cooling capasity	kW	-0.2	±		0.0 %		
Mass flow water	Kg/h		±				
Temperature differenca R-744	°C	0.7		0.04	5.9 %		
Pressure drop	bar	0.0		0.00	0.7 %		
Mass flow R-744	kg/h	4164	±	8.98	0.2 %		
Temperature difference water	°C	2.1		0.11	5.1 %		

Gascooler 4a

R744 side				Total Deviation		Total uncertainty	Comment
Inlet temperature	°C	40.6	±	0.02	0.0 %		
Outlet temperature	°C	38.5	±	0.02	0.0 %		
Spesific heat difference	kJ/kg	0.00	±	0.00	12.1 %		
Temperature difference	°C	2.2	±	0.03	1.4 %		
Mass flow R744	Kg/h	4164	±	8.98	0.2 %		
Cooling capasity	kW	4.1	±	0.50	12.1 %		
Pressure drop	bar	0.04	±	0.00	10.5 %		
Glycol side							
Spesific heat difference	kJ/kg	0.04	±	0.38	893.6 %		
Temperature difference	°C	12.2	±	0.11	0.9 %		
Mass flow glycol	Kg/h	-4	±	0.00	0.0 %		
Cooling capasity	kW	-0.04	±	0.00	0.3 %		
Pressure drop	Pa	0.00	±	0.00	2.1 %		

Gascooler 4b

R744 side

Inlte temperature	°C	40.6	±	0.0 %	
Outlet temperature	°C	40.5	±	0.1 %	
Spesific heat difference	kJ/kg	0.5	±	89.2 %	
Temperature difference	°C	0.2	±	24.2 %	
Mass flow R744	kg/h	4164	±	0.2 %	
Cooling capasity	kW	0.00	±	89.2 %	
Pressure drop	Bar	0.06	±	5.7 %	

Glycol side

Spesific heat difference	kJ/kg	82.5	±	237.9 %	
Temperature difference	°C	23.6	±	0.6 %	
Mass flow glycol	Kg/h	-2	±	0.1 %	
Cooling capasity	kW	-293	±	0.1 %	
Pressure drop	bar	0.01	±	6.5 %	

IHX

HP side			**Total Deviation**		**Total uncertainty**	**Comment**
Spesific heat difference	kJ/kg	4.9	±	0.42	8.5 %	
Temperature difference	°C	0.7	±	0.02	3.3 %	
Mass flow R744	kg/h	4164	±	8.98	0.2 %	
Cooling capasity	kW	5.7	±	0.48	8.5 %	
Pressure loss	bar	1.8	±	0.00	0.1 %	
			±			

LP side

Spesific heat difference	kJ/kg	27.0	±	0.54	2.0 %	
Temperature difference	°C	24.3	±	0.01	0.1 %	
Mass flow R744	Kg/h	4164	±	8.98	0.2 %	
Cooling capasity	kW	0.3	±	0.00	0.0 %	
Pressure loss	bar	0.04	±	0.01	18.6 %	
Superheat IHX inlet	[°C]	5.3				

Evaporator 6a

R744 side			**Total Deviation**		**Total uncertainty**	**Comment**
Pressure inlet	bar	62.1	±	0.16	0.25 %	
Temperature difference	°C	-4.1	±	0.00	0.0 %	
Mass flow R744	kg/h	4164	±	8.98	0.2 %	
Heat difference R744	kJ/kg	-204	±	-0.09	0.0 %	
Cooling capasity	kW	-236.18	±	-0.11	0.0 %	
Pressure drop	bar	0.04	±	0.00	1.3 %	

Glycol side

Spesific heat difference	kJ/kg	7.62	±	89	1161.7 %	
Temperature difference	°C	2.19	±	0.08	3.8 %	
Mass flow glycol	Kg/h	0	±	0.00	26.4 %	
Cooling capasity	kW	0.00	±	2	13664545.4 %	
Pressure drop	bar	0.01	±	0.00	5.1 %	

Evaporator 6b

R744 side

Pressure inlet	bar	62.1	±	0.16	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	4164	±	9.0	0.2 %
Cooling capasity	kW	0.0	±	0.00	0.0 %
Pressure drop	bar	0.04	±	0.00	1.6 %

Glycol side

Spesific heat out	kJ/kg	18944.4	±	66873.0	353.0 %
Temperature difference	°C	3255.2	±	8.19	0.3 %
Mass flow glycol	Kg/h	-0	±	0.00	26.4 %
Cooling capasity	kW	0.1	±	0.42	354.0 %
Pressure drop	bar	0.01	±	0.00	6.8 %