

LAMPIRAN 1
PROPERTY OF METHANOL

1. Molar mass = 32,042 Kg/Kmol
2. Triple point temperature = -97,54 °C
3. Normal boiling point = 64,482 °C
4. Critical Point
 - T = 239,45 °C
 - P = 8,1035 MPa
5. Density = 275,56 Kg/m³
6. Range of applicability
 - T_{min} = -97,54 °C
 - T_{mak} = 346,85 °C
 - P_{mak} = 800 MPa
 - P_{min} = 1139,7 Kg/m³

LITERATURE REFERENCE

de Reuck, K.M. and Craven, R.J.B., "Methanol, International Thermodynamic Tables of the Fluid State - 12," IUPAC, Blackwell Scientific Publications, London, 1993. The uncertainties of the equation of state are generally 0.1% in density and 2% in the speed of sound, except in the critical region and high pressures.

LAMPIRAN 2
SATURATION VAPOR/LIQUID TABLES OF METHANOL

T = -20 °C to T= 100 °C

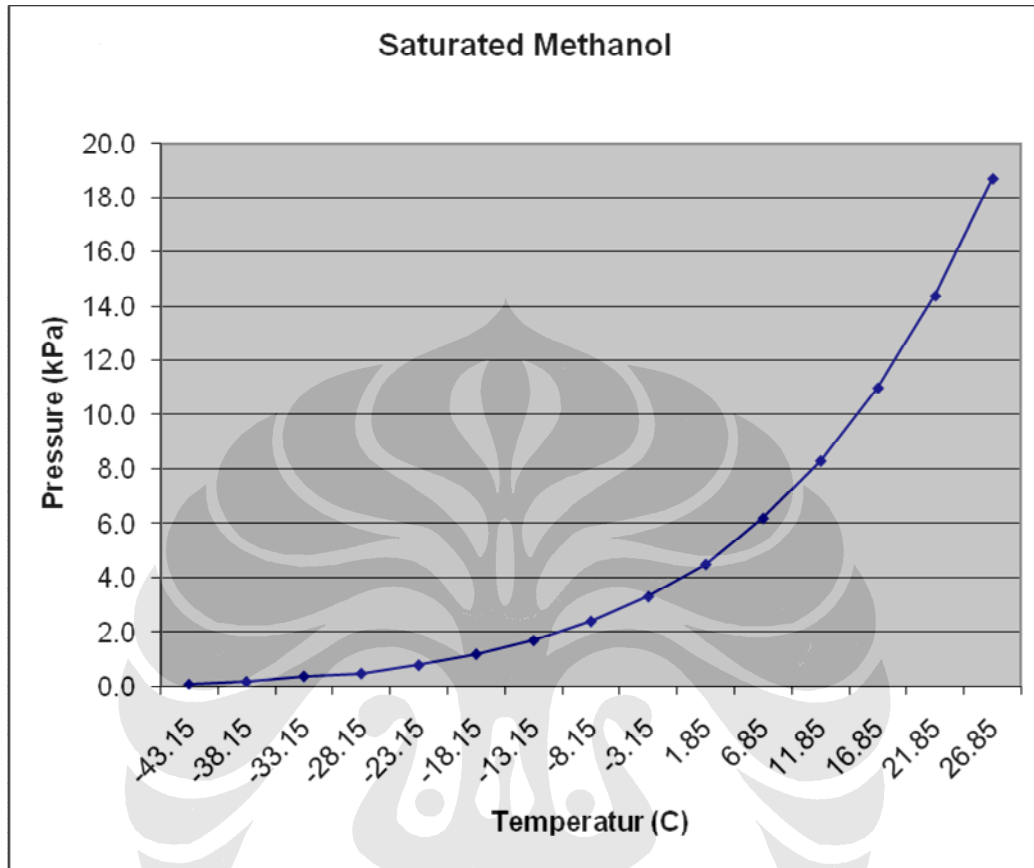
NIST Reference Fluid Thermodynamic and Transport Properties

Temp. (°C)	Absolute Pressure (mmHg)	Liquid Density (kg/L)	Vapor Density (kg/L)	Liquid Enthalpy (kJ/kg)	Vapor Enthalpy (kJ/kg)	Liquid Entropy (kJ/kg.K)	Vapor Entropy (kJ/kg.K)
-20,000	7,7125	0,82852	0,000015773	-214,39	1016,6	-0,72693	4,1357
-19,000	8,3072	0,82757	0,000016927	-212,07	1017,7	-0,71777	4,1208
-18,000	8,9419	0,82662	0,000018153	-209,74	1018,7	-0,70863	4,1061
-17,000	9,6191	0,82567	0,000019457	-207,41	1019,8	-0,69951	4,0915
-16,000	10,341	0,82472	0,000020841	-205,08	1020,9	-0,69041	4,0771
-15,000	11,111	0,82378	0,000022311	-202,74	1022,0	-0,68134	4,0628
-14,000	11,930	0,82283	0,000023871	-200,40	1023,0	-0,67229	4,0487
-13,000	12,802	0,82188	0,000025524	-198,05	1024,1	-0,66325	4,0347
-12,000	13,730	0,82094	0,000027277	-195,70	1025,2	-0,65424	4,0208
-11,000	14,716	0,81999	0,000029133	-193,35	1026,2	-0,64525	4,0070
-10,000	15,764	0,81905	0,000031098	-190,99	1027,3	-0,63627	3,9934
-9,0000	16,877	0,81811	0,000033178	-188,63	1028,4	-0,62732	3,9799
-8,0000	18,058	0,81717	0,000035377	-186,27	1029,4	-0,61839	3,9666
-7,0000	19,312	0,81622	0,000037702	-183,90	1030,5	-0,60947	3,9534
-6,0000	20,640	0,81528	0,000040158	-181,52	1031,6	-0,60057	3,9402
-5,0000	22,049	0,81434	0,000042751	-179,15	1032,6	-0,59169	3,9273
-4,0000	23,540	0,81340	0,000045488	-176,77	1033,7	-0,58283	3,9144
-3,0000	25,119	0,81246	0,000048376	-174,38	1034,7	-0,57398	3,9017
-2,0000	26,790	0,81152	0,000051421	-171,99	1035,8	-0,56515	3,8890
-1,0000	28,557	0,81058	0,000054630	-169,60	1036,8	-0,55634	3,8765
0,00000	30,424	0,80965	0,000058010	-167,20	1037,9	-0,54754	3,8641
1,0000	32,398	0,80871	0,000061570	-164,79	1038,9	-0,53876	3,8519
2,0000	34,482	0,80777	0,000065316	-162,38	1039,9	-0,52999	3,8397
3,0000	36,681	0,80683	0,000069257	-159,97	1041,0	-0,52124	3,8277
4,0000	39,002	0,80590	0,000073401	-157,55	1042,0	-0,51250	3,8158
5,0000	41,449	0,80496	0,000077756	-155,13	1043,1	-0,50378	3,8039
6,0000	44,029	0,80402	0,000082332	-152,70	1044,1	-0,49507	3,7922
7,0000	46,747	0,80309	0,000087137	-150,27	1045,1	-0,48637	3,7806
8,0000	49,609	0,80215	0,000092181	-147,84	1046,2	-0,47769	3,7691
9,0000	52,622	0,80122	0,000097473	-145,39	1047,2	-0,46902	3,7577
10,000	55,793	0,80028	0,00010302	-142,95	1048,2	-0,46036	3,7465
11,000	59,127	0,79935	0,00010884	-140,49	1049,2	-0,45172	3,7353
12,000	62,632	0,79841	0,00011494	-138,03	1050,3	-0,44308	3,7242

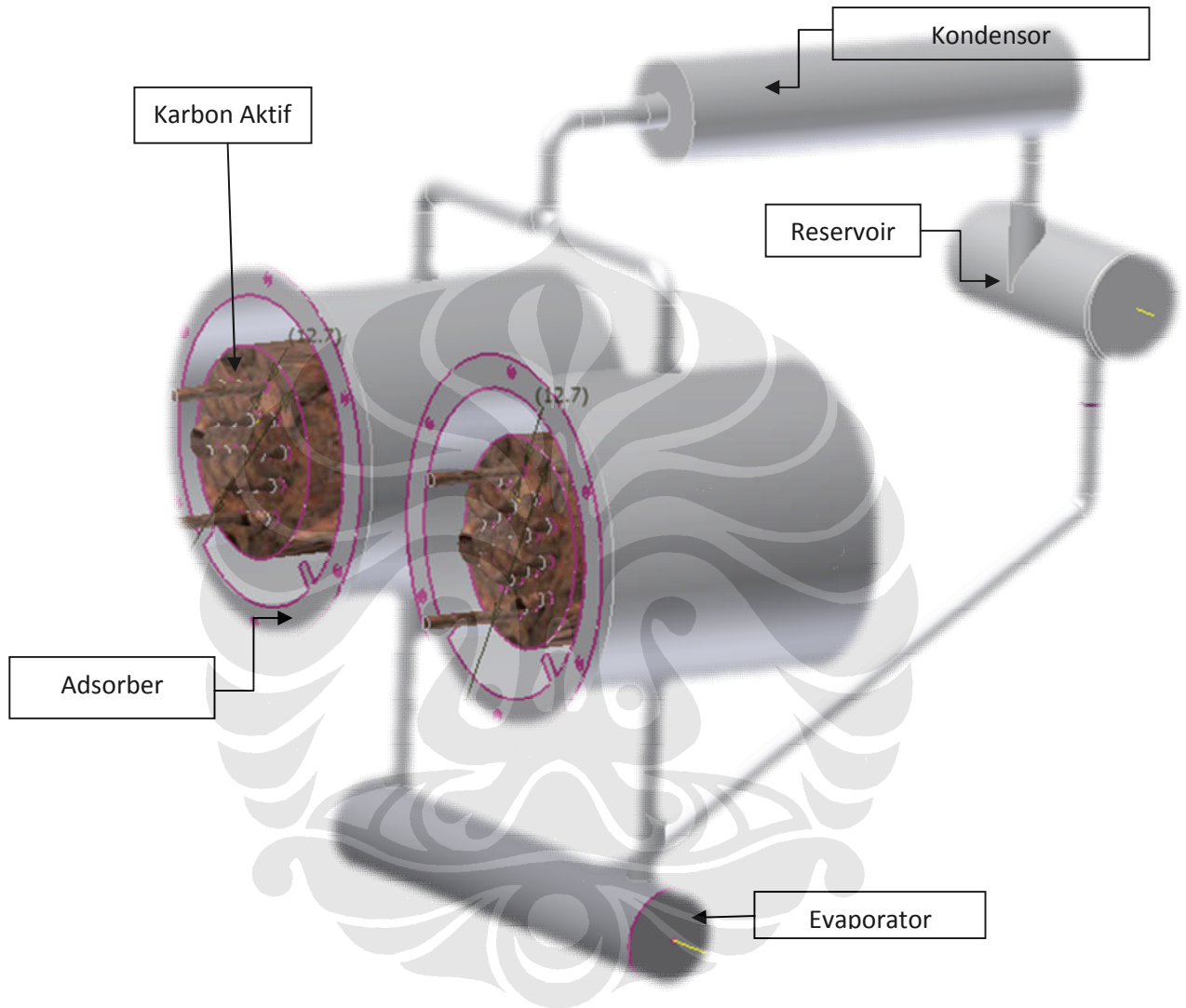
13,000	66,316	0,79748	0,00012133	-135,57	1051,3	-0,43446	3,7132
14,000	70,185	0,79654	0,00012802	-133,10	1052,3	-0,42585	3,7023
15,000	74,248	0,79560	0,00013502	-130,63	1053,3	-0,41726	3,6916
16,000	78,512	0,79467	0,00014234	-128,15	1054,3	-0,40867	3,6809
17,000	82,985	0,79373	0,00015001	-125,66	1055,4	-0,40009	3,6703
18,000	87,676	0,79280	0,00015802	-123,17	1056,4	-0,39152	3,6598
19,000	92,593	0,79186	0,00016639	-120,68	1057,4	-0,38297	3,6494
20,000	97,746	0,79093	0,00017514	-118,17	1058,4	-0,37442	3,6391
21,000	103,14	0,78999	0,00018427	-115,67	1059,4	-0,36588	3,6289
22,000	108,79	0,78905	0,00019381	-113,15	1060,4	-0,35735	3,6188
23,000	114,71	0,78812	0,00020376	-110,63	1061,4	-0,34883	3,6088
24,000	120,90	0,78718	0,00021414	-108,11	1062,4	-0,34032	3,5989
25,000	127,37	0,78624	0,00022497	-105,57	1063,4	-0,33181	3,5890
26,000	134,14	0,78530	0,00023626	-103,04	1064,4	-0,32332	3,5793
27,000	141,21	0,78437	0,00024803	-100,49	1065,4	-0,31483	3,5696
28,000	148,60	0,78343	0,00026028	-97,939	1066,4	-0,30635	3,5600
29,000	156,32	0,78249	0,00027305	-95,382	1067,4	-0,29787	3,5506
30,000	164,37	0,78155	0,00028634	-92,818	1068,4	-0,28941	3,5411
31,000	172,78	0,78061	0,00030017	-90,248	1069,4	-0,28095	3,5318
32,000	181,55	0,77966	0,00031456	-87,671	1070,4	-0,27249	3,5226
33,000	190,70	0,77872	0,00032954	-85,087	1071,4	-0,26405	3,5134
34,000	200,24	0,77778	0,00034510	-82,497	1072,4	-0,25560	3,5043
35,000	210,18	0,77683	0,00036129	-79,900	1073,3	-0,24717	3,4953
36,000	220,53	0,77589	0,00037810	-77,296	1074,3	-0,23874	3,4864
37,000	231,32	0,77494	0,00039557	-74,685	1075,3	-0,23031	3,4775
38,000	242,55	0,77399	0,00041372	-72,068	1076,3	-0,22189	3,4688
39,000	254,24	0,77305	0,00043256	-69,443	1077,3	-0,21348	3,4601
40,000	266,41	0,77210	0,00045211	-66,811	1078,2	-0,20507	3,4515
41,000	279,06	0,77115	0,00047241	-64,172	1079,2	-0,19666	3,4429
42,000	292,22	0,77019	0,00049346	-61,526	1080,2	-0,18826	3,4344
43,000	305,90	0,76924	0,00051529	-58,873	1081,1	-0,17986	3,4260
44,000	320,12	0,76829	0,00053792	-56,212	1082,1	-0,17146	3,4177
45,000	334,89	0,76733	0,00056139	-53,544	1083,0	-0,16307	3,4094
46,000	350,23	0,76637	0,00058570	-50,868	1084,0	-0,15468	3,4012
47,000	366,16	0,76542	0,00061089	-48,185	1085,0	-0,14630	3,3931
48,000	382,70	0,76446	0,00063698	-45,495	1085,9	-0,13792	3,3851
49,000	399,86	0,76349	0,00066399	-42,796	1086,9	-0,12954	3,3771
50,000	417,67	0,76253	0,00069196	-40,090	1087,8	-0,12116	3,3691
51,000	436,13	0,76156	0,00072090	-37,377	1088,7	-0,11279	3,3613
52,000	455,28	0,76060	0,00075085	-34,655	1089,7	-0,10441	3,3535
53,000	475,13	0,75963	0,00078182	-31,926	1090,6	-0,096042	3,3457
54,000	495,69	0,75866	0,00081386	-29,188	1091,5	-0,087672	3,3381
55,000	517,00	0,75769	0,00084698	-26,443	1092,5	-0,079305	3,3305
56,000	539,07	0,75671	0,00088122	-23,689	1093,4	-0,070938	3,3229
57,000	561,93	0,75574	0,00091660	-20,928	1094,3	-0,062573	3,3154
58,000	585,58	0,75476	0,00095316	-18,158	1095,2	-0,054209	3,3080

59,000	610,07	0,75378	0,00099092	-15,380	1096,1	-0,045846	3,3006
60,000	635,40	0,75279	0,0010299	-12,594	1097,1	-0,037483	3,2933
61,000	661,61	0,75181	0,0010702	-9,7988	1098,0	-0,029121	3,2860
62,000	688,71	0,75082	0,0011118	-6,9957	1098,9	-0,020759	3,2788
63,000	716,73	0,74983	0,0011547	-4,1840	1099,7	-0,012397	3,2717
64,000	745,69	0,74884	0,0011989	-1,3638	1100,6	-0,0040346	3,2646
65,000	775,62	0,74784	0,0012446	1,4650	1101,5	0,0043276	3,2575
66,000	806,54	0,74685	0,0012917	4,3025	1102,4	0,012690	3,2505
67,000	838,47	0,74585	0,0013403	7,1488	1103,3	0,021053	3,2436
68,000	871,45	0,74484	0,0013904	10,004	1104,2	0,029417	3,2367
69,000	905,50	0,74384	0,0014420	12,868	1105,0	0,037782	3,2298
70,000	940,65	0,74283	0,0014952	15,740	1105,9	0,046147	3,2230
71,000	976,91	0,74182	0,0015500	18,622	1106,7	0,054514	3,2163
72,000	1014,3	0,74080	0,0016065	21,513	1107,6	0,062882	3,2096
73,000	1052,9	0,73979	0,0016647	24,413	1108,4	0,071252	3,2029
74,000	1092,7	0,73877	0,0017246	27,322	1109,3	0,079623	3,1963
75,000	1133,8	0,73774	0,0017863	30,240	1110,1	0,087997	3,1897
76,000	1176,0	0,73672	0,0018498	33,168	1110,9	0,096372	3,1832
77,000	1219,6	0,73569	0,0019152	36,105	1111,7	0,10475	3,1767
78,000	1264,5	0,73466	0,0019825	39,051	1112,6	0,11313	3,1702
79,000	1310,8	0,73362	0,0020517	42,007	1113,4	0,12151	3,1638
80,000	1358,5	0,73258	0,0021229	44,973	1114,2	0,12989	3,1575
81,000	1407,5	0,73154	0,0021962	47,948	1115,0	0,13828	3,1512
82,000	1458,0	0,73049	0,0022715	50,932	1115,7	0,14667	3,1449
83,000	1510,0	0,72944	0,0023490	53,926	1116,5	0,15506	3,1386
84,000	1563,5	0,72838	0,0024287	56,931	1117,3	0,16346	3,1324
85,000	1618,6	0,72733	0,0025106	59,945	1118,1	0,17186	3,1262
86,000	1675,2	0,72626	0,0025947	62,969	1118,8	0,18026	3,1201
87,000	1733,4	0,72520	0,0026812	66,002	1119,6	0,18867	3,1140
88,000	1793,3	0,72413	0,0027701	69,046	1120,3	0,19708	3,1079
89,000	1854,8	0,72305	0,0028614	72,100	1121,0	0,20549	3,1019
90,000	1918,1	0,72198	0,0029551	75,165	1121,7	0,21391	3,0958
91,000	1983,1	0,72089	0,0030514	78,239	1122,5	0,22233	3,0899
92,000	2049,9	0,71981	0,0031504	81,324	1123,2	0,23075	3,0839
93,000	2118,6	0,71872	0,0032519	84,419	1123,9	0,23918	3,0780
94,000	2189,1	0,71762	0,0033562	87,524	1124,5	0,24762	3,0721
95,000	2261,5	0,71652	0,0034632	90,641	1125,2	0,25606	3,0662
96,000	2335,8	0,71542	0,0035731	93,767	1125,9	0,26450	3,0604
97,000	2412,1	0,71431	0,0036859	96,905	1126,5	0,27295	3,0546
98,000	2490,4	0,71319	0,0038016	100,05	1127,2	0,28140	3,0488
99,000	2570,8	0,71207	0,0039203	103,21	1127,8	0,28986	3,0431
100,00	2653,2	0,71095	0,0040421	106,38	1128,4	0,29833	3,0373

LAMPIRAN 3
GRAFIK SATURASI METHANOL



LAMPIRAN 4
DESAIN TIGA DIMENSI ALAT ADSORPSI DENGAN DUA ADSORBER



LAMPIRAN 5
DATA ADSORPSI ADSORBER 1

Waktu (menit)	P ads 2 (mA)	T ads 2 (°C)	P ads 1 (mA)	T ads 1 (°C)	P evap (cmHg)	T evap (°C)	P kond (cmHg)	T kond (°C)	P resv (bar)	T resv (°C)	Keterangan
0	3.909	19.7	4.146	20.5	-61	15.4		19.7		19	12 Desember 2008
5	3.911	19.6	4.153	20.4	-68	15.5		19.5		19	
10	3.908	19.5	4.157	20.4	-68	15.4		19.5		19.1	
15	3.909	19.4	4.157	20.3	-68	15		19.3		19.1	
20	3.909	19.3	4.155	20.3	-68	14.8		19.4		19.1	
25	3.909	19.2	4.157	20.2	-68	14.5		19.4		19.2	
30	3.909	19.2	4.161	20.2	-68	14.4		19.4		19.3	
35	3.911	19.1	4.163	20.1	-68	14.4		19.4		19.3	
40	3.911	19.1	4.161	20	-69	14.2		19.4		19.4	
45	3.911	19.1	4.166	19.9	-68	14.1		19.4		19.3	
50	3.911	19.1	4.164	19.9	-68	14.2		19.2		19.4	
55	3.911	19.1	4.166	19.8	-69	14.2		19.3		19.3	
60	3.914	19.1	4.168	19.7	-69	14.2		19.3		19.3	
65	3.912	19.1	4.168	19.7	-69	14.1		19.2		19.2	
70	3.915	19	4.167	19.5	-69	14		19.1		19.2	
75	3.913	18.5	4.171	19.5	-68	14		19.2		19.2	

LAMPIRAN 6
DATA ADSORPSI ADSORBER 2

Waktu (menit)	P ads 2 (mA)	T ads 2 (°C)	P ads 1 (mA)	T ads 1 (°C)	P evap (cmHg)	T evap (°C)	P kond (cmHg)	T kond (°C)	P resv (bar)	T resv (°C)	Keterangan
0	3.889	20.2	4.12	21.1	-68	20		20.1		20.5	12 Desember 2008
5	3.909	20.5	4.118	21.2	-70	18.9		20.1		20.4	
10	3.912	20.7	4.124	21.1	-70	18.2		20.1		20.4	
15	3.914	20.7	4.12	21.1	-70	17.2		20.1		20.4	
20	3.914	20.7	4.123	21.1	-70	16.5		20.2		20.3	
25	3.914	20.6	4.124	21	-70	15.7		20		20.2	
30	3.915	20.7	4.126	21	-70	15.3		20.1		20.2	
35	3.912	20.5	4.129	21	-70	15		20		20.1	
40	3.916	20.4	4.132	20.9	-70	14.7		19.9		20.1	
45	3.913	20.4	4.128	20.8	-70	14.5		19.8		19.9	
50	3.916	20.2	4.132	20.7	-70	14.3		19.7		19.8	
55	3.915	20.2	4.135	20.7	-70	14.2		19.7		19.8	
60	3.914	20.1	4.134	20.6	-70	14.2		19.5		19.8	
65	3.914	20	4.136	20.5	-70	14		19.5		19.7	
70	3.915	19.9	4.137	20.7	-70	14		19.5		19.8	
75	3.914	19.9	4.138	20.6	-70	14		19.6		19.7	