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APPENDICES

APPENDIX A Raw Data

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A1 Condensate at 20 degree of Celsius

A1.1 Initial Pressure.: 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	20.2	115	259	20
1	400	20.5	120	259	20.2
2	362	19.7	125	259	20
3	343	19.3	130	259	19.7
4	322	18.8	135	259	19.8
5	310	18.3	140	259	20
10	284	20.4	145	259	20
15	277	21.5	150	259	20
20	265	20.2	155	259	20.1
25	262	19.5	160	259	20.4
30	260	19.5	165	259	20.3
35	260	19.8	170	259	20
40	261	20.2	175	260	20.4
45	260	20	180	259	19.7
50	258	19.9	185	259	19.9
55	258	19.7	190	259	20.1
60	258	19.8	195	259	20.2
65	259	20	200	259	20
70	259	20.1	205	259	19.8
75	258	20	210	259	19.9
80	257	19.7	215	259	20.1
85	258	19.8	220	259	20
90	259	20	225	259	20.2
95	259	20.1	230	259	20.2
100	260	20.4	235	259	20
105	257	19.7	240	259	20.3
110	259	19.9			

A1.2 Initial Pressure.: 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	601	20.2	115	325	19.9
1	484	20.7	120	326	20.2
2	445	20.2	125	324	19.7
3	419	19.5	130	325	19.9
4	398	19.1	135	325	20
5	386	18.9	140	325	20.1
10	351	18.8	145	325	20.1
15	339	19.1	150	325	20.1
20	334	19.6	155	325	20.2
25	332	20	160	326	20.4
30	332	20.4	165	326	20.3
35	329	20.3	170	325	20
40	327	19.7	175	325	19.6
45	326	19.8	180	325	19.7
50	327	20	185	325	19.9
55	328	20.4	190	325	20.1
60	326	20.2	195	327	20.5
65	325	19.9	200	325	20.3
70	325	19.8	205	325	20
75	327	20.1	210	325	20
80	328	20.3	215	325	20
85	328	20.7	220	325	19.9
90	325	20.1	225	325	20
95	325	19.8	230	325	20.2
100	325	20	235	325	20.2
105	325	20.2	240	325	20.1
110	325	20.1			

A1.3 Initial Pressure.: 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	650	20.7	115	351	20.1
1	531	21	120	351	20.2
2	479	20.6	125	351	20
3	448	19.9	130	351	19.8
4	423	19.5	135	351	19.7
5	411	19.3	140	352	20.2
10	374	19.2	145	352	20.3
15	363	19.6	150	351	20.2
20	359	19.9	155	351	20
25	357	20.2	160	351	20
30	356	20.5	165	351	19.9
35	350	19.7	170	351	20.1
40	354	20.4	175	351	20
45	353	20	180	351	20.3
50	353	20	185	351	20
55	352	20.1	190	351	19.8
60	352	20	195	351	19.9
65	352	20.2	200	349	20.2
70	352	20.3	205	351	19.9
75	351	20.1	210	351	20
80	353	20.3	215	351	20
85	351	20	220	351	20
90	351	20	225	351	20.3
95	353	20.2	230	351	19.7
100	351	20	235	351	19.9
105	351	19.9	240	351	20.2
110	351	19.9			

A1.4 Initial Pressure.: 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	703	21	115	378	19.9
1	562	22.1	120	378	20
2	511	21.5	125	379	20.4
3	478	20.8	130	379	20.3
4	455	20.5	135	378	19.9
5	440	20.2	140	378	19.8
10	406	20	145	378	19.8
15	396	20.2	150	378	20
20	382	19.7	155	378	20
25	379	19.5	160	378	20
30	380	20	165	378	20.1
35	380	20.1	170	378	20.3
40	382	20.4	175	378	20.1
45	378	20.1	180	378	20
50	378	19.8	185	376	19.7
55	379	19.9	190	378	19.8
60	380	20.3	195	378	20
65	379	20	200	378	20
70	378	20	205	379	20.3
75	379	20.3	210	378	20.2
80	378	20.1	215	378	20
85	378	20	220	378	20.1
90	379	20.2	225	378	20
95	378	20	230	378	20.2
100	378	20	235	378	19.9
105	378	20.2	240	378	19.9
110	378	20.1			

A1.5 Initial Pressure.: 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	748	21.3	115	418	20.1
1	588	21.4	120	418	20.1
2	538	20.5	125	418	20.3
3	504	19.9	130	418	20
4	483	19.5	135	418	20
5	468	19.2	140	418	20
10	433	19	145	418	20.2
15	426	19.2	150	418	20.1
20	423	19.5	155	418	19.9
25	423	20	160	417	19.7
30	421	20.2	165	416	19.5
35	417	19.7	170	418	19.8
40	417	19.8	175	418	20
45	418	19.8	180	418	20
50	419	20.1	185	418	20.1
55	418	20.1	190	418	20
60	416	19.6	195	418	20.1
65	417	19.7	200	418	20.3
70	418	20	205	418	20
75	418	20.2	210	418	19.8
80	417	20	215	418	19.8
85	418	20.1	220	418	19.9
90	418	20	225	418	20.1
95	418	19.9	230	418	20.2
100	417	19.7	235	418	20
105	417	19.9	240	418	19.8
110	418	20			

A1.6 Initial Pressure.: 775 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	775	21.3	115	426	20.4
1	596	21.8	120	425	20.1
2	540	21.4	125	425	19.8
3	504	21	130	425	19.8
4	484	20.7	135	425	20
5	471	20.3	140	425	20.1
10	443	19.8	145	425	20
15	437	19.9	150	425	20.1
20	435	20.2	155	425	20.1
25	429	19.9	160	425	20.3
30	428	19.9	165	425	20.3
35	429	20.2	170	423	19.6
40	428	20.2	175	424	19.8
45	428	20.2	180	425	19.9
50	426	20	185	425	20.2
55	427	20	190	425	20.1
60	428	20.3	195	425	20
65	426	20.1	200	425	20.1
70	423	19.6	205	425	20.1
75	425	19.8	210	425	19.9
80	425	19.9	215	425	19.8
85	427	20.3	220	425	19.9
90	425	20	225	425	20
95	425	20.1	230	425	20.1
100	425	20.1	235	425	20.2
105	425	20.2	240	425	20
110	425	20.2			

A1.7 Initial Pressure.: 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	800	21.5	115	457	20
1	632	22.4	120	457	20.1
2	575	22.1	125	458	20.4
3	539	21.9	130	459	20.5
4	517	21.6	135	457	20.3
5	503	21.3	140	457	20.1
10	466	20	145	457	19.8
15	461	19.7	150	457	20
20	460	20	155	457	20
25	461	20.3	160	457	20
30	458	19.9	165	457	20.3
35	459	20.1	170	456	19.7
40	460	20.4	175	456	19.8
45	457	19.9	180	457	19.9
50	456	19.9	185	457	20.2
55	459	20.2	190	457	20
60	460	20.3	195	457	20
65	457	20	200	457	20.1
70	457	20.1	205	457	20.1
75	460	20.3	210	457	19.9
80	457	20.1	215	457	19.8
85	458	20	220	457	20
90	458	20.1	225	457	20
95	457	20	230	457	20.1
100	457	19.9	235	457	20.1
105	457	19.9	240	457	20.1
110	457	20			

A1.8 Initial Pressure.: 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	848	22.9	115	521	20
1	661	23.2	120	521	20
2	614	23	125	521	20.1
3	586	22.5	130	521	20.3
4	566	21.7	135	521	20.1
5	556	21.2	140	521	20.1
10	531	20	145	521	20.1
15	526	20.2	150	521	20.3
20	526	19.9	155	521	20.2
25	524	20.4	160	521	20.3
30	519	19.6	165	517	19.4
35	519	19.6	170	517	19.5
40	521	20	175	519	19.8
45	523	20.4	180	521	19.9
50	520	20.1	185	521	19.9
55	521	20	190	521	20.1
60	524	20.2	195	521	20.1
65	522	20.2	200	521	20.3
70	521	20	205	521	20
75	521	20.1	210	521	20
80	521	20.1	215	521	20
85	524	20.4	220	521	20.1
90	521	20.2	225	521	20
95	522	20.3	230	521	20.2
100	521	20	235	521	20.1
105	519	19.6	240	521	20
110	520	19.8			

A1.9 Initial Pressure.: 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	901	22.6	115	564	19.8
1	674	23.4	120	564	19.9
2	635	22.7	125	564	20
3	613	21.3	130	564	20
4	597	20.5	135	564	20.2
5	587	19.9	140	564	20.1
10	566	18.8	145	564	20
15	563	19	150	564	20
20	563	19.5	155	563	19.7
25	565	19.9	160	564	19.9
30	565	20	165	564	20.1
35	562	19.9	170	564	20
40	561	19.4	175	564	20.2
45	564	19.8	180	564	19.9
50	567	20.3	185	564	20
55	565	20	190	564	20
60	565	19.9	195	564	20.1
65	565	20.1	200	564	19.8
70	564	20	205	564	19.7
75	564	20	210	564	20
80	563	19.7	215	564	20.1
85	564	19.8	220	564	19.9
90	566	20.4	225	564	19.8
95	564	20	230	564	20
100	564	19.8	235	562	19.6
105	564	20.2	240	564	19.8
110	564	19.8			

A2 Condensate at 30 degree of Celsius

A2.1 Initial Pressure : 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	30.6	115	264	30
1	346	31.3	120	264	30
2	299	30.8	125	264	30
3	286	30.6	130	264	30
4	281	30.6	135	264	30
5	275	30.5	140	264	30
10	270	30.3	145	264	30
15	268	30.1	150	264	30.1
20	267	30.1	155	264	30.1
25	266	30.2	160	264	30.1
30	266	30.2	165	264	30.1
35	266	30.2	170	264	30.2
40	265	30	175	264	30.2
45	264	30	180	264	30
50	264	30	185	264	30
55	264	30	190	264	30
60	264	30	195	264	30
65	264	30.1	200	264	30
70	264	30.1	205	264	30
75	264	30.1	210	264	30
80	264	30.2	215	264	30
85	264	29.8	220	264	30
90	264	29.8	225	264	30
95	264	29.9	230	264	30
100	264	29.9	235	264	30
105	264	30	240	264	30
110	264	30			

A2.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	598	31.2	115	340	30
1	484	32.1	120	340	30.2
2	452	31.4	125	340	30.2
3	419	30.6	130	340	30.2
4	402	30.3	135	340	30
5	399	30.2	140	340	30
10	365	30.1	145	340	30
15	353	30	150	340	30
20	348	30	155	340	29.9
25	345	30.1	160	340	29.9
30	343	30.1	165	340	29.9
35	342	30.1	170	340	29.9
40	342	30.1	175	340	29.9
45	341	30	180	340	30
50	341	30	185	340	30
55	341	30	190	340	30
60	340	30	195	340	30
65	340	30	200	340	30
70	340	30	205	340	30
75	340	30	210	340	30
80	340	30	215	340	30
85	340	30	220	340	30
90	340	30.1	225	340	30
95	340	30	230	340	30
100	340	30	235	340	30
105	340	30	240	340	30
110	340	30			

A2.3 Initial Pressure : 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	651	31.1	115	368	30
1	546	32.4	120	368	30
2	508	31.9	125	368	30
3	486	31.6	130	368	30.1
4	466	31.4	135	368	30.1
5	451	31.2	140	368	30.1
10	419	31.1	145	368	30.2
15	381	31.3	150	368	30.2
20	386	31.4	155	368	30
25	383	31.3	160	368	30
30	380	31.3	165	368	30
35	362	30.2	170	368	30
40	362	30.1	175	368	30.1
45	368	29.4	180	368	30.1
50	368	30	185	368	30.1
55	369	30.2	190	368	29.8
60	368	30.2	195	368	29.8
65	368	30.1	200	368	29.9
70	368	30	205	368	29.9
75	368	30	210	368	29.9
80	368	30	215	368	30
85	368	30.1	220	368	30
90	368	30.1	225	368	30
95	368	30.2	230	368	30
100	368	30.2	235	368	30
105	368	30.1	240	368	30
110	368	30			

A2.4 Initial Pressure : 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	700	31.2	115	410	30
1	606	32	120	410	30
2	558	31.4	125	410	30
3	529	30.9	130	410	30.1
4	506	30.7	135	410	30.1
5	490	30.6	140	410	30.1
10	442	30.2	145	410	30
15	429	30.1	150	410	30
20	422	30.1	155	410	30
25	426	30	160	410	30
30	415	30	165	410	30
35	413	29.9	170	410	30.1
40	412	29.9	175	410	30.1
45	411	30	180	410	30.1
50	411	29.9	185	409	29.7
55	410	29.8	190	410	29.9
60	410	30	195	410	29.9
65	410	29.8	200	410	29.9
70	410	29.8	205	410	30
75	410	30	210	410	30
80	410	29.8	215	410	30
85	410	29.8	220	410	30
90	410	30	225	410	30
95	410	30	230	410	30
100	410	30	235	410	30
105	410	30	240	410	30
110	410	30			

A2.5 Initial Pressure : 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	749	31.1	115	446	30
1	611	31.7	120	446	30
2	567	31.2	125	446	29.9
3	529	30.3	130	446	29.9
4	513	30.1	135	446	29.9
5	503	30	140	446	29.9
10	473	30.1	145	446	29.9
15	459	30	150	446	29.9
20	453	30	155	446	29.9
25	449	30.1	160	446	29.9
30	448	30	165	446	30
35	447	30	170	446	30
40	446	30	175	446	30
45	446	30	180	446	30
50	445	29.9	185	446	30.1
55	446	29.9	190	446	30
60	445	29.9	195	446	30
65	445	29.8	200	446	29.8
70	446	29.8	205	446	29.9
75	446	29.9	210	446	30
80	446	30	215	446	30
85	446	30	220	446	30
90	446	30	225	446	30
95	446	30	230	446	30
100	446	30	235	446	30
105	446	30	240	446	30
110	446	30			

A2.6 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	800	31.3	115	473	30.1
1	667	31.9	120	473	30
2	607	31.5	125	473	30
3	567	31.4	130	473	30
4	542	31.1	135	473	30
5	525	30.7	140	473	30
10	493	30.5	145	473	30
15	493	30.2	150	473	30
20	477	30	155	472	30
25	475	29.8	160	473	30
30	476	30	165	473	30
35	476	30.1	170	473	30
40	475	30.1	175	473	30
45	475	30.1	180	473	30
50	473	30.1	185	473	30
55	473	30	190	474	30.1
60	474	30	195	474	30.1
65	473	30	200	473	30.1
70	474	30	205	473	30
75	473	30	210	473	30
80	473	30	215	473	30
85	473	30	220	473	30
90	473	30	225	473	30
95	473	30	230	473	30
100	473	30	235	473	30
105	473	30.1	240	473	30
110	473	30.1			

A2.7 Initial Pressure : 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	849	31.3	115	508	30.1
1	707	31.9	120	509	30
2	641	31.5	125	509	30
3	592	31.4	130	510	30
4	556	31.1	135	509	30
5	551	30.7	140	505	30
10	524	30.5	145	508	30
15	514	30.2	150	509	30
20	512	30	155	509	30
25	509	29.8	160	509	30
30	507	30	165	509	30
35	510	30.1	170	509	30
40	509	30.1	175	509	30
45	512	30.1	180	509	30
50	510	30.1	185	509	30
55	511	30	190	509	30.1
60	509	30	195	509	30.1
65	509	30	200	509	30.1
70	508	30	205	509	30
75	507	30	210	509	30
80	508	30	215	509	30
85	509	30	220	509	30
90	509	30	225	509	30
95	509	30	230	509	30
100	509	30	235	509	30
105	509	30.1	240	509	30
110	507	30.1			

A2.8 Initial Pressure : 875 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	875	32	115	547	30
1	696	31.8	120	547	30
2	636	31.3	125	547	29.9
3	597	30.6	130	547	30
4	576	30.2	135	551	30.2
5	570	30.2	140	547	30
10	549	30.1	145	547	30
15	541	30.1	150	547	30
20	538	30	155	547	30
25	537	29.9	160	547	29.9
30	537	29.9	165	547	30
35	538	29.9	170	547	30
40	539	29.9	175	547	30
45	540	29.9	180	547	30
50	544	30	185	547	30
55	545	30	190	547	30.1
60	545	29.9	195	547	30.1
65	547	30	200	547	30.1
70	547	30	205	547	30
75	547	30	210	547	29.9
80	547	30	215	547	30
85	546	30.1	220	547	30
90	546	30.1	250	547	30
95	547	30.1	230	547	30
100	548	30.1	235	547	30
105	547	30.1	240	547	30
110	547	30			

A2.9 Initial Pressure : 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	897	31.3	115	553	30
1	754	32.1	120	552	30
2	688	32.2	125	552	30.1
3	647	32.3	130	552	30.1
4	617	31.8	135	552	30
5	602	31.4	140	552	29.9
10	570	30.3	145	552	29.9
15	562	30.3	150	552	29.9
20	557	30.2	155	552	30
25	555	30.2	160	552	30
30	554	30.2	165	552	30
35	552	30.1	170	552	30.1
40	552	30	175	552	30.1
45	551	30	180	552	30.1
50	551	30	185	552	30
55	551	30.1	190	552	30
60	552	30.1	195	552	30
65	552	30.1	200	552	30
70	552	30.1	205	552	30
75	552	30.1	210	552	30
80	553	30.1	215	552	30
85	551	30	220	552	30
90	550	29.8	225	552	30
95	552	30	230	552	30
100	552	30	235	552	30
105	553	30	240	552	30
110	553	30			

A3 Oil sample at 20 degree of Celsius

A3.1 Initial Pressure.: 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	21	115	245	19.8
1	399	21.5	120	245	19.9
2	365	20.8	125	245	20
3	341	20.3	130	245	20
4	321	19.9	135	245	20.2
5	309	19.6	140	245	20.1
10	272	19.3	145	245	20
15	258	19.6	150	245	20
20	252	20.1	155	243	19.7
25	251	20.3	160	245	19.9
30	248	20.4	165	245	20.1
35	247	20.2	170	245	20.1
40	246	20.1	175	246	20.2
45	245	20	180	245	19.9
50	245	20.1	185	245	20
55	243	20.3	190	245	20.1
60	245	20.2	195	245	20.1
65	244	19.7	200	245	19.8
70	243	19.5	205	244	19.6
75	244	19.7	210	245	19.9
80	245	20	215	245	20
85	245	20.2	220	245	19.9
90	245	20.1	225	245	20.1
95	245	20	230	245	20.2
100	245	19.8	235	242	19.6
105	245	20.2	240	245	20
110	244	19.8			

A3.2 Initial Pressure.: 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	604	21.5	115	311	20.3
1	473	22.2	120	309	20
2	430	21.5	125	309	19.8
3	400	20.8	130	309	20.2
4	380	20.4	135	308	19.8
5	366	20.1	140	309	20
10	333	19.7	145	310	20.3
15	321	19.8	150	309	19.8
20	317	20.2	155	309	20
25	312	20.2	160	309	20.2
30	311	20.1	165	309	20.1
35	311	20.3	170	309	19.9
40	309	20.2	175	309	19.8
45	308	19.9	180	309	20
50	309	19.9	185	305	19.6
55	310	20.2	190	307	19.8
60	311	20.5	195	309	20.1
65	309	20.5	200	310	20.3
70	308	19.9	205	309	19.9
75	308	19.8	210	309	20.1
80	309	20	215	309	19.9
85	309	20.1	220	309	20
90	309	20	225	309	20.3
95	309	19.9	230	309	20
100	309	20	235	309	20.4
105	309	19.9	240	309	20.2
110	309	20.1			

A3.3 Initial Pressure.: 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	650	21.1	115	327	20.1
1	494	21.6	120	327	20.2
2	448	21.2	125	324	19.6
3	415	20.7	130	326	20
4	395	20.4	135	327	20.1
5	382	20.1	140	327	20
10	349	19.8	145	327	19.8
15	339	19.9	150	327	20.2
20	336	20.1	155	323	19.6
25	324	20.3	160	325	20.1
30	326	19.5	165	327	20
35	324	19.2	170	327	19.8
40	325	19.5	175	327	20.2
45	326	19.7	180	327	19.8
50	327	20	185	324	19.5
55	328	20.2	190	327	20.3
60	327	20.2	195	327	20.2
65	327	20	200	327	20.3
70	328	20.2	205	327	20.2
75	327	19.9	210	327	20
80	327	19.9	215	327	19.9
85	327	20	220	327	19.8
90	328	20.2	225	327	20.1
95	326	19.8	230	327	20.2
100	327	20.1	235	327	20
105	327	20	240	327	20
110	327	20			

A3.4 Initial Pressure.: 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	700	21	115	371	19.8
1	544	21.4	120	371	20.1
2	499	20.7	125	371	20.3
3	458	20.1	130	371	19.9
4	433	19.7	135	370	19.7
5	418	19.4	140	371	19.9
10	387	19.1	145	371	20.1
15	379	19.3	150	371	19.8
20	378	19.6	155	371	20.2
25	375	19.8	160	371	20
30	375	20.2	165	371	20.1
35	373	20.2	170	373	20.4
40	372	19.9	175	372	20.4
45	371	20	180	371	20.1
50	372	20.1	185	369	19.7
55	373	20.3	190	371	20
60	371	19.9	195	371	20
65	371	19.8	200	371	20
70	371	19.8	205	372	20.3
75	372	20	210	371	20.2
80	371	20.1	215	371	20
85	371	20.1	220	371	19.9
90	371	19.9	225	371	19.9
95	371	20.2	230	371	20
100	368	19.5	235	371	19.9
105	370	19.8	240	371	19.8
110	371	20.1			

A3.5 Initial Pressure.: 725 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	726	21.4	115	384	20
1	563	22.1	120	384	20
2	503	21.6	125	384	20.2
3	468	21.4	130	384	20.2
4	442	21.1	135	384	20.1
5	435	20.8	140	383	19.8
10	400	20.3	145	384	19.8
15	392	20.1	150	384	19.9
20	388	20.1	155	384	20.1
25	387	20	160	384	20.1
30	386	20.2	165	385	20.3
35	386	20.2	170	384	20.1
40	385	20.1	175	384	20
45	385	19.9	180	384	19.9
50	385	20.1	185	384	19.9
55	384	20.2	190	384	20
60	384	19.9	195	384	20
65	385	20.1	200	384	20.1
70	386	20.4	205	387	20.4
75	384	20	210	385	20.4
80	384	20.1	215	384	20.2
85	385	20.4	220	384	20
90	384	20.1	225	384	20
95	384	19.9	230	384	19.9
100	383	19.7	235	384	20
105	384	20	240	384	19.8
110	384	20			

A3.6 Initial Pressure.: 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	752	20.6	115	414	20
1	582	21.2	120	414	20
2	532	20.6	125	416	20.4
3	474	20	130	413	19.7
4	455	19.7	135	414	19.8
5	442	19.4	140	414	20.1
10	419	18.8	145	414	19.9
15	414	19.1	150	414	20
20	414	19.5	155	414	20.2
25	415	19.9	160	414	20.2
30	416	20.2	165	414	20.2
35	415	20.2	170	414	19.9
40	415	20.1	175	414	19.8
45	416	20.3	180	415	20.3
50	414	20	185	414	20
55	415	20	190	414	19.9
60	416	20.2	195	414	19.9
65	415	20.1	200	414	20.3
70	414	20	205	414	20
75	414	19.9	210	414	20.2
80	414	20	215	413	19.7
85	414	20	220	414	19.9
90	414	20	225	414	20.1
95	414	20.2	230	414	20.1
100	414	20.2	235	414	20.3
105	411	20	240	414	20
110	413	19.9			

A3.7 Initial Pressure.: 800 psi

Time	Pressure	Temperature	125	444	20
0	800	21.6	130	443	19.8
1	609	22.5	135	444	19.9
2	548	22.5	140	444	20.1
3	515	22.1	145	444	20.1
4	494	21.8	150	444	20
5	483	21.5	155	444	20.2
10	458	20.7	160	445	20.3
15	453	20.6	165	445	20.1
20	445	20.1	170	444	20.1
25	445	20	175	444	20
30	444	20.2	180	444	20
35	442	19.7	185	444	20
40	444	19.9	190	444	20.2
45	445	20.3	195	444	20.2
50	444	20.2	200	444	19.8
55	443	20	205	441	19.7
60	445	20.1	210	443	19.9
65	443	20.1	215	444	20
70	444	20	220	444	20
75	445	20.2	225	444	20.1
80	444	20.1	230	445	20.3
85	444	20	235	444	20
90	444	19.9	240	444	20
95	444	19.9			
100	444	19.9			
105	444	20			
110	444	20.2			
115	445	20.3			
120	444	20			

A3.8 Initial Pressure.: 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	851	21.3	115	492	20.4
1	659	24.3	120	490	20.1
2	598	24.5	125	490	20
3	562	23.8	130	490	19.9
4	543	23.1	135	489	19.7
5	525	22.2	140	490	19.9
10	496	19.8	145	490	20
15	492	19.7	150	490	20
20	492	20	155	490	20.1
25	490	19.9	160	490	20
30	491	20	165	490	20.1
35	490	20.2	170	490	20.2
40	490	20	175	490	20
45	491	20.2	180	490	20
50	491	20.2	185	490	19.9
55	492	20.4	190	491	20.2
60	490	20	195	490	20.1
65	490	20.1	200	490	20
70	489	19.8	205	490	20
75	490	20	210	490	19.9
80	490	20.1	215	490	19.9
85	490	20.1	220	490	20.1
90	490	20	225	490	20
95	490	20.1	230	490	20.2
100	490	19.9	235	489	19.8
105	490	20.1	240	490	20
110	490	20.2			

A3.9 Initial Pressure.: 900 psi

Time	Pressure	Temperature			
			125	537	20.3
0	900	21.8	130	536	20.1
1	650	24.1	135	536	20
2	607	23.2	140	536	20.1
3	682	21.6	145	535	19.9
4	563	20.6	150	536	20
5	549	19.6	155	536	19.8
10	536	18.7	160	536	20.1
15	531	19.7	165	536	20.2
20	533	19.7	170	536	20.2
25	536	20.1	175	536	20.2
30	534	20.1	180	536	20.1
35	534	19.7	185	536	20
40	536	20	190	536	20
45	537	20.4	195	538	20.3
50	536	20.1	200	535	19.6
55	536	20	205	536	19.8
60	538	20.2	210	536	20
65	536	20.1	215	536	20
70	536	19.8	220	536	20.1
75	536	20	225	536	20
80	535	19.6	230	535	19.8
85	536	19.7	235	536	19.9
90	536	19.9	240	536	20
95	536	19.9			
100	534	20.2			
105	535	19.8			
110	536	20			
115	536	20			
120	539	20.4			

A4 Oil sample at 30 degree of Celsius (Experiment 1)

A4.1 Initial Pressure : 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	30.7	115	272	30.1
1	343	31.3	120	272	30
2	310	31.3	125	272	30
3	295	31	130	272	30
4	289	30.8	135	272	29.9
5	286	30.5	140	272	29.9
10	282	30	145	270	29.7
15	279	30.1	150	272	29.9
20	277	30.1	155	274	30.4
25	274	30	160	273	30.3
30	272	29.8	165	272	30.1
35	272	29.6	170	272	30.1
40	273	29.8	175	272	30.1
45	275	30.3	180	272	29.9
50	275	30.3	185	272	30
55	273	30.2	190	272	30
60	272	30.2	195	272	30
65	272	30.1	200	273	30.2
70	272	30	205	272	30.1
75	272	30	210	272	30
80	273	30.2	215	272	30
85	272	30	220	272	30.1
90	272	29.9	225	272	29.9
95	271	29.8	230	271	29.8
100	273	30.2	235	272	29.8
105	272	30.2	240	272	30
110	272	30.2			

A4.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	125	320	30
0	602	30.7	130	320	30
1	493	31.6	135	321	30
2	447	31.5	140	321	30.2
3	415	31.1	145	322	30.3
4	394	30.9	150	320	30.1
5	377	30.6	155	320	29.9
10	336	30.4	160	320	29.9
15	324	29.8	165	320	30
20	323	29.9	170	320	30.1
25	322	30.1	175	321	30.2
30	322	30.1	180	320	30
35	321	30.1	185	320	30
40	320	30.1	190	320	29.9
45	319	30	195	319	29.9
50	319	29.8	200	318	29.7
55	319	29.7	205	320	29.9
60	322	30.3	210	320	30
65	320	30	215	320	30
70	320	30.1	220	320	30
75	322	30	225	320	30.1
80	320	30.3	230	320	30.1
85	320	30	235	321	30.3
90	320	30	240	320	30.1
95	320	29.9			
100	319	29.8			
105	319	29.8			
110	320	30.1			
115	320	30.1			
120	320	30			

A4.3 Initial Pressure : 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	650	30.5	115	364	30.1
1	522	31.3	120	364	30
2	472	31	125	365	30
3	441	30.7	130	365	30.2
4	419	30.3	135	364	30.2
5	406	30.1	140	364	29.9
10	379	30.2	145	364	30
15	369	30.3	150	364	29.9
20	362	29.9	155	361	29.7
25	361	29.9	160	363	29.9
30	364	30.5	165	364	30
35	360	29.9	170	364	30.1
40	361	30	175	364	30
45	364	30.1	180	364	29.9
50	363	30	185	364	30
55	364	30	190	364	30
60	364	30	195	364	23.1
65	364	29.8	200	364	30.2
70	365	30.2	205	367	30.3
75	364	30	210	366	30
80	364	30.1	215	365	29.8
85	364	29.9	220	364	29.8
90	364	30	225	364	29.9
95	364	90	230	364	29.8
100	364	30.1	235	364	30
105	364	29.9	240	364	30
110	364	30			

A4.4 Initial Pressure : 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	700	30.5	115	394	29.7
1	565	31.1	120	394	29.7
2	517	30.7	125	396	30
3	486	30.3	130	396	30.2
4	465	30	135	396	30.1
5	453	30	140	396	30
10	420	29.9	145	395	29.8
15	407	29.7	150	396	29.8
20	402	29.6	155	396	30
25	401	30	160	396	30.1
30	400	30.3	165	396	30.1
35	398	30.3	170	402	30.5
40	396	30	175	399	30.3
45	394	29.8	180	397	30.3
50	396	30.1	185	396	30.2
55	396	30	190	394	29.8
60	396	30	195	395	29.9
65	395	29.8	200	396	30
70	396	29.8	205	396	30.2
75	396	30	210	396	30.2
80	396	30.1	215	396	30
85	397	30.4	220	396	29.7
90	396	30.3	225	394	29.6
95	397	30.3	230	395	29.8
100	396	30	235	396	30
105	396	30	240	396	30.1
110	395	29.9			

A4.5 Initial Pressure : 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	750	30.6	115	410	30
1	593	32	120	410	30
2	535	31.7	125	410	29.9
3	497	31.5	130	410	30
4	476	31.6	135	411	30.1
5	459	31.3	140	410	30
10	426	30	145	410	30
15	415	30.1	150	412	30.2
20	415	30	155	409	29.9
25	417	30.2	160	407	29.7
30	414	29.9	165	408	29.7
35	413	30	170	409	29.9
40	412	30	175	410	29.9
45	411	30	180	411	30.2
50	411	30	185	410	30.2
55	410	30	190	410	30.2
60	409	29.9	195	410	30
65	410	30	200	410	30
70	410	30.1	205	410	29.9
75	410	30	210	410	30
80	410	30	215	411	30.1
85	411	30.2	220	410	30.1
90	410	30.1	225	410	30
95	410	30.1	230	410	30.2
100	410	30.2	235	410	30.1
105	411	30.3	240	410	30
110	411	30.2			

A4.6 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	799	30.6	115	450	30
1	639	32.3	120	450	29.9
2	578	32.5	125	449	29.9
3	543	32.9	130	446	29.7
4	518	32.8	135	447	29.8
5	502	32.6	140	450	30.2
10	466	31.2	145	449	30
15	455	30.1	150	449	30
20	455	30.3	155	449	30
25	452	29.8	160	449	30.1
30	451	29.8	165	450	30.2
35	450	30.1	170	452	30.4
40	451	30.2	175	450	30.3
45	559	30.1	180	449	30
50	449	30.1	185	449	29.9
55	450	30.1	190	449	29.9
60	449	30	195	449	30.3
65	448	29.9	200	449	30.2
70	448	29.8	205	450	30.3
75	450	29.9	210	449	30.1
80	451	30	215	449	30
85	450	30	220	449	30
90	450	30.1	225	449	30
95	451	30.2	230	449	30.1
100	450	30.2	235	449	29.9
105	450	30	240	449	29.9
110	449	29.9			

A4.7 Initial Pressure : 825 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	825	31.2	115	481	30
1	623	30	120	482	30.2
2	579	32.1	125	482	30.2
3	543	31.6	130	481	30.1
4	520	31	135	481	30
5	505	30.5	140	481	30.1
10	492	30.4	145	481	30
15	485	29.8	150	481	30.1
20	483	29.9	155	481	30.1
25	482	30.1	160	482	30.2
30	481	30	165	484	30.3
35	479	30	170	480	29.8
40	479	29.7	175	481	29.8
45	481	30.1	180	481	30
50	481	30	185	481	30
55	481	29.9	190	481	29.9
60	482	30.2	195	481	30.1
65	480	30	200	478	29.7
70	481	30	205	480	30
75	481	30.1	210	481	30.1
80	480	29.9	215	481	30.1
85	481	30.1	220	481	30.1
90	481	30	225	483	30.3
95	481	29.8	230	479	29.8
100	480	29.8	235	480	29.8
105	481	30	240	481	30
110	481	29.9			

A4.8 Initial Pressure : 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	851	30.9	115	495	30
1	664	32.1	120	495	30
2	605	32.4	125	495	30.1
3	565	32	130	495	30
4	541	31.4	135	495	30
5	524	31	140	495	30.1
10	506	30.4	145	495	30
15	497	29.7	150	494	29.9
20	499	30.2	155	492	29.7
25	495	29.7	160	497	30.4
30	498	30.1	165	493	29.8
35	495	30	170	494	29.8
40	495	30.2	175	495	29.9
45	496	30.2	180	495	30
50	495	30.1	185	496	30.2
55	495	30	190	495	30.2
60	494	29.9	195	495	30.1
65	495	30	200	497	30.3
70	497	30.4	205	494	29.8
75	495	30.1	210	495	30
80	495	30.1	215	495	30
85	495	29.8	220	495	29.9
90	495	30	225	495	30
95	497	30.3	230	495	29.8
100	496	30.1	235	495	30
105	495	30	240	495	30.1
110	495	30.1			

A4.9 Initial Pressure : 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	902	31.4	115	538	29.8
1	765	35.8	120	539	30
2	771	37.5	125	539	30
3	640	37	130	542	30.4
4	613	35.9	135	541	30.4
5	593	34.8	140	539	30.1
10	552	31	145	539	30
15	545	30.3	150	538	29.8
20	542	30.1	155	539	30.1
25	540	30	160	538	29.9
30	539	30	165	539	30
35	539	30	170	539	30
40	537	29.7	175	539	30.1
45	540	29.9	180	539	30.2
50	539	30.1	185	538	30.1
55	539	30	190	539	30.1
60	539	30.1	195	539	30
65	540	30.2	200	539	29.9
70	539	30	205	538	29.8
75	538	30	210	539	30
80	539	29.9	215	539	30.1
85	538	29.8	220	539	30
90	539	30	225	537	29.6
95	539	30	230	538	29.9
100	539	30.1	235	539	30
105	539	29.7	240	539	30.1
110	539	30			

A5 CO₂ injection with 1 %N₂ at 20 degree of Celsius

A5.1 Initial Pressure : 500 psi

Time	Pressure	Temperature			
0	500	20.8	125	267	19.7
1	402	20.9	130	266	19.6
2	365	19.9	135	268	19.8
3	342	19.2	140	269	20
4	324	18.6	145	269	20.1
5	312	19.2	150	269	20.1
10	279	19.7	155	270	20.3
15	275	20	160	269	20.3
20	273	20.1	165	269	20
25	271	19.7	170	268	20.1
30	272	20.2	175	269	20
35	272	20.2	180	269	19.9
40	270	20	185	269	20.2
45	269	20	190	269	20.2
50	270	20.1	195	269	20.1
55	269	19.8	200	269	19.8
60	270	20	205	269	19.6
65	269	20.1	210	271	20.4
70	271	20.1	215	271	20.3
75	271	20.3	220	269	19.9
80	270	20.2	225	269	19.8
85	269	19.9	230	269	20
90	269	19.9	235	269	20.1
95	267	19.6	240	269	20.2
100	270	19.8			
105	269	19.9			
110	269	20			
115	268	20			
120	269	20.1			

A5.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	600	21.3	115	314	19.9
1	479	22.1	120	314	20
2	430	21	125	315	19.8
3	397	20.3	130	315	20.2
4	377	19.7	135	314	20
5	364	19.4	140	314	20
10	337	19.7	145	312	19.7
15	329	19.9	150	313	19.8
20	322	20.3	155	313	20.1
25	317	19.7	160	314	20.2
30	317	19.8	165	315	20.4
35	317	20.3	170	314	20.1
40	315	20.1	175	314	20
45	315	20.1	180	314	20
50	316	20.3	185	314	19.9
55	314	20.2	190	314	19.8
60	313	19.8	195	314	20.1
65	314	19.9	200	313	19.6
70	314	20	205	314	20.1
75	314	20	210	314	20
80	312	19.7	215	314	19.9
85	313	20.1	220	315	20.3
90	314	20.2	225	314	20.3
95	315	20.2	230	314	20
100	316	20.4	235	314	20
105	314	20	240	314	20
110	314	19.9			

A5.3 Initial Pressure : 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	650	22	115	336	19.5
1	504	21.7	120	337	19.7
2	470	21	125	338	20
3	435	20.1	130	338	20
4	414	19.6	135	338	20.2
5	397	19.2	140	338	20.3
10	364	20.3	145	338	20.4
15	353	20.2	150	338	20
20	349	20	155	338	19.9
25	344	20	160	337	19.9
30	343	20	165	338	20
35	340	20.3	170	338	20.1
40	338	19.7	175	340	20.1
45	338	19.9	180	339	19.8
50	339	20	185	339	19.5
55	339	20.1	190	338	20.3
60	338	20.2	195	338	20.2
65	337	19.8	200	338	20.3
70	338	19.9	205	337	19.6
75	338	19.9	210	338	19.8
80	339	20.3	215	338	20
85	338	20.1	220	338	20.1
90	338	20.1	225	338	20.1
95	339	20.4	230	338	20.2
100	337	20.2	235	338	19.9
105	338	20	240	338	19.9
110	338	20			

A5.4 Initial Pressure : 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	701	22.2	115	379	20.2
1	546	22.6	120	377	20
2	494	21.4	125	378	20
3	457	20.7	130	380	20.2
4	437	20.1	135	381	20.4
5	423	19.9	140	379	20.3
10	394	19.4	145	379	20.1
15	382	19.7	150	378	19.8
20	381	20.2	155	379	20.1
25	380	20.4	160	379	20
30	377	20	165	379	20.2
35	377	20	170	379	20.2
40	379	20.2	175	379	20.1
45	377	20.1	180	377	19.6
50	379	20	185	379	19.8
55	381	20.2	190	379	20
60	379	20	195	379	20.1
65	379	19.9	200	379	20
70	379	20.1	205	378	19.9
75	382	20.3	210	379	20.1
80	380	20.1	215	379	20
85	379	20	220	380	20.3
90	379	20	225	379	20.3
95	377	19.7	230	379	20.1
100	379	19.8	235	379	19.9
105	378	19.8	240	379	19.8
110	379	20.1			

A5.5 Initial Pressure : 725 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	725	22.4	115	401	20.2
1	572	22.6	120	399	20.2
2	519	21.7	125	397	19.5
3	482	21.1	130	398	19.7
4	457	20.6	135	399	20
5	443	20.3	140	398	19.8
10	417	19.9	145	400	20.2
15	400	19.9	150	399	20.1
20	401	20.2	155	399	20.1
25	396	19.9	160	399	20.1
30	398	19.9	165	399	19.9
35	400	20	170	401	20.4
40	398	19.9	175	399	20.2
45	398	19.8	180	399	19.9
50	399	20	185	399	20
55	399	20.1	190	400	20.3
60	401	20.2	195	399	20.3
65	401	20.4	200	399	20.1
70	399	20	205	399	20
75	397	19.8	210	397	19.9
80	399	20	215	398	19.8
85	399	20.1	220	399	20
90	397	19.9	225	399	20.1
95	399	20.1	230	399	19.9
100	400	20.3	235	399	20.2
105	399	20.2	240	399	20.2
110	399	20			

A5.6 Initial Pressure : 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	750	22.4	115	412	20
1	587	22.3	120	412	20.1
2	528	21.5	125	415	20.4
3	493	20.9	130	413	20.2
4	472	20.5	135	411	19.8
5	457	20.2	140	412	20
10	410	19.4	145	412	19.9
15	409	19.4	150	412	19.9
20	410	19.6	155	412	20.1
25	412	20	160	412	20
30	415	20.3	165	411	19.8
35	410	19.8	170	412	19.9
40	411	19.8	175	412	19.9
45	412	20	180	412	20.1
50	416	20.2	185	412	20
55	411	20	190	412	20.3
60	412	20.1	195	413	20.4
65	409	19.8	200	412	20.3
70	410	19.8	205	412	20
75	411	20	210	412	20
80	412	20	215	412	19.7
85	412	20.2	220	412	19.9
90	412	20.3	225	412	20
95	413	20.1	230	412	20.1
100	412	19.9	235	412	20.1
105	412	20	240	412	19.9
110	411	19.9			

A5.7 Initial Pressure : 775 psi

Time	Pressure	Temperature			
			125	445	20.4
0	773	21.9	130	444	20.2
1	593	22.5	135	447	20.4
2	532	22.1	140	446	20.4
3	497	21.6	145	444	19.9
4	476	21.1	150	443	19.8
5	460	20.8	155	444	19.8
10	434	19.5	160	444	19.8
15	431	19.3	165	444	20
20	433	19.5	170	444	20.1
25	436	19.9	175	443	19.8
30	437	20.1	180	444	20.1
35	433	19.4	185	444	20.1
40	435	19.6	190	444	20.2
45	438	19.7	195	444	20
50	442	20	200	444	19.9
55	444	20.3	205	444	20
60	444	20	210	445	20.2
65	448	19.8	215	444	20.1
70	446	20.1	220	444	20.2
75	448	20.3	225	444	19.9
80	446	20.2	230	444	20.1
85	444	20	235	444	20
90	444	20	240	444	19.8
95	445	20.1			
100	441	19.8			
105	446	20.3			
110	444	20.1			
115	444	20.2			
120	444	20.1			

A5.8 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	800	21.9	115	466	19.7
1	605	22.3	120	466	20
2	550	21.8	125	466	20.1
3	519	21.2	130	466	20.3
4	501	20.7	135	466	20.4
5	490	20.4	140	466	20.2
10	464	19.7	145	466	20.1
15	463	19.8	150	466	20.1
20	467	20.1	155	466	20.5
25	467	20.1	160	466	20.3
30	463	19.3	165	466	20.1
35	462	19.3	170	466	19.8
40	465	19.8	175	466	20
45	466	20.2	180	466	20.1
50	465	19.8	185	466	20
55	466	20	190	466	19.8
60	466	20.1	195	466	20
65	466	20.3	200	466	20
70	466	20.3	205	466	20.1
75	466	20.2	210	466	20.2
80	466	19.9	215	466	20.4
85	466	19.9	220	466	20
90	466	19.9	225	466	20.1
95	466	20.2	230	466	20.1
100	466	20.1	235	466	20.2
105	466	19.9	240	466	20
110	466	19.5			

A5.9 Initial Pressure : 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	848	22.8	115	501	20
1	635	23.4	120	501	20
2	581	23	125	500	19.8
3	548	22.4	130	503	20.4
4	523	21.7	135	502	20.2
5	509	20.7	140	501	19.9
10	497	19.3	145	501	19.9
15	500	20.7	150	501	20
20	497	19.7	155	501	20.1
25	498	19.9	160	499	20
30	499	20.1	165	501	20.1
35	497	20	170	501	20.2
40	498	20.2	175	498	19.8
45	497	19.8	180	500	19.9
50	501	20	185	501	19.9
55	500	20.3	190	501	20.2
60	500	19.9	195	500	20.1
65	501	20.2	200	501	19.9
70	502	20.3	205	501	20
75	501	20	210	502	20.3
80	500	19.7	215	501	20.1
85	499	19.7	220	501	20
90	501	19.8	225	501	20
95	501	20	230	501	20.2
100	501	19.9	235	501	19.8
105	502	20.1	240	501	20
110	501	20.1			

A5.10 Initial Pressure : 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	900	23.3	115	548	19.7
1	684	25	120	549	19.7
2	632	24.5	125	550	20.3
3	600	22.9	130	551	20.4
4	582	21.8	135	551	20.3
5	573	21.1	140	549	20.1
10	553	19.4	145	549	19.9
15	548	19.6	150	550	20.1
20	549	20	155	549	20.1
25	547	20.1	160	549	20
30	546	19.7	165	546	19.6
35	548	20	170	547	19.8
40	548	20	175	548	20
45	549	19.9	180	549	20
50	549	20.1	185	549	20.1
55	548	19.9	190	549	20
60	551	20.2	195	549	20.2
65	549	19.9	200	553	20.5
70	548	19.8	205	550	20.3
75	549	20.1	210	549	20
80	549	20	215	549	20.1
85	551	20.5	220	548	20.1
90	551	20.4	225	549	19.9
95	550	20.2	230	549	20
100	549	19.9	235	549	19.8
105	549	19.9	240	549	20
110	549	20			

A6 CO₂ injection with 1 %N₂ at 30 degree of Celsius

A6.1 Initial Pressure : 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	503	30.3	115	281	30.2
1	345	31.3	120	281	30.1
2	305	31.2	125	281	30.1
3	294	30.9	130	280	29.8
4	290	30.6	135	281	29.9
5	286	30.4	140	281	29.9
10	284	30.4	145	281	30.1
15	280	29.8	150	281	30.1
20	281	30	155	281	30
25	282	30.1	160	281	30
30	281	30.2	165	281	30
35	281	30.1	170	281	30
40	281	30.1	175	281	30.1
45	281	30	180	282	30.2
50	281	30	185	281	30.2
55	282	30	190	281	30
60	281	30.1	195	281	30.1
65	281	30.1	200	281	30.1
70	281	30	205	281	30.1
75	281	30	210	280	29.8
80	281	30	215	281	30
85	282	30.1	220	281	30
90	280	29.9	225	281	30.1
95	281	30.1	230	281	30.1
100	281	30	235	281	30
105	281	30	240	281	30.1
110	281	30			

A6.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	604	31.4	115	338	30.1
1	497	32.9	120	338	30.1
2	455	32.8	125	338	30
3	417	32.3	130	338	30
4	377	31.8	135	338	30
5	358	31.4	140	338	30
10	344	30.9	145	338	30
15	337	29.9	150	338	29.9
20	337	30.2	155	336	29.7
25	334	29.9	160	337	29.9
30	334	29.9	165	338	29.9
35	336	30	170	338	29.9
40	335	29.9	175	338	30.1
45	338	30	180	338	30.1
50	337	29.9	185	338	30
55	338	29.9	190	338	30
60	338	30.2	195	338	29.9
65	338	30	200	338	30.1
70	338	30.1	205	338	30.1
75	338	30	210	338	30.1
80	338	30	215	338	30.2
85	338	29.9	220	338	30
90	338	29.9	225	338	30
95	338	30	230	338	30.1
100	338	30	235	338	30
105	338	30.1	240	338	30
110	338	30.1			

A6.3 Initial Pressure : 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	646	29	115	369	30
1	639	30.4	120	369	29.9
2	492	30.4	125	368	29.7
3	463	30	130	369	29.8
4	443	29.7	135	369	29.8
5	429	29.5	140	369	30
10	380	30.8	145	369	30
15	371	30.1	150	369	30.1
20	370	30.2	155	370	30.2
25	369	30.1	160	369	30.1
30	369	30.1	165	369	29.9
35	369	30	170	369	30
40	369	29.9	175	369	29.9
45	369	30	180	369	30.2
50	369	29.9	185	369	30.1
55	370	30.1	190	369	30.2
60	369	30	195	369	30.1
65	369	30	200	369	30
70	369	30.1	205	369	30
75	369	30	210	369	29.9
80	369	30	215	369	29.9
85	369	30.1	220	369	29.8
90	369	30.1	225	369	29.9
95	369	30.1	230	369	30
100	369	30	235	369	30.1
105	369	30	240	369	30
110	369	30			

A6.4 Initial Pressure : 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	704	31.2	115	402	30.1
1	584	33	120	402	30.1
2	527	33.3	125	402	30
3	502	32.9	130	402	30
4	462	32.4	135	402	30
5	442	31.7	140	402	29.9
10	410	30.3	145	402	30.2
15	400	29.9	150	402	30.2
20	399	30.1	155	402	29.9
25	402	30.2	160	402	30
30	401	30.1	165	402	30
35	400	30	170	402	29.8
40	399	29.9	175	403	30.2
45	398	29.7	180	402	30.2
50	400	29.7	185	402	30.1
55	402	30	190	402	30.1
60	402	30	195	402	30.1
65	402	30	200	402	30
70	402	29.9	205	402	30
75	402	29.9	210	402	30
80	402	30	215	402	29.9
85	402	30.1	220	402	30
90	402	30.1	225	402	29.9
95	402	30	230	402	29.9
100	402	30	235	402	29.9
105	402	30	240	402	30.1
110	402	29.9			

A6.5 Initial Pressure : 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	756	31.3	115	447	30.1
1	612	30.5	120	447	29.9
2	559	32.2	125	447	30
3	514	32	130	447	30
4	493	31.5	135	447	30
5	479	31	140	447	29.9
10	458	30.4	145	445	29.7
15	449	30	150	446	29.7
20	446	30.2	155	447	29.9
25	446	29.9	160	447	30.1
30	446	29.9	165	447	30.1
35	447	29.7	170	447	30
40	447	30	175	447	30
45	447	29.9	180	447	29.9
50	448	30	185	447	30
55	447	30.3	190	448	30.3
60	447	30	195	447	30.1
65	447	30	200	447	30
70	447	30.1	205	447	30.2
75	447	30.2	210	447	30.2
80	447	30	215	447	30.1
85	447	29.9	220	447	30
90	447	29.9	225	447	29.9
95	448	29.9	230	447	29.9
100	447	30.1	235	447	30.1
105	447	30	240	447	30
110	447	30			

A6.6 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	800	31	115	475	30
1	648	32.6	120	475	29.9
2	585	32.7	125	475	30.1
3	537	32.6	130	475	30.1
4	511	31.9	135	475	29.9
5	492	31.3	140	475	30
10	476	30.2	145	475	30
15	467	29.8	150	475	30
20	471	29.9	155	473	29.7
25	471	30.1	160	474	29.8
30	471	30.1	165	475	30
35	471	30.1	170	475	30
40	471	29.9	175	475	30.1
45	471	29.7	180	475	30
50	475	30	185	475	29.9
55	475	30.1	190	475	30
60	474	29.8	195	475	30
65	475	29.9	200	475	30.1
70	475	29.9	205	475	30.1
75	476	30.2	210	475	30.1
80	475	30.1	215	475	30.2
85	475	30.1	220	475	29.9
90	475	30	225	475	29.9
95	475	29.9	230	475	29.8
100	475	30.1	235	475	30
105	475	30.1	240	475	30
110	475	30			

A6.7 Initial Pressure : 825 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	825	30.7	115	494	30.1
1	675	32.2	120	494	30.1
2	605	32.8	125	494	30.1
3	564	32.4	130	494	30
4	539	31.8	135	494	29.9
5	521	31.2	140	494	29.8
10	500	30.3	145	494	29.9
15	494	30.1	150	494	30
20	493	30.2	155	492	29.7
25	493	30.2	160	493	29.9
30	491	29.9	165	494	30.1
35	491	29.8	170	494	30.1
40	493	29.8	175	494	30
45	494	30.2	180	494	30
50	495	30	185	494	29.9
55	494	30	190	494	30.1
60	493	29.7	195	495	30.2
65	494	29.8	200	494	30
70	494	29.8	205	494	30.1
75	493	29.7	210	494	30.1
80	495	30.1	215	494	30
85	494	30.1	220	494	29.9
90	494	30	225	494	29.9
95	494	30	230	494	30
100	495	30.1	235	494	30
105	494	30	240	494	30.1
110	494	30			

A6.8 Initial Pressure : 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	850	31.6	115	495	30
1	699	33.6	120	495	29.9
2	639	35	125	495	30
3	610	35.4	130	495	30
4	590	35.6	135	495	30
5	575	35.6	140	495	30.1
10	497	31.2	145	495	30.1
15	496	30.3	150	493	29.8
20	492	29.7	155	493	29.7
25	493	30.1	160	496	29.9
30	493	30.1	165	495	30
35	495	30.1	170	495	30.1
40	495	30	175	495	30.1
45	492	29.7	180	495	30.1
50	495	30	185	496	30.2
55	493	30	190	495	30
60	495	29.9	195	495	30
65	495	29.9	200	495	29.9
70	495	29.9	205	495	30
75	495	29.9	210	495	29.8
80	495	30	215	495	30
85	495	30	220	495	29.9
90	495	30.1	225	495	30
95	496	30.2	230	495	30
100	494	30	235	495	30
105	495	29.9	240	495	29.8
110	495	30			

A6.9 Initial Pressure : 875 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	875	31.7	115	527	30.1
1	708	32.3	120	527	29.9
2	650	33.1	125	527	29.9
3	602	33.2	130	527	30
4	580	33	135	527	30.1
5	551	32.2	140	527	30
10	521	30	145	525	29.8
15	520	30.4	150	526	30
20	520	30.1	155	527	29.9
25	520	30.1	160	528	30.3
30	525	30	165	528	30.1
35	524	29.9	170	527	30.1
40	527	29.9	175	527	30
45	525	29.9	180	526	29.8
50	524	29.7	185	527	30.1
55	525	29.8	190	527	30
60	527	30	195	527	30.1
65	526	30.1	200	527	30
70	527	30	205	527	29.9
75	527	30.1	210	527	30.1
80	527	30	215	527	30
85	524	29.7	220	527	30
90	526	29.8	225	527	30.1
95	527	30	230	528	30.2
100	527	30	235	527	30
105	528	30.1	240	527	30
110	528	30.1			

A6.10 Initial Pressure : 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	897	31.3	115	554	30.2
1	938	33.1	120	554	30
2	661	33.6	125	554	30.1
3	615	33.1	130	553	29.8
4	585	32.3	135	554	29.8
5	568	31.6	140	554	30
10	550	30.1	145	554	29.9
15	548	30.1	150	554	30.1
20	549	30.3	155	554	30.1
25	549	30.1	160	552	29.7
30	547	30	165	553	29.7
35	549	30	170	553	29.9
40	550	30	175	554	30.2
45	550	30	180	554	30
50	551	30.1	185	554	30
55	554	29.9	190	552	29.8
60	553	30	195	553	30
65	554	30.1	200	554	30
70	554	30	205	554	30.1
75	554	30	210	554	30.1
80	554	30.1	215	554	30.1
85	554	30	220	554	30.1
90	554	30.1	225	554	29.9
95	554	30	230	554	30
100	554	30.1	235	554	30.1
105	554	30.1	240	554	30
110	555	30.2			

A7 CO₂ injection with 3 %N₂ at 20 degree of Celsius

A7.1 Initial Pressure : 500 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	21.3	115	281	20.1
1	412	21.6	120	281	20
2	380	20.9	125	283	20.4
3	353	20	130	283	20.4
4	336	19.6	135	282	20.3
5	324	19.3	140	281	20.1
10	294	19.4	145	281	20.1
15	283	20.8	150	281	20.1
20	277	20.2	155	281	20
25	274	19.9	160	281	20
30	275	19.9	165	281	19.9
35	276	20.2	170	281	20.1
40	277	20.2	175	281	20.2
45	277	20	180	282	20.2
50	279	20	185	281	20.1
55	281	20.1	190	281	19.9
60	281	20.1	195	280	19.8
65	281	20	200	281	19.9
70	281	19.9	205	281	19.9
75	280	19.7	210	281	20
80	279	19.7	215	281	20.1
85	281	19.8	220	281	20
90	282	20.2	225	281	20
95	281	20.1	230	281	19.9
100	281	20	235	281	20.1
105	281	20	240	281	20
110	282	20.2			

A7.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	601	20.5	115	334	19.8
1	498	21.3	120	333	19.9
2	459	21.2	125	334	20
3	425	20.8	130	334	20
4	419	20.6	135	334	20.2
5	389	20.4	140	336	20.4
10	352	20.2	145	335	20.4
15	339	20.3	150	333	20.1
20	336	20.4	155	334	20.2
25	332	20.1	160	334	20
30	332	20	165	334	20
35	330	20	170	334	19.9
40	332	20	175	333	19.8
45	334	20.2	180	334	19.9
50	332	19.9	185	334	19.9
55	333	19.8	190	334	20
60	334	20	195	334	20.1
65	334	20	200	335	20.1
70	334	20.1	205	334	20.1
75	333	19.9	210	334	19.9
80	334	19.9	215	334	20
85	335	20.3	220	334	20
90	334	20.2	225	334	19.9
95	334	20.1	230	334	20.1
100	334	20	235	334	19.9
105	334	19.9	240	334	20
110	334	19.9			

A7.3 Initial Pressure : 650 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	652	21.4	115	374	20
1	525	21.5	120	374	20.1
2	484	21.1	125	374	20.1
3	454	20.8	130	374	20.1
4	433	20.5	135	376	20.4
5	418	20.3	140	375	20.3
10	386	20.1	145	374	20.1
15	380	20.2	150	374	20
20	378	20.4	155	374	19.9
25	374	20.1	160	374	19.9
30	377	20.1	165	374	20
35	374	20.1	170	374	20.1
40	375	20.1	175	375	20.2
45	375	20.1	180	374	20.2
50	374	20	185	374	20.1
55	374	19.9	190	373	20
60	375	20.1	195	374	20.1
65	373	20.1	200	374	19.9
70	372	19.7	205	374	20
75	373	19.6	210	375	20.2
80	374	19.8	215	374	20.1
85	374	20	220	374	19.9
90	374	20.1	225	374	19.8
95	374	20	230	374	20
100	374	19.9	235	374	20.1
105	373	19.8	240	374	20
110	374	20			

A7.4 Initial Pressure : 700 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	700	21	115	411	20
1	454	20.9	120	411	20.2
2	492	20.2	125	415	20.6
3	462	19.7	130	413	20.4
4	446	19.4	135	412	20.1
5	436	19.2	140	411	20
10	421	20.3	145	411	20
15	411	20.1	150	411	20
20	409	19.9	155	411	19.9
25	411	20.2	160	411	19.8
30	408	19.9	165	411	20
35	410	19.9	170	410	19.8
40	412	20.2	175	411	20.1
45	411	20	180	411	19.9
50	410	20	185	411	19.9
55	409	19.8	190	411	20
60	412	20.3	195	411	20.2
65	410	20.1	200	411	20.1
70	411	20	205	411	20.1
75	411	20	210	412	20.2
80	411	19.9	215	411	19.9
85	412	20.1	220	411	20
90	411	20.1	225	411	20
95	411	20	230	411	19.9
100	411	19.9	235	411	20.1
105	412	20.2	240	411	19.9
110	411	20.1			

A7.5 Initial Pressure : 750 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	748	21.7	115	453	19.7
1	584	22	120	454	19.8
2	531	21.8	125	454	20
3	506	21.6	130	454	20
4	490	21.4	135	454	20.1
5	481	21.2	140	456	20.3
10	471	20.8	145	456	20.4
15	458	20	150	453	20.1
20	454	19.9	155	454	20
25	456	20.1	160	454	19.9
30	455	20.2	165	454	19.9
35	455	20.1	170	454	20
40	454	20	175	454	20.1
45	454	19.9	180	454	20.1
50	454	20	185	454	20
55	455	20.2	190	454	19.9
60	454	20.2	195	453	19.9
65	453	19.6	200	452	19.7
70	453	19.7	205	454	19.8
75	454	19.9	210	454	20
80	454	20	215	454	20
85	454	20.1	220	454	20.2
90	455	20.2	225	454	20.1
95	456	20.3	230	454	20.2
100	454	20.2	235	454	20
105	454	20.2	240	454	19.9
110	454	20			

A7.6 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	801	21.1	115	499	19.8
1	611	21.9	120	500	19.9
2	561	21.6	125	500	20
3	535	21.1	130	500	20
4	522	20.7	135	500	20.1
5	516	20.5	140	501	20.2
10	510	20.3	145	500	20
15	502	20.1	150	500	20.1
20	499	20	155	500	19.9
25	502	20.1	160	500	20
30	501	20	165	500	20.2
35	500	19.9	170	501	20.3
40	497	19.8	175	500	20.2
45	496	19.7	180	503	20
50	497	19.9	185	502	20
55	500	20	190	500	20.1
60	500	20.1	195	500	20.1
65	500	20	200	500	19.9
70	501	20.1	205	500	19.8
75	503	20.3	210	500	19.9
80	502	20.3	215	499	19.7
85	500	20.1	220	500	20
90	500	20	225	500	20.1
95	500	20.1	230	500	20.3
100	500	19.9	235	500	20
105	501	20.2	240	500	20.1
110	500	19.9			

A7.7 Initial Pressure : 850 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	849	21.9	115	541	19.9
1	639	22.9	120	541	20
2	584	22.7	125	541	20.1
3	562	20.2	130	541	20.1
4	548	21.5	135	543	20.3
5	540	21	140	542	20.3
10	535	20.1	145	541	20.2
15	537	20.2	150	541	20
20	539	20.1	155	541	20
25	541	20	160	541	20
30	539	19.9	165	541	20.1
35	539	19.8	170	540	19.8
40	541	19.7	175	541	20
45	540	19.8	180	541	20.1
50	541	20	185	541	20
55	541	20.1	190	541	20.1
60	540	20	195	541	19.9
65	540	19.8	200	541	20
70	542	20.1	205	540	19.9
75	542	20.2	210	541	19.9
80	543	20.2	215	541	20
85	541	20.2	220	542	20.2
90	541	20.1	225	541	20
95	541	20	230	541	19.9
100	541	20	235	541	19.9
105	542	20.1	240	541	20.1
110	541	19.9			

A7.8 Initial Pressure : 875 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	875	21.7	115	596	20
1	667	23.9	120	595	19.9
2	638	23.6	125	595	20
3	607	23.7	130	595	20.1
4	599	21.3	135	595	20.1
5	592	20.8	140	595	20.1
10	593	20	145	597	20.4
15	600	19.8	150	596	20.4
20	605	19.9	155	595	20.2
25	603	20.2	160	595	20
30	604	20.3	165	595	20.1
35	607	20.3	170	595	19.9
40	599	20	175	595	19.9
45	597	19.9	180	595	20
50	595	19.9	185	596	20.2
55	595	20.1	190	595	20.1
60	595	20.2	195	595	20.2
65	595	20.1	200	595	20
70	596	20.1	205	595	19.9
75	594	19.7	210	594	19.7
80	594	19.8	215	593	19.7
85	595	20	220	594	19.9
90	595	20.1	225	595	19.9
95	596	20.2	230	595	20.2
100	595	19.9	235	595	20
105	595	20	240	595	20
110	595	20.2			

A7.9 Initial Pressure : 900 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	900	22.6	115	632	20.2
1	697	24.9	120	631	20.1
2	670	23.2	125	631	20
3	641	22.4	130	631	20
4	632	21.4	135	632	20.2
5	628	20.7	140	634	20.4
10	627	19.9	145	633	20.4
15	634	20.3	150	631	20.1
20	628	19.9	155	631	20
25	632	20	160	631	20
30	634	20.1	165	631	19.9
35	637	20.3	170	632	20.1
40	633	20.1	175	631	20
45	627	19.6	180	631	19.9
50	630	19.8	185	631	19.8
55	631	20	190	631	19.9
60	631	20.1	195	631	20
65	632	20.2	200	630	19.8
70	631	20	205	630	19.7
75	630	19.8	210	631	19.9
80	630	19.9	215	631	20
85	631	20	220	631	20.1
90	631	20.2	225	631	20.1
95	633	20.4	230	631	20.2
100	632	20.4	235	631	20.1
105	631	20.2	240	631	20.1
110	631	20			

A8 n-Decane at 20 degree of Celsius

A8.1 Initial Pressure : 500 psi

A8.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	20.4	0	601	20.8
1	415	20.3	1	513	21.2
2	397	19.3	2	572	20.2
3	376	18.6	3	452	19.5
4	368	18.3	4	438	19.1
5	365	18	5	428	19
10	324	18.4	10	394	19.4
15	308	20.6	15	364	20
20	290	20.8	20	350	20.1
25	280	19.7	25	344	20.1
30	279	20.2	30	338	19.8
35	270	19.7	35	336	20.1
40	270	20	40	335	20.3
45	269	20.1	45	334	19.9
50	270	20.4	50	330	19.7
55	270	20.1	55	332	20.3
60	273	20.4	60	329	19.9
65	269	19.8	65	330	19.8
70	269	19.7	70	332	20.5
75	269	20.1	75	329	20.2
80	270	20.3	80	328	19.8
85	269	20.5	85	329	20
90	269	20	90	330	20.2
95	269	20	95	329	20.5
100	269	20.1	100	328	20.1
105	269	19.8	105	328	20
110	269	19.5	110	328	20.1
115	270	20	115	328	20.3
120	269	20.1	120	329	20
125	269	20	125	328	19.8
130	269	20	130	328	19.8
135	269	20.3	135	328	20.1
140	269	20.2	140	328	20
145	269	20	145	328	20.1
150	269	20	150	328	20

A8.3 Initial Pressure : 650 psi

Time	Pressure	Temperature
0	650	20.8
1	534	21
2	498	19.9
3	477	19.2
4	463	18.9
5	453	18.7
10	420	19.1
15	402	20
20	384	20.2
25	384	20
30	372	20.4
35	367	20.2
40	364	19.9
45	365	20.2
50	362	20.1
55	361	19.8
60	363	20.2
65	362	20.4
70	363	20.2
75	362	20
80	363	20.1
85	364	20.3
90	362	20.1
95	361	20
100	362	19.8
105	361	20
110	361	20
115	360	20.2
120	361	20.1
125	360	20.1
130	361	19.9
135	361	20
140	361	20.1
145	361	20.1
150	361	20

A8.4 Initial Pressure : 700 psi

Time	Pressure	Temperature
0	702	21.7
1	556	20.5
2	514	19
3	487	18.9
4	476	19.2
5	465	19.6
10	448	20.2
15	418	19.8
20	411	19.5
25	411	20.3
30	404	19.5
35	405	19.8
40	405	20.2
45	403	19.6
50	404	20
55	404	20.1
60	404	20
65	402	19.8
70	403	20.2
75	399	19.6
80	400	20.1
85	400	20
90	399	19.8
95	401	19.9
100	400	19.9
105	401	20
110	401	19.9
115	401	20.2
120	402	20.3
125	401	20.2
130	401	20.1
135	401	20
140	401	20
145	401	20.1
150	401	20.2

A8.5 Initial Pressure : 750 psi

Time	Pressure	Temperature
0	749	21
1	597	20.7
2	558	19.2
3	532	18.5
4	517	18.1
5	504	18.1
10	480	20.6
15	458	19.8
20	454	20
25	450	20.3
30	445	19.6
35	445	19.7
40	444	20.1
45	443	19.7
50	445	20.2
55	443	20
60	442	19.8
65	444	20.2
70	442	20.1
75	443	19.9
80	444	20.2
85	442	19.8
90	444	20
95	443	20.1
100	443	20.2
105	443	20
110	444	19.8
115	443	19.9
120	443	20.1
125	443	20.3
130	443	20
135	443	20
140	443	19.9
145	443	20.1
150	443	20.2

A8.6 Initial Pressure : 800 psi

Time	Pressure	Temperature
0	801	21.8
1	650	21.3
2	607	19.8
3	580	19.1
4	563	18.7
5	552	18.7
10	527	19.3
15	518	20.2
20	504	20
25	502	20.1
30	498	19.9
35	499	20.1
40	496	19.8
45	498	20.2
50	493	19.6
55	496	20
60	491	19.9
65	495	19.8
70	495	20.1
75	492	19.6
80	494	19.9
85	495	20.1
90	494	20
95	492	20
100	493	20.2
105	493	19.9
110	492	19.7
115	493	20
120	493	20.1
125	493	20.1
130	493	20.2
135	493	19.6
140	493	19.9
145	493	20
150	493	20

A8.7 Initial Pressure : 825 psi

Time	Pressure	Temperature
0	825	21.3
1	651	20.8
2	608	19.4
3	682	18.7
4	568	18.5
5	558	18.4
10	535	18.9
15	526	19.8
20	522	20.2
25	512	19.6
30	513	19.9
35	515	20.1
40	511	19.5
45	513	19.8
50	513	20
55	511	19.8
60	513	19.9
65	512	20.1
70	511	19.6
75	514	20
80	515	20
85	514	19.9
90	514	20
95	514	20.2
100	513	20
105	513	19.8
110	513	20
115	513	20.1
120	513	19.9
125	513	19.7
130	513	20.1
135	513	20
140	513	20
145	513	19.9
150	513	20

A8.8 Initial Pressure : 850 psi

Time	Pressure	Temperature
0	847	21.9
1	666	20.5
2	629	19.1
3	604	18.5
4	588	18.3
5	577	18.1
10	555	18.4
15	550	19.2
20	553	20
25	548	19.9
30	548	19.7
35	551	20.3
40	548	19.8
45	549	20
50	547	20
55	548	19.8
60	549	20.3
65	548	19.9
70	546	19.8
75	548	20
80	546	20
85	547	20.1
90	546	19.9
95	545	19.8
100	547	20
105	546	19.5
110	547	19.8
115	547	20.1
120	547	20.1
125	547	19.9
130	547	20.1
135	547	20
140	547	20
145	547	20.2
150	547	20

A8.9 Initial Pressure : 900 psi

Time	Pressure	Temperature
0	900	22.6
1	702	21.3
2	662	20.4
3	641	20.3
4	627	19.8
5	618	19.6
10	602	19.4
15	600	20
20	594	19.7
25	595	19.8
30	598	20.4
35	593	20
40	594	19.8
45	596	20.2
50	592	19.8
55	595	19.9
60	593	19.9
65	594	20
70	593	20
75	594	20.2
80	593	20.1
85	593	20
90	594	20
95	592	19.7
100	593	19.9
105	593	20.1
110	593	20
115	593	20.2
120	593	19.9
125	593	20
130	593	20
135	593	20.1
140	593	19.8
145	593	19.7
150	593	20

A9 n-Decane at 25 degree of Celsius

A9.1 Initial Pressure : 500 psi

A9.2 Initial Pressure : 600 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	500	26.2	0	602	26.6
1	444	27.2	1	519	27.5
2	423	27	2	477	26.9
3	404	26.4	3	448	26.3
4	385	25.9	4	427	25.8
5	376	25.7	5	409	25.4
10	344	25.1	10	383	25.1
15	325	25.2	15	370	25
20	313	25.4	20	364	25.1
25	305	25.3	25	361	25.3
30	301	25.3	30	354	25.2
35	298	25.4	35	351	24.7
40	295	25.3	40	351	24.8
45	293	25.1	45	351	25
50	293	25.1	50	351	25.1
55	292	25.2	55	352	25.3
60	292	25.4	60	352	25.4
65	290	25.2	65	348	24.8
70	290	25.1	70	349	24.9
75	290	25.3	75	350	25
80	290	25.4	80	352	25.3
85	288	25	85	351	25.1
90	289	25	90	350	25
95	289	25.1	95	350	25.1
100	289	25.3	100	350	25.2
105	288	25.3	105	350	25.4
110	288	24.7	110	349	25
115	289	24.9	115	349	25
120	289	25	120	350	25.1
125	289	25.2	125	350	25.3
130	289	25.1	130	350	24.9
135	289	25.1	135	350	25
140	289	25.2	140	349	25.2
145	289	25.2	145	350	25.3
150	289	25.1	150	350	25.1

A9.3 Initial Pressure : 650 psi

Time	Pressure	Temperature
0	650	25.9
1	556	27.2
2	518	26.7
3	490	26.2
4	468	25.8
5	453	25.4
10	422	25.2
15	407	25.2
20	398	25.4
25	390	25.3
30	389	25.3
35	387	25.4
40	382	25.3
45	382	25
50	382	25.1
55	382	25.2
60	383	25.4
65	381	25.4
70	381	25.3
75	381	25.4
80	376	25.3
85	379	24.9
90	380	25
95	380	25.1
100	381	25.3
105	380	25.4
110	380	24.9
115	380	25.1
120	381	25.2
125	381	25.4
130	380	25.4
135	380	25.1
140	380	25.3
145	380	25.2
150	380	25

A9.4 Initial Pressure : 700 psi

Time	Pressure	Temperature
0	700	25.6
1	588	27
2	550	26.7
3	526	26.1
4	500	25.5
5	483	25.1
10	457	25.1
15	441	25.4
20	430	25.3
25	422	24.7
30	422	24.9
35	422	25.2
40	418	25
45	417	24.7
50	418	25
55	419	25.2
60	419	25.1
65	418	25.3
70	416	24.6
75	419	25
80	417	25.1
85	420	25.1
90	419	25.2
95	417	25.3
100	419	25
105	418	25
110	419	25.1
115	419	24.9
120	419	25
125	419	25.1
130	419	25
135	419	25.2
140	419	24.9
145	419	25
150	419	25

A9.5 Initial Pressure : 750 psi

A9.6 Initial Pressure : 800 psi

Time	Pressure	Temperature	Time	Pressure	Temperature
0	750	25.9	0	800	26.5
1	638	27.5	1	798	27.4
2	595	26.8	2	646	26.6
3	564	26.1	3	605	25.9
4	540	25.6	4	581	25.4
5	523	25.2	5	564	25
10	495	25	10	534	25.2
15	477	25.4	15	518	25.4
20	469	25.1	20	506	24.7
25	468	25.2	25	504	24.9
30	460	25.2	30	503	25.1
35	461	24.9	35	503	25.3
40	460	25.2	40	503	25.5
45	459	25	45	498	25.1
50	458	25.3	50	499	25
55	456	24.8	55	500	25.2
60	459	25.3	60	500	25.4
65	457	25.1	65	498	25
70	459	25.2	70	499	25.2
75	457	25	75	500	25.4
80	459	25.4	80	502	25.5
85	457	24.9	85	500	25.2
90	459	25.3	90	502	25.3
95	458	25	95	500	25.5
100	458	25.2	100	499	24.9
105	458	25.2	105	500	25.2
110	458	25.1	110	500	25.2
115	458	25	115	500	25
120	458	25.1	120	499	25.1
125	457	25	125	500	24.9
130	458	24.9	130	500	25.1
135	458	25	135	500	25.3
140	458	25.1	140	500	25
145	458	25	145	500	24.9
150	458	25	150	500	25

A9.7 Initial Pressure : 850 psi

Time	Pressure	Temperature
0	853	26.4
1	720	26.9
2	669	26.1
3	635	25.8
4	613	25.7
5	594	25.4
10	571	25.3
15	557	25
20	552	25
25	549	24.9
30	550	25.1
35	551	24.8
40	552	25
45	552	25.3
50	550	25.2
55	552	25.2
60	554	25.5
65	553	25.3
70	551	25
75	552	25.1
80	551	25
85	551	25.2
90	551	25.2
95	552	25.2
100	550	25.1
105	551	25.3
110	550	24.8
115	551	25.2
120	551	25.1
125	551	25
130	551	24.9
135	552	25.2
140	551	25
145	551	25.1
150	551	25.1

A9.8 Initial Pressure : 875 psi

Time	Pressure	Temperature
0	875	26.7
1	743	27.3
2	693	26.7
3	652	26.7
4	632	26.4
5	610	25.9
10	579	25.2
15	574	25.1
20	573	25
25	573	25
30	573	25.1
35	570	24.9
40	571	25.3
45	570	25
50	570	25.1
55	571	25.3
60	569	24.9
65	570	25.1
70	569	25.1
75	570	25.1
80	571	25.2
85	569	24.8
90	570	25
95	569	25
100	569	24.9
105	569	25
110	569	25
115	569	25.1
120	569	25
125	570	25.2
130	569	24.9
135	569	25
140	569	25.1
145	569	25
150	569	25

A9.9 Initial Pressure : 900 psi

Time	Pressure	Temperature
0	900	26
1	762	26.8
2	715	27.1
3	671	26.9
4	649	26.3
5	629	25.8
10	603	25.3
15	586	24.8
20	589	25
25	591	25.2
30	597	25.1
35	599	25.2
40	589	25
45	589	25
50	589	25.2
55	589	25.1
60	589	25
65	588	25
70	589	25.1
75	588	25.1
80	589	25
85	587	25.1
90	587	25.2
95	587	25
100	587	24.8
105	587	25.2
110	587	25.1
115	586	25
120	587	25
125	587	25.3
130	587	25.2
135	587	25
140	587	24.9
145	587	25
150	587	25

A9.10 Initial Pressure : 925 psi

Time	Pressure	Temperature
0	926	27.6
1	799	27.3
2	757	27.1
3	730	26.9
4	713	26.7
5	703	26.5
10	671	25.1
15	671	25.2
20	669	24.8
25	671	25
30	672	25.1
35	673	25.3
40	671	25
45	671	25
50	671	25
55	672	25.4
60	671	25.1
65	672	25.2
70	670	25.1
75	671	25
80	668	24.8
85	671	25.1
90	668	24.9
95	671	25
100	671	25.1
105	671	25
110	671	25.1
115	670	24.9
120	671	25.2
125	671	25
130	671	25.1
135	671	25.2
140	671	25
145	671	25
150	671	25

A10 Table Summary of Raw Data

Table A10.1 Condensate at 20 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	241	19.97
600	276	19.99
650	299	20.04
700	325	20.15
750	330	19.96
775	350	20.15
800	343	20.25
850	327	20.31
900	337	20.1
	AVE	20.10
	SD	0.1244

Table A10.2 Condensate at 30 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	236	30.12
600	258	30.12
650	283	30.33
700	290	30.11
750	303	30.05
800	327	30.18
850	340	30.18
875	328	30.12
900	345	30.25
	AVE	30.16
	SD	0.0845

Table A10.3 Oil sample at 20 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	255	20.04
600	295	20.16
650	323	20.07
700	329	20.01
725	342	20.22
750	338	20.02
800	356	20.29
850	361	20.39
900	364	20.18
	AVE	20.15
	SD	0.1313

Table A10.4 Oil sample at 30 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	228	30.13
600	282	30.14
650	286	31.09
700	304	30.06
750	340	30.19
800	350	30.31
825	344	30.13
850	356	30.21
900	363	30.64
	AVE	30.32
	SD	0.3348

Table A10.5 CO₂ injection with 1%N₂ at 20 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	231	19.98
600	286	20.09
650	312	20.09
700	322	20.16
725	326	20.2
750	338	20.14
775	329	20.18
800	332	20.18
850	347	20.27
900	351	20.36
	AVE	20.17
	SD	0.1037

Table A10.6 CO₂ injection with 1%N₂ at 30 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	222	30.13
600	266	30.26
650	277	30
700	302	30.28
750	308	30.17
800	325	30.22
825	331	30.21
850	355	30.51
875	348	30.3
900	343	30.3
	AVE	30.24
	SD	0.1325

Table A10.7 CO₂ injection with 3%N₂ at 20 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	219	20.09
600	267	20.13
650	278	20.14
700	289	20.05
750	294	20.22
800	301	20.16
850	308	20.21
875	280	20.31
900	269	20.32
	AVE	20.18
	SD	0.0925

Table A10.8 n-decane at 20 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	231	19.88
600	273	20.02
650	289	20
700	301	19.95
750	306	19.89
800	308	19.93
825	312	19.83
850	300	19.8
900	307	20.07
	AVE	19.97
	SD	0.1627

Table A10.9 n-decane at 25 degree of Celsius

Initial Pressure (psi)	Total Pressure Drop (psi)	Temperature (°C)
500	211	25.38
600	252	25.32
650	270	25.39
700	281	25.21
750	292	25.29
800	300	25.32
850	302	25.27
875	306	25.32
900	313	25.31
925	255	25.39
	AVE	25.32
	SD	0.0542

A11 Data of Condensate

API gravity: 63.9

Specific gravity: 0.7092 (at 96.5 °F)

Average molecular weight: 113.64

GCMS testing condition

Column: HP5-MS 30 m x 0.25 μ m x 0.25 μ m

Carrier gas: Helium, constant flow 20 mL/min

Split/splitless inlet: 320 °C, split 400:1

Oven: 50 °C (1min) \rightarrow 310 C at 5 °C/min, hold for 20 minutes

Analysis time: 72 min

Sample: Condensate, 0.2 μ L injection

MSD: Ion Source = 250 °C, scan = 35-500 μ , detector voltage = 1,700 volts

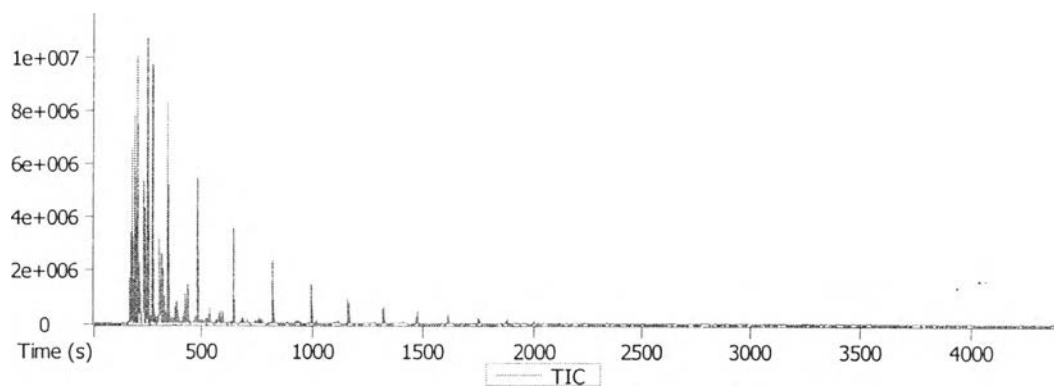


Figure A11.1 GCMS chromatogram of condensate API 63.9.

Table A11.1 GC-TOFMS results

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Benzeneethanamine, N-methyl-	C9H13N	1.95	135	0.15109965
Butane	C4H10	170.45	58	0.26525822
Pentane	C5H12	180.6	72	7.80007725
Butane, 2,2-dimethyl-	C6H14	187.35	86	0.44026092
Carbon disulfide	CS2	189.85	76	0.06807469
Pentane, 2-methyl-	C6H14	194.65	86	9.1094391
Hexane	C6H14	203.95	86	6.67294461
Pentane, 2,4-dimethyl-	C7H16	215.15	100	0.00497558
Cyclopentane, methyl-	C6H12	217.15	84	0.84213545
Butane, 2,2,3-trimethyl-	C7H16	220.1	100	0.03601427
Benzene	C6H6	232.9	78	0.7983014
3-Penten-2-one, 4-(acetyloxy)-, (Z)-	C7H10O3	233.35	142	1.38415365
1-Hexene, 5-methyl-	C7H14	233.55	98	5.4870903
Cyclohexane	C6H12	234.75	84	1.46925459
Hexane, 3-methyl-	C7H16	238.75	100	1.78156089
2-Pentene, 3,4-dimethyl-, (Z)-	C7H14	240.55	98	0.19375119
Cyclopentane, 1,2-dimethyl-, cis-	C7H14	250	98	0.12323465
Heptane	C7H16	253.75	100	10.8700785
Butane, 2,2,3,3-tetramethyl-	C8H18	269.2	114	0.41052613
Cycloheptane, bromo-	C7H13Br	276.25	176	0.15884161
Cyclohexane, methyl-	C7H14	276.5	98	5.25503358
Hexane, 2,5-dimethyl-	C8H18	276.75	114	0.02349776
Hexane, 2,4-dimethyl-	C8H18	278.7	114	0.21781596
Hexane, 3,3-dimethyl-	C8H18	287.25	114	0.23012628
Cyclopentane, 1,2,4-trimethyl-	C8H16	288.75	112	0.28049957
Cyclopentane, 1,2,3-trimethyl-, (1à,2à,3à)-	C8H16	295.45	112	0.12519541
Hexane, 2,3-dimethyl-	C8H18	303.75	114	0.14868408
Heptane, 2-bromo-	C7H15Br	308.35	178	2.40768954
Heptane, 4-methyl-	C8H18	309.55	114	0.78109928
Toluene	C7H8	312.65	92	0.70278014
Heptane, 3-methyl-	C8H18	316.15	114	1.60478946
Hexane, 3-ethyl-	C8H18	316.45	114	0.14812819
Pentane, 2,2,4,4-tetramethyl-	C9H20	325.1	128	0.18768699
1,3-Dimethylcyclohexane,c&t	C8H16	327.8	112	1.80086526
Cyclohexane, 1,1-dimethyl-	C8H16	337.65	112	0.22205079
Octane	C8H18	345.05	114	10.2303054
1à,2à,3à,4à-Tetramethylcyclopentane	C9H18	349.65	126	0.00120627
Cyclohexane, 1,2-dimethyl-	C8H16	350.7	112	0.37399943
Cyclohexane, 1,4-dimethyl-, cis-	C8H16	357.95	112	0.47220915
2-Pentanone, 3-[(acetyloxy)methyl]-3,4-dimethyl-, (+-)-	C10H18O3	362.65	186	0.01359493
Heptane, 2,4-dimethyl-	C9H20	370.75	128	0.31144721
Heptane, 1,1'-oxybis-	C14H30O	378.2	214	0.00390757

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Heptane, 2,5-dimethyl-	C9H20	388.2	128	0.9568398
Cyclohexane, 1,2,3-trimethyl-, (1à,2à,3à)-	C9H18	389	126	0.16261152
Cyclohexane, ethyl-	C8H16	393.1	112	0.00836334
Cyclohexane, ethyl-	C8H16	393.65	112	0.00046932
Cyclohexane, 1,1,3-trimethyl-	C9H18	398.3	126	0.19615666
1,1,4-Trimethylcyclohexane	C9H18	403.3	126	0.04914731
Isooctanol	C8H18O	403.6	130	0.05002156
Propanoic acid, anhydride	C6H10O3	413.8	130	0.00123326
Hexane, 3-ethyl-2-methyl-	C9H20	417.1	128	0.05753612
Cyclohexane, 1,2,4-trimethyl-, (1à,2à,4à)-	C9H18	419.55	126	0.12470017
Heptane, 3,4-dimethyl-	C9H20	421.35	128	0.00786375
Heptane, 4-ethyl-	C9H20	421.75	128	0.01547988
Ethylbenzene	C8H10	426.05	106	0.05816073
Octane, 4-methyl-	C9H20	426.5	128	0.22227314
Octane, 2-methyl-	C9H20	428.95	128	0.03111642
Benzene, (3,3-dimethylbutyl)-	C12H18	438.55	162	1.61893926
Pentalene, octahydro-	C8H14	442.25	110	0.03807206
Heptane, 2,2,4-trimethyl-	C10H22	447.85	142	0.03288616
Cyclohexane, 1,2,3-trimethyl-, (1à,2à,3à)-	C9H18	453.25	126	0.05462126
Octane, 2,2-dimethyl-	C10H22	457.1	142	0.03011987
Cyclohexane, 1,1,3,5-tetramethyl-, trans-	C10H20	462.6	140	0.01259534
4-Nonene	C9H18	463.1	126	0.01910526
Cyclohexane, 1,1,2-trimethyl-	C9H18	465	126	0.00577514
Cyclohexane, 1-ethyl-4-methyl-, cis-	C9H18	469.05	126	0.23440154
o-Xylene	C8H10	472.6	106	0.25328142
Cyclohexane, 1-ethyl-4-methyl-, cis-	C9H18	474.55	126	0.0088601
Cyclohexene, 1-propyl-	C9H16	479.15	124	0.06402481
Nonane	C9H20	481.05	128	4.24635498
Oxalic acid, diallyl ester	C8H10O4	481.35	170	0.00225154
1-Octanol, 2-butyl-	C12H26O	496.75	186	0.05096859
Cyclohexane, 1,1,3,5-tetramethyl-, trans-	C10H20	497.45	140	0.02176846
2-Decyne	C10H18	498.55	138	0.05722179
Cyclohexane, 1-ethyl-4-methyl-, cis-	C9H18	499.3	126	0.10716452
Cyclohexane, 1-ethyl-4-methyl-, cis-	C9H18	504.5	126	0.00194924
Heptane, 2,3,6-trimethyl-	C10H22	505.45	142	0.01902137
Pentane, 3-ethyl-2,4-dimethyl-	C9H20	506.5	128	0.04810528
Cyclohexane, 1-ethyl-1-methyl-	C9H18	506.8	126	0.01134208
Pentane, 3-methyl-	C6H14	508.35	86	0.08952275
Hexane, 4-ethyl-2-methyl-	C9H20	518.5	128	0.2301566
Cyclopentane, 1-methyl-2-(2-propenyl)-, trans-	C9H16	520.1	124	0.06407131
Octane, 2,7-dimethyl-	C10H22	527.1	142	0.13764723
Cyclopropane, (2-methylenebutyl)-	C8H14	531	110	0.02478439

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
4-Ethyl-2-hexynal	C ₈ H ₁₂ O	532.2	124	0.01175646
Octane, 2,6-dimethyl-	C ₁₀ H ₂₂	534.55	142	0.38338883
Cyclohexane, propyl-	C ₉ H ₁₈	535.3	126	0.22840809
1-Octene, 3,3-dimethyl-	C ₁₀ H ₂₀	538.45	140	0.0071407
(1-Propoxy-pentyl)-cyclopropane	C ₁₁ H ₂₂ O	543.3	170	0.06930269
Heptane, 2,5-dimethyl-	C ₉ H ₂₀	544	128	0.14892665
Piperoxan	C ₁₄ H ₁₉ NO ₂	545.05	233	0.01042537
2-(Butyliden-2-one)tetrahydrofuran	C ₈ H ₁₂ O ₂	548.65	140	0.01080034
Cyclohexane, 1,1,3,5-tetramethyl-, cis-	C ₁₀ H ₂₀	554.1	140	0.01022828
2,6-Dimethylbicyclo[3.2.1]octane	C ₁₀ H ₁₈	558.2	138	0.00849271
3-Ethyl-3-methylheptane	C ₁₀ H ₂₂	559.55	142	0.00177267
1-Nonyne	C ₉ H ₁₆	566.45	124	0.02499158
Heptane, 3-ethyl-2-methyl-	C ₁₀ H ₂₂	568.35	142	0.19341766
Benzene, propyl-	C ₉ H ₁₂	569.5	120	0.03321362
1,4-Hexadiene, 3-ethyl-4,5-dimethyl-	C ₁₀ H ₁₈	573.45	138	0.00942912
Pentane, 3-ethyl-2,4-dimethyl-	C ₉ H ₂₀	576.2	128	0.05833154
Cyclohexene, 3-methyl-6-(1-methylethyl)-	C ₁₀ H ₁₈	577.55	138	0.00145187
Nonane, 4-methyl-	C ₁₀ H ₂₂	579.8	142	0.12547841
1-Hepten-5-yne, 2-methyl-3-methylene-	C ₉ H ₁₂	581.65	120	0.04785361
Cyclooctanemethanol	C ₉ H ₁₈ O	582.8	142	0.01281871
Cyclohexane, 1,1,2,3-tetramethyl-	C ₁₀ H ₂₀	583.35	140	0.00981127
Nonane, 2-methyl-	C ₁₀ H ₂₂	585.55	142	0.40410818
Cyclooctanemethanol	C ₉ H ₁₈ O	587	142	0.01146639
1-Octene, 2,6-dimethyl-	C ₁₀ H ₂₀	588.85	140	0.00267836
1-Decene, 4-methyl-	C ₁₁ H ₂₂	589.85	154	0.04043305
Benzene, 1,2,4-trimethyl-	C ₉ H ₁₂	595.7	120	0.18282552
Nonane, 3-methyl-	C ₁₀ H ₂₂	596.65	142	0.39271759
Hexane, 2,4-dimethyl-	C ₈ H ₁₈	603.95	114	0.02017256
Cyclohexane, 1-methyl-3-(1-methylethyl)-	C ₁₀ H ₂₀	605.95	140	0.01560218
1,4-Hexadiene, 4-methyl-	C ₇ H ₁₂	609.65	96	0.00815928
Benzene, 1-ethyl-4-methyl-	C ₉ H ₁₂	611.7	120	0.02332797
Cyclohexane, 1-(1,1-dimethylethyl)-4-methyl-	C ₁₁ H ₂₂	615.5	154	0.02804086
Cyclohexane, 1-isopropyl-3-methyl-, trans-	C ₁₀ H ₂₀	623.85	140	0.07646956
1-Undecyne	C ₁₁ H ₂₀	624.9	152	0.00476858
1-Butene, 2-ethyl-3-methyl-	C ₇ H ₁₄	627.15	98	0.00239799
Cyclohexane, 2-propenyl-	C ₉ H ₁₆	627.9	124	0.0120152
1,6-Heptadiene, 3,3-dimethyl-	C ₉ H ₁₆	629.95	124	0.00681808
Cyclohexane, 1-methyl-4-(1-methylethyl)-, trans-	C ₁₀ H ₂₀	630.7	140	0.03957699
Benzene, tert-butyl-	C ₁₀ H ₁₄	634.3	134	0.0755003
Cyclooctane, ethyl-	C ₁₀ H ₂₀	634.9	140	0.00889456
Benzene, 1,2,3-trimethyl-	C ₉ H ₁₂	638.8	120	0.17951043

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Pentalene, octahydro-2-methyl-	C9H16	639.3	124	0.0059506
Decane	C10H22	646.75	142	3.21109497
1-Methyl-4-(1-methylethyl)-cyclohexane	C10H20	653.8	140	0.00965208
Benzene, (2-methylpropyl)-	C10H14	662.55	134	0.02784681
Octane, 5-ethyl-2-methyl-	C11H24	666.3	156	0.01826537
Decane, 5-methyl-	C11H24	668.95	156	0.00271494
Heptane, 5-ethyl-2-methyl-	C10H22	673.55	142	0.00122557
Nonane, 2,5-dimethyl-	C11H24	678.5	156	0.10845822
Benzene, 1-methyl-3-(1-methylethyl)-	C10H14	683.1	134	0.01185046
Nonane, 2,6-dimethyl-	C11H24	684.9	156	0.18715132
Benzene, (1-methylethyl)-	C9H12	686.9	120	0.06160823
Benzene, 1-methyl-3-(1-methylethyl)-	C10H14	692.15	134	0.0046282
Hexane, 3,3-dimethyl-	C8H18	694.35	114	0.06296863
Cyclohexane, (1-methylpropyl)-	C10H20	696.75	140	0.00673076
Bicyclo[3.1.0]hexan-3-one, 4-methyl-1-(1-methylethyl)-	C10H16O	700.3	152	0.00062463
1-Undecene, 4-methyl-	C12H24	701.9	168	0.00281025
Decane, 2,9-dimethyl-	C12H26	707.4	170	0.05542982
Cyclohexane, butyl-	C10H20	708.75	140	0.11135893
Cyclopentane, butyl-	C9H18	712.8	126	0.00597506
Nonane, 3,7-dimethyl-	C11H24	714.1	156	0.0258436
Cyclohexane, 1-ethyl-1-methyl-	C9H18	717.1	126	0.01329879
Oxalic acid, allyl nonyl ester	C14H24O4	728.55	256	0.01958332
1-Undecene, 4-methyl-	C12H24	734.35	168	0.01723648
Benzene, 1-methyl-4-propyl-	C10H14	737.3	134	0.0337594
Nonane, 2,3-dimethyl-	C11H24	740.65	156	0.0083502
Heptane, 4-ethyl-	C9H20	745.25	128	0.14216506
Benzene, 1-ethyl-2,4-dimethyl-	C10H14	748.4	134	0.02302071
Decane, 4-methyl-	C11H24	751.65	156	0.09055468
Cyclohexene, 1-ethyl-	C8H14	753.25	110	0.00243033
Cyclohexane, 1-ethyl-1,3-dimethyl-, trans-	C10H20	754.15	140	0.00409222
1,1'-Bicyclopentyl	C10H18	758.85	138	0.05416038
Decane, 2-methyl-	C11H24	759.25	156	0.18090519
Benzene, 1-methyl-2-propyl-	C10H14	763.75	134	0.01396888
Decane, 3-methyl-	C11H24	770.4	156	0.14348908
Benzene, 1-methyl-2-(1-methylethyl)-	C10H14	781.55	134	0.0097385
Benzene, 1-methyl-2-(1-methylethyl)-	C10H14	786.4	134	0.01041324
Cyclohexane, 2,4-diethyl-1-methyl-	C11H22	792.1	154	0.00261226
Cyclopentane, 1-hydroxymethyl-1,3-dimethyl-	C8H16O	800.55	128	0.03104365
Benzene, 1,3-diethyl-5-methyl-	C11H16	811.3	148	0.00512011
Oxalic acid, allyl octadecyl ester	C23H42O4	816.35	382	0.00361689
Undecane	C11H24	822.85	156	2.20150674
Benzene, (1,2-dimethylpropyl)-	C11H16	825.95	148	0.03479436
Benzene, 2-ethyl-1,3-dimethyl-	C10H14	832.45	134	0.00434793

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Ether, p-methylbenzyl vinyl	C10H12O	839.7	148	0.00990163
Tricyclo[3.3.1.1(3,7)]decane, 1-nitro-	C10H15NO2	846.4	181	0.0087278
Undecane, 5-methyl-	C12H26	851.6	170	0.00543039
Benzene, 1-methyl-3-(1-methylethyl)-	C10H14	854.25	134	0.00274638
Naphthalene, decahydro-2-methyl-	C11H20	857.65	152	0.02449836
Decane, 3,7-dimethyl-	C12H26	863.4	170	0.00674228
Oxalic acid, allyl nonyl ester	C14H24O4	866.7	256	0.00147047
Decane, 3,7-dimethyl-	C12H26	869	170	0.03068788
Adamantane, 1,3-dimethyl-	C12H20	870.9	164	0.00451136
1-Methyldecahydronaphthalene	C11H20	885.6	152	0.01166247
Cyclohexane, pentyl-	C11H22	887.75	154	0.00082894
Cyclohexane, pentyl-	C11H22	889.9	154	0.05306984
5-Ethyldecane	C12H26	896.85	170	0.02340175
Benzene, 1-methyl-4-(1-methylpropyl)-	C11H16	900.9	148	0.00985352
Decane, 4-ethyl-	C12H26	906.95	170	0.01729106
Heptane, 4-(1-methylethyl)-	C10H22	915.95	142	0.00909327
Benzene, 1,3-diethyl-	C10H14	916.3	134	0.00542534
Undecane, 5-methyl-	C12H26	918.4	170	0.03613556
Undecane, 4-methyl-	C12H26	925.7	170	0.03880886
Ether, p-methylbenzyl vinyl	C10H12O	927.45	148	0.00382489
Undecane, 2-methyl-	C12H26	934.55	170	0.0975467
Undecane, 3-methyl-	C12H26	945.75	170	0.07571255
Pentane, 2,2,3,3-tetramethyl-	C9H20	952.85	128	0.01337156
Cyclohexene, 2-ethenyl-1,3,3-trimethyl-	C11H18	958.1	150	0.00230379
Octane, 2,3,7-trimethyl-	C11H24	962.35	156	0.00327083
Cyclohexane, 1-ethyl-1-methyl-	C9H18	978.7	126	0.01495432
Naphthalene	C10H8	979.75	128	0.05178119
Cyclohexane, 1-ethyl-1,4-dimethyl-, trans-	C10H20	985.85	140	0.00857205
Adamantane, 1,3-dimethyl-	C12H20	986.9	164	0.00191831
Dodecane	C12H26	996.95	170	1.40830938
Cycloheptane, bromo-	C7H13Br	997.2	176	0.00451409
Cyclohexane, pentyl-	C11H22	1001.8	154	0.00310538
Oxalic acid, allyl hexadecyl ester	C21H38O4	1013.2	354	0.00279176
Undecane, 2,6-dimethyl-	C13H28	1018.6	184	0.18242124
Undecane	C11H24	1025.6	156	0.02854116
Benzene, 1,3-diethyl-5-methyl-	C11H16	1037.75	148	0.00377466
3-Hexene, 2-methyl-, (Z)-	C7H14	1041.95	98	0.00248359
Dodecane, 2-methyl-	C13H28	1043.6	184	0.01258524
Naphthalene, 2-ethyldecahydro-	C12H22	1056	166	0.00170596
3-Hexanone, 2,4-dimethyl-	C8H16O	1063.7	128	0.00809126
Cyclohexane, hexyl-	C12H24	1068.8	168	0.02870994
Undecane, 4-ethyl-	C13H28	1075.15	184	0.00413012
Octane, 4-ethyl-	C10H22	1083.3	142	0.00085276
Undecane, 2,4-dimethyl-	C13H28	1086.8	184	0.01577197

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Dodecane, 4-methyl-	C13H28	1095.05	184	0.01744974
Tridecane, 3-methyl-	C14H30	1104.15	198	0.05833457
Octane, 2,3,7-trimethyl-	C11H24	1117.55	156	0.12712585
Decane, 2,6,6-trimethyl-	C13H28	1122.05	184	0.0390019
Cyclohexane, 1-ethyl-1,3-dimethyl-, trans-	C10H20	1138.9	140	0.0014078
Tridecane	C13H28	1164.1	184	0.93779821
Octane, 2,3,7-trimethyl-	C11H24	1181	156	0.00733051
Dodecanoic acid, 2-hexen-1-yl ester	C18H34O2	1186.25	282	0.00164845
Dodecane, 2,6,10-trimethyl-	C15H32	1191	212	0.02319455
Cyclohexane, 1,1,4,4-tetramethyl-	C10H20	1198.85	140	0.0020402
Hexane, 2,2,3,3-tetramethyl-	C10H22	1199.25	142	0.00261599
Octane, 2,7-dimethyl-	C10H22	1208.05	142	0.00227084
Heptane, 2,3,5-trimethyl-	C10H22	1224.15	142	0.00311245
Cyclohexane, hexyl-	C12H24	1239.6	168	0.0203838
Tridecane, 6-methyl-	C14H30	1243.6	198	0.02396976
Tridecane, 5-methyl-	C14H30	1248.35	198	0.01965508
Tridecane, 4-methyl-	C14H30	1256.7	198	0.01809658
Tridecane, 3-methyl-	C14H30	1265.9	198	0.04112538
Tridecane, 3-methyl-	C14H30	1276.6	198	0.02845525
Dodecane, 2,6,10-trimethyl-	C15H32	1284.65	212	0.06808682
Decane	C10H22	1290.8	142	0.00755266
Biphenyl	C12H10	1299.6	154	0.0069809
Tetradecane	C14H30	1323	198	0.65375108
1H-Indene, octahydro-2,2,4,4,7,7-hexamethyl-, trans-	C15H28	1376.15	208	0.00837426
Cyclohexane, undecyl-	C17H34	1401.5	238	0.01386579
Decane, 2,3,5,8-tetramethyl-	C14H30	1414.55	198	0.06385299
Tridecane, 3-methyl-	C14H30	1419.35	198	0.03106589
Tridecane, 3-methyl-	C14H30	1419.75	198	0.00264308
Octane, 2,7-dimethyl-	C10H22	1429.75	142	0.01522923
Tetradecane	C14H30	1473.55	198	0.45715982
Oxalic acid, butyl cyclohexylmethyl ester	C13H22O4	1485.6	242	0.00315854
Decane, 5-propyl-	C13H28	1539.45	184	0.00611858
Cyclohexane, (1-methylethyl)-	C9H18	1554.6	126	0.00950715
Nonadecane, 2-methyl-	C20H42	1564.75	282	0.01761044
Pentadecane, 3-methyl-	C16H34	1574.9	226	0.00790782
Diphenyl sulfide	C12H10S	1605.75	186	0.00319038
Hexadecane	C16H34	1616.15	226	0.31811783
Decane, 2,6,8-trimethyl-	C13H28	1680.2	184	0.04524399
Decane, 2,9-dimethyl-	C12H26	1702.4	170	0.00882179
1-Iodo-2-methylundecane	C12H25I	1712.5	296	0.00576897
Naphthalene, 1,6-dimethyl-4-(1-methylethyl)-	C15H18	1726.85	198	0.00388938
Hexadecane	C16H34	1751.45	226	0.08434595

Table A11.1 GC-TOFMS results (cont.)

Name	Formula	Retention Time (s)	Molecular Weight	%Area
Dodecane, 2,6,10-trimethyl-	C15H32	1756.35	212	0.00795269
Oxalic acid, allyl hexadecyl ester	C21H38O4	1761	354	0.00214622
1-Iodo-2-methylundecane	C12H25I	1764.05	296	0.01142495
Decane, 2,4-dimethyl-	C12H26	1816.7	170	0.00333824
Heptadecane, 2-methyl-	C18H38	1833.25	254	0.00575968
Nonadecane	C19H40	1880	268	0.17248606
Dodecane, 2,7,10-trimethyl-	C15H32	1888.65	212	0.01489671
1-Methyl-4-(1-methylethyl)-cyclohexane	C10H20	1893.35	140	0.00116938
Oxalic acid, isobutyl nonyl ester	C15H28O4	1930.95	272	0.0024463
Nonadecane	C19H40	2002.35	268	0.13411989
1-Iodo-2-methylundecane	C12H25I	2076.35	296	0.00266198
Cyclohexane, (1-methylethyl)-	C9H18	2089.15	126	0.00205415
Nonadecane	C19H40	2118.95	268	0.10516334
Eicosane	C20H42	2230.4	282	0.08380421
Decane, 2,9-dimethyl-	C12H26	2297.95	170	0.00183765
Cyclohexane, octyl-	C14H28	2318.35	196	0.00123184
Heptacosane	C27H56	2336.95	380	0.06461506
Heptacosane	C27H56	2439.2	380	0.05092513
Decane	C10H22	2501.15	142	0.00152373
Heptacosane	C27H56	2537.2	380	0.03920606
Octadecane, 2-methyl-	C19H40	2631.4	268	0.03180168
Eicosane, 2-methyl-	C21H44	2722.05	296	0.02345026
Heptacosane	C27H56	2809.35	380	0.0187879
Eicosane, 2-methyl-	C21H44	2893.6	296	0.0138567
Nonadecane, 2-methyl-	C20H42	2974.9	282	0.01032127
1-Iodo-2-methylundecane	C12H25I	3053.6	296	0.00714939
Sulfurous acid, 2-propyl tridecyl ester	C16H34O3S	3129.6	306	0.00559473

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Presentations:

1. Jirarattanawanna, S.; Saiwan, C.; and Torabi, F. (2015, April 20) Measurement of minimum miscibility pressure of CO₂ in Thai crude oil. Effect of gas impurity. Paper presented at The 6th Research Symposium on Petroleum, Petrochemicals, and Polymers, Bangkok, Thailand.
2. Jirarattanawanna, S.; Saiwan, C.; and Torabi, F. (2015, May 20-22) Measurement of minimum miscibility pressure of CO₂ in Thai crude oil. Effect of gas impurity. Paper presented at EST International Conference and Exhibition, Karlsruhe, Germany