

Figure 14: Sample (iii) at 9°F

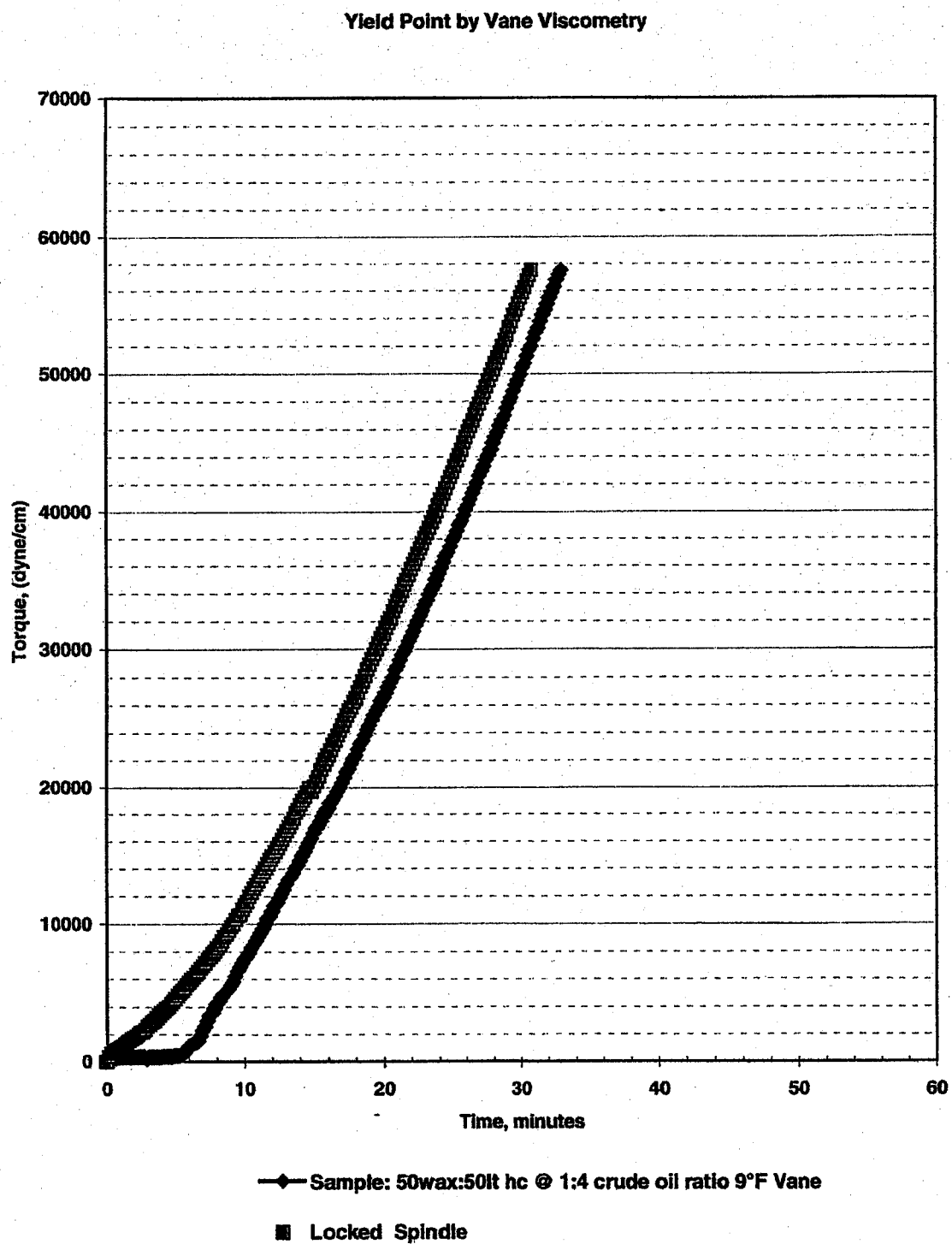


Figure 15: Sample (iv) at 60°F

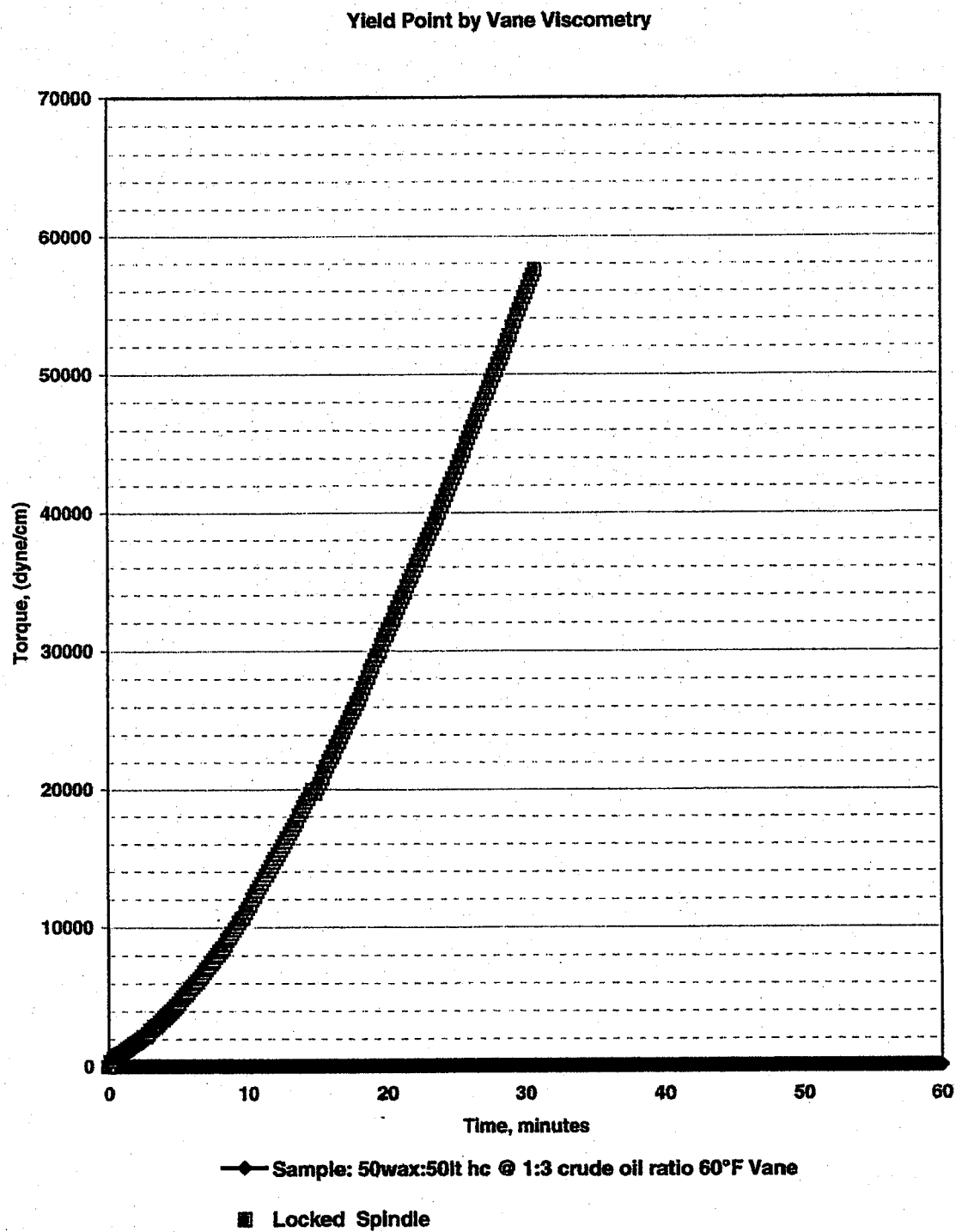


Figure 16: Sample (iv) at 40°F

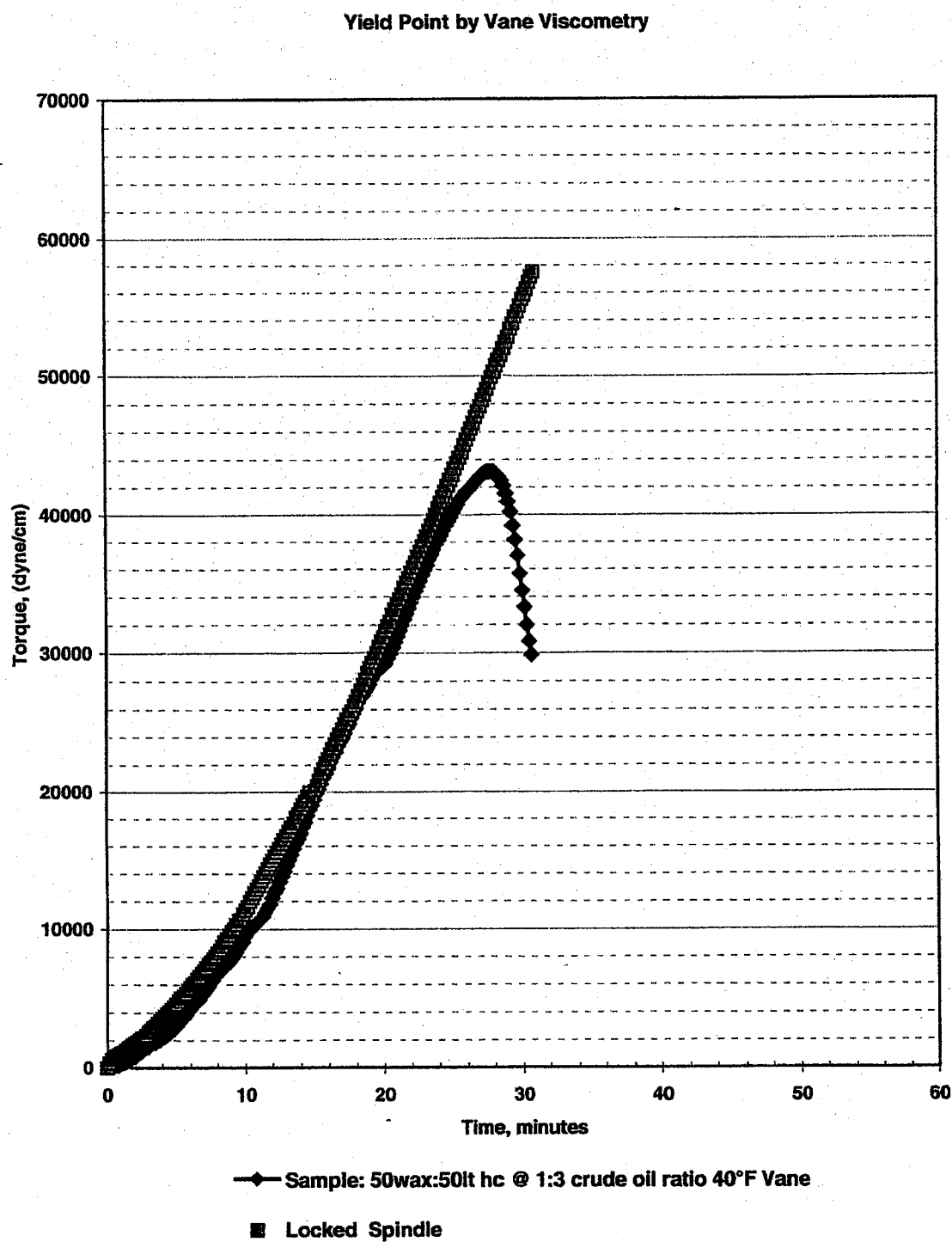


Figure 17: Sample (iv) at 20°F

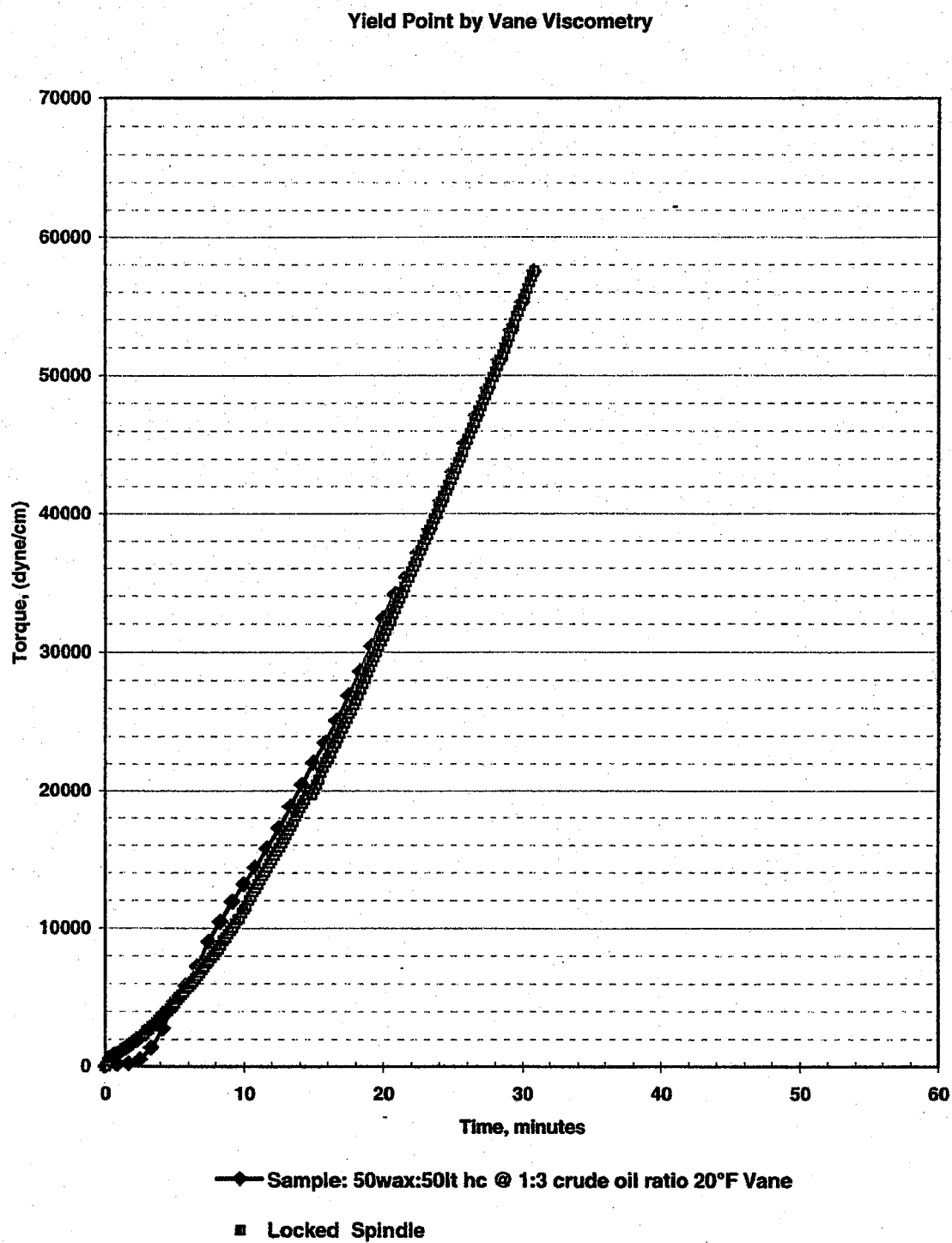


Figure 18: Sample (iv) at 9°F

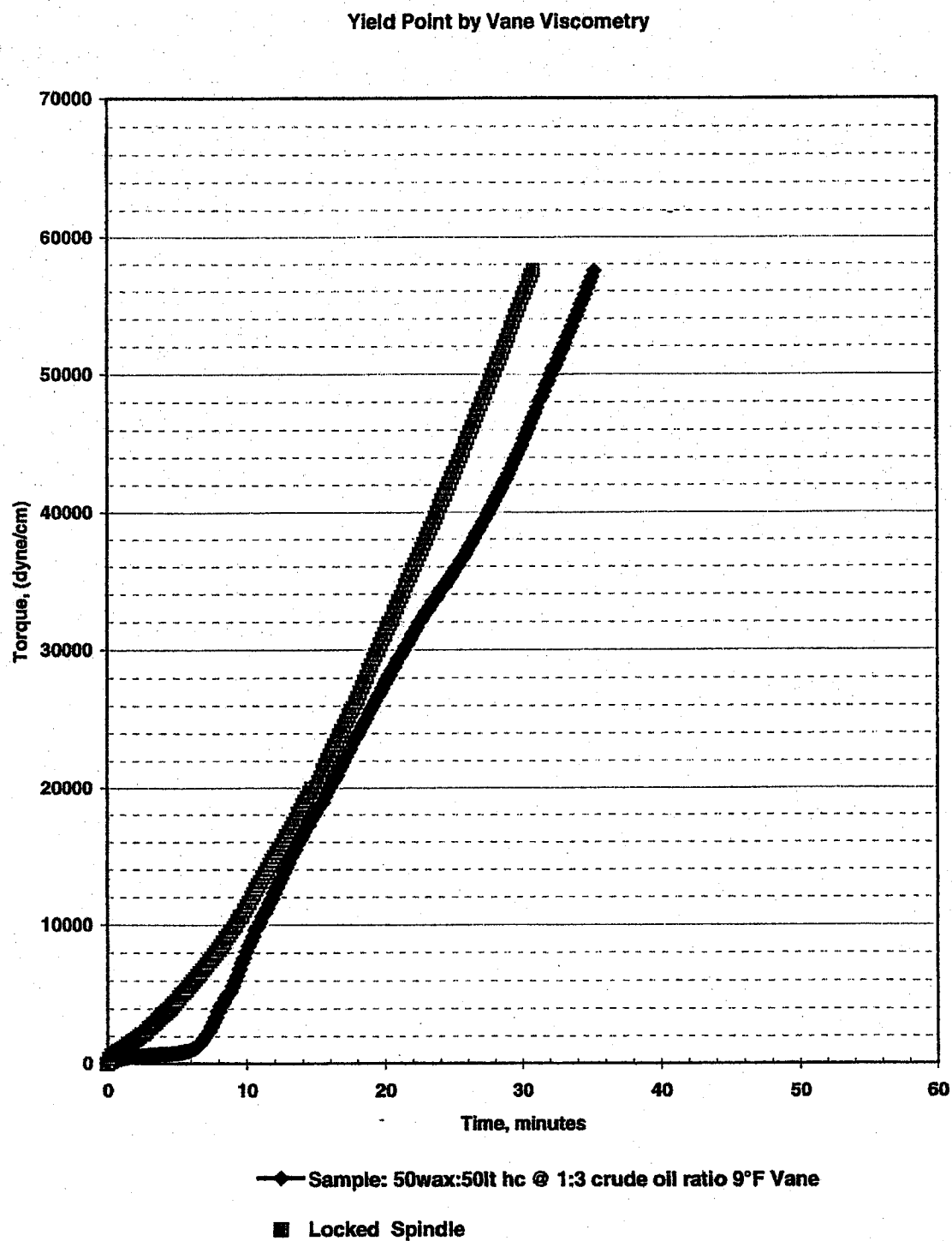


Figure 19: Sample (v) at 20°F

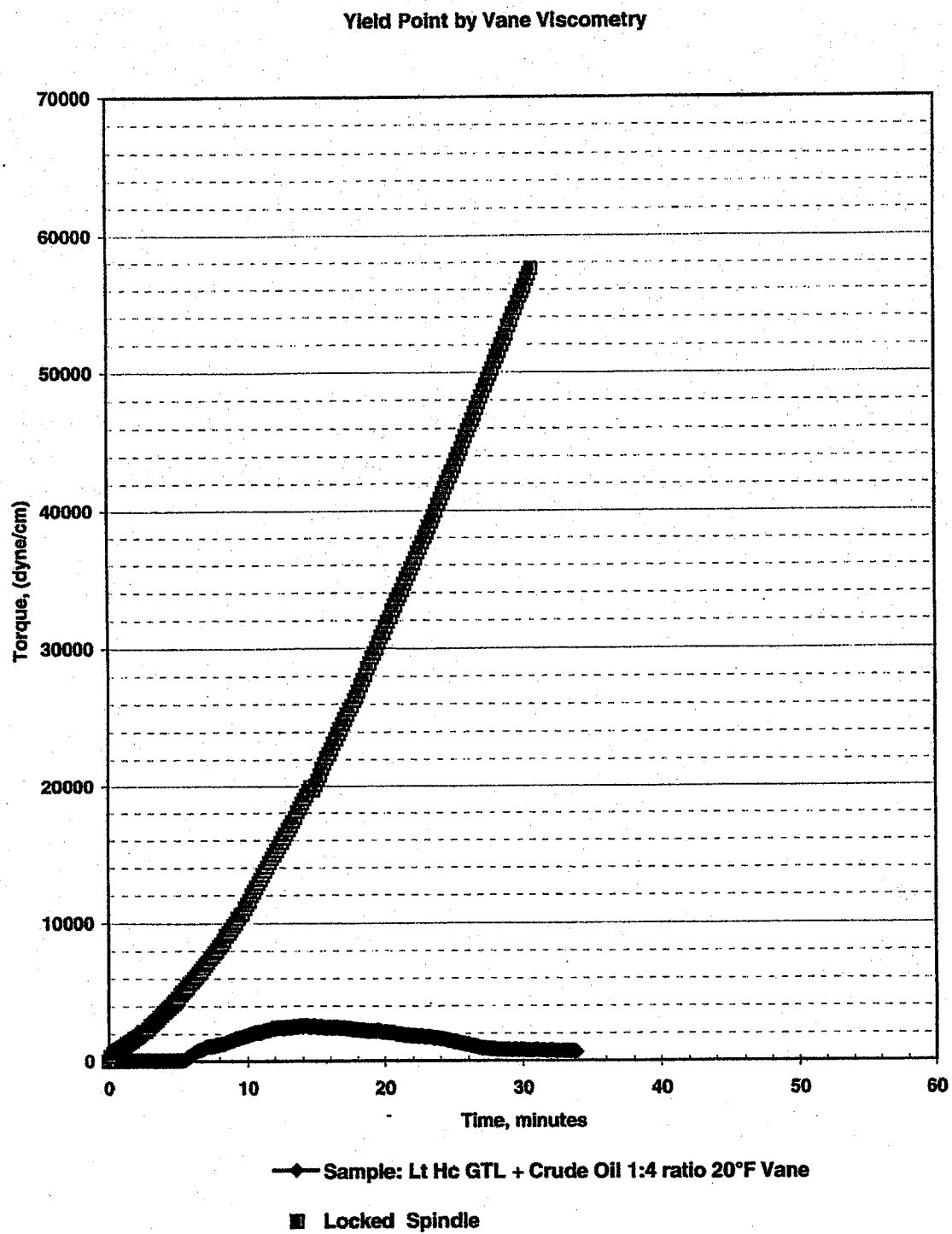


Figure 20: Sample (v) at 9°F

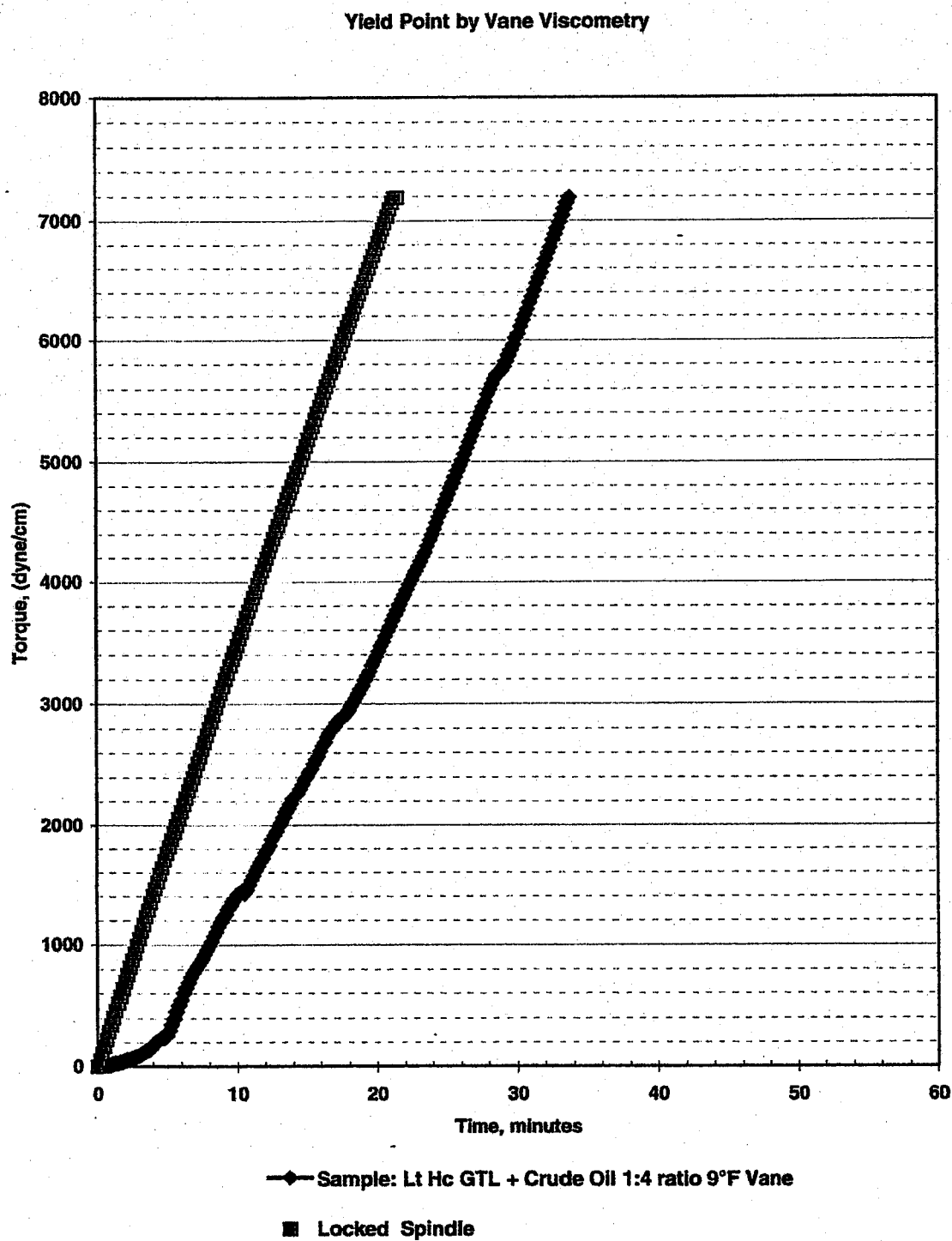


Figure 21: Sample (v) at 9°F

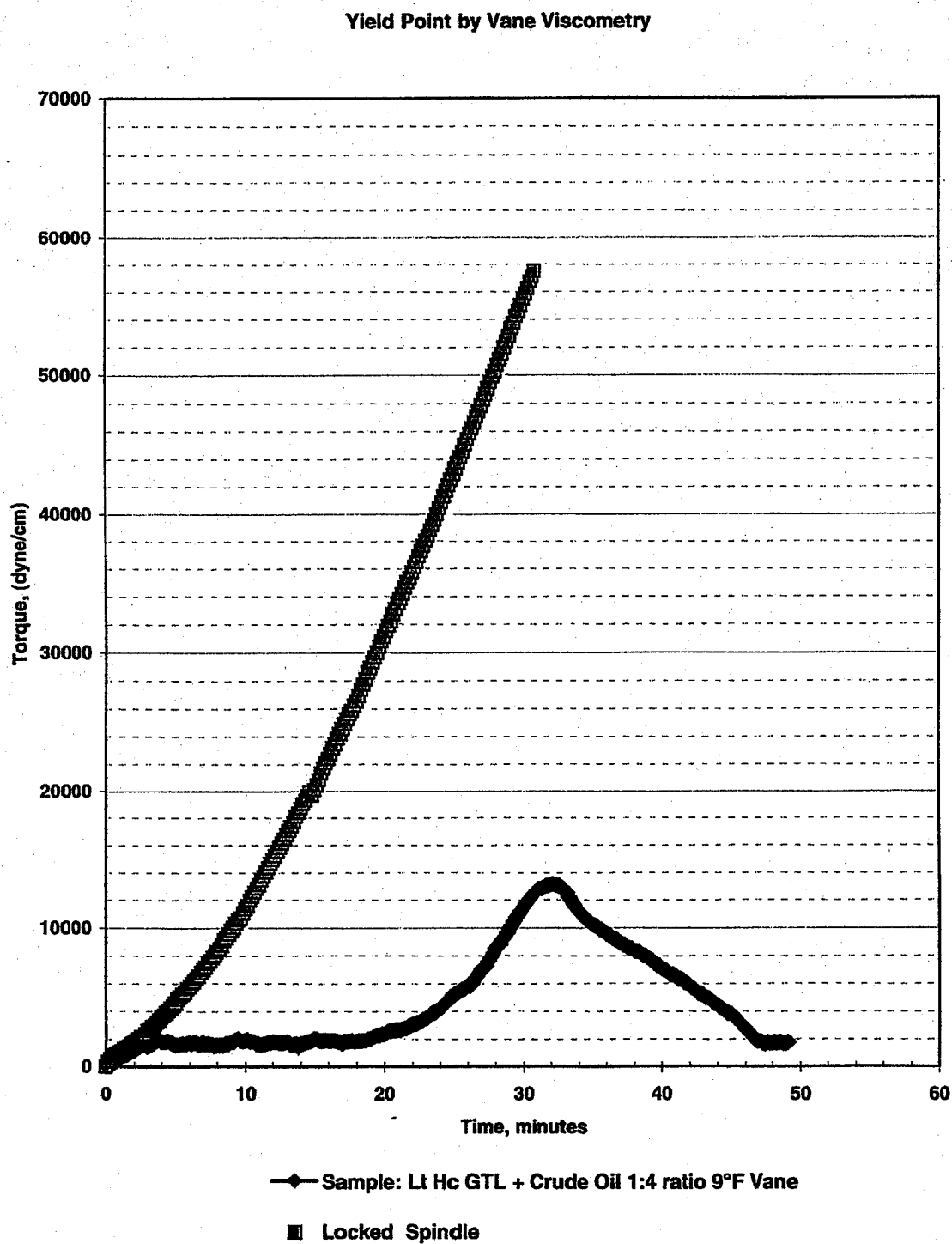


Figure 22: Sample (v) at 0°F

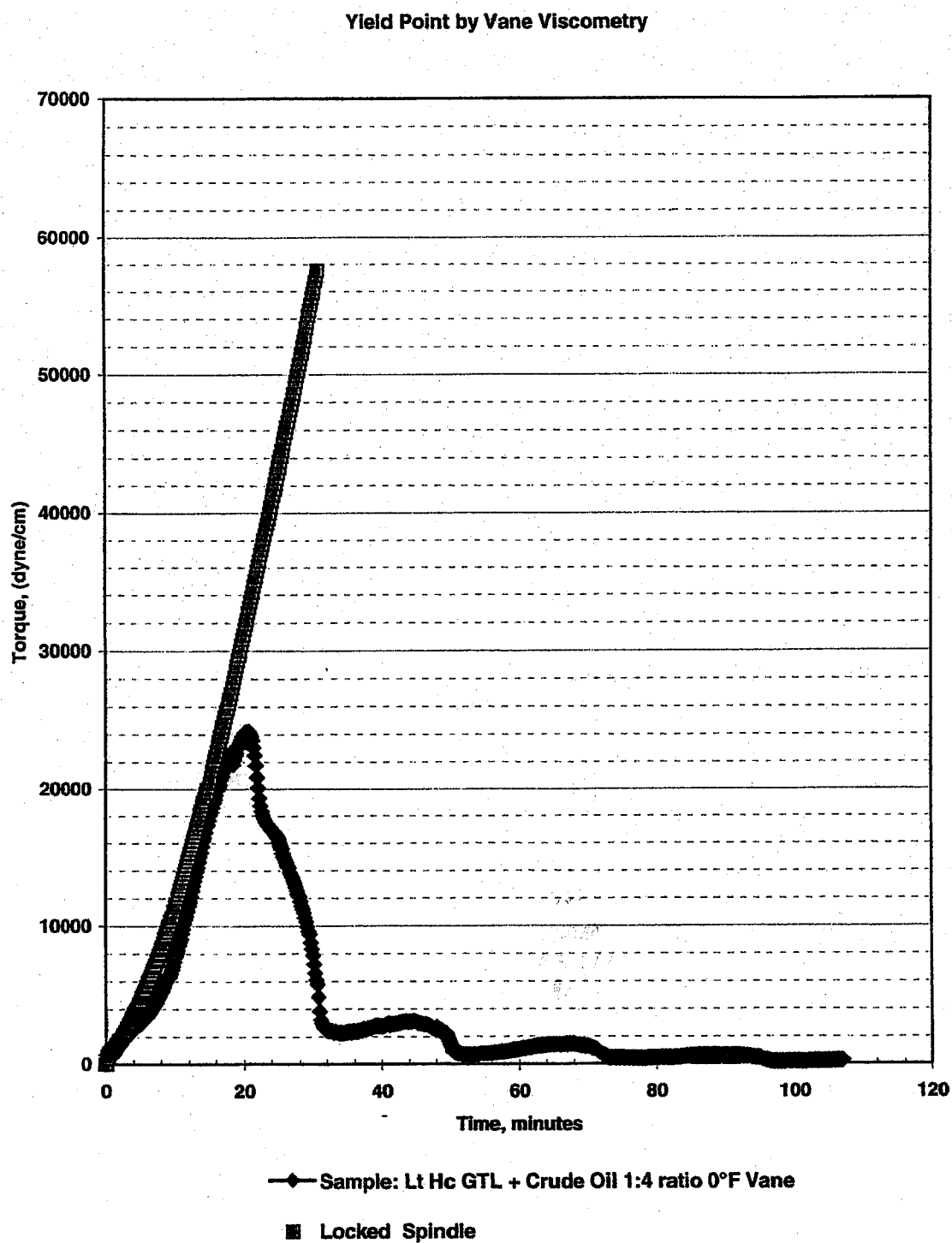


Figure 23: Sample (vi) at 20°F

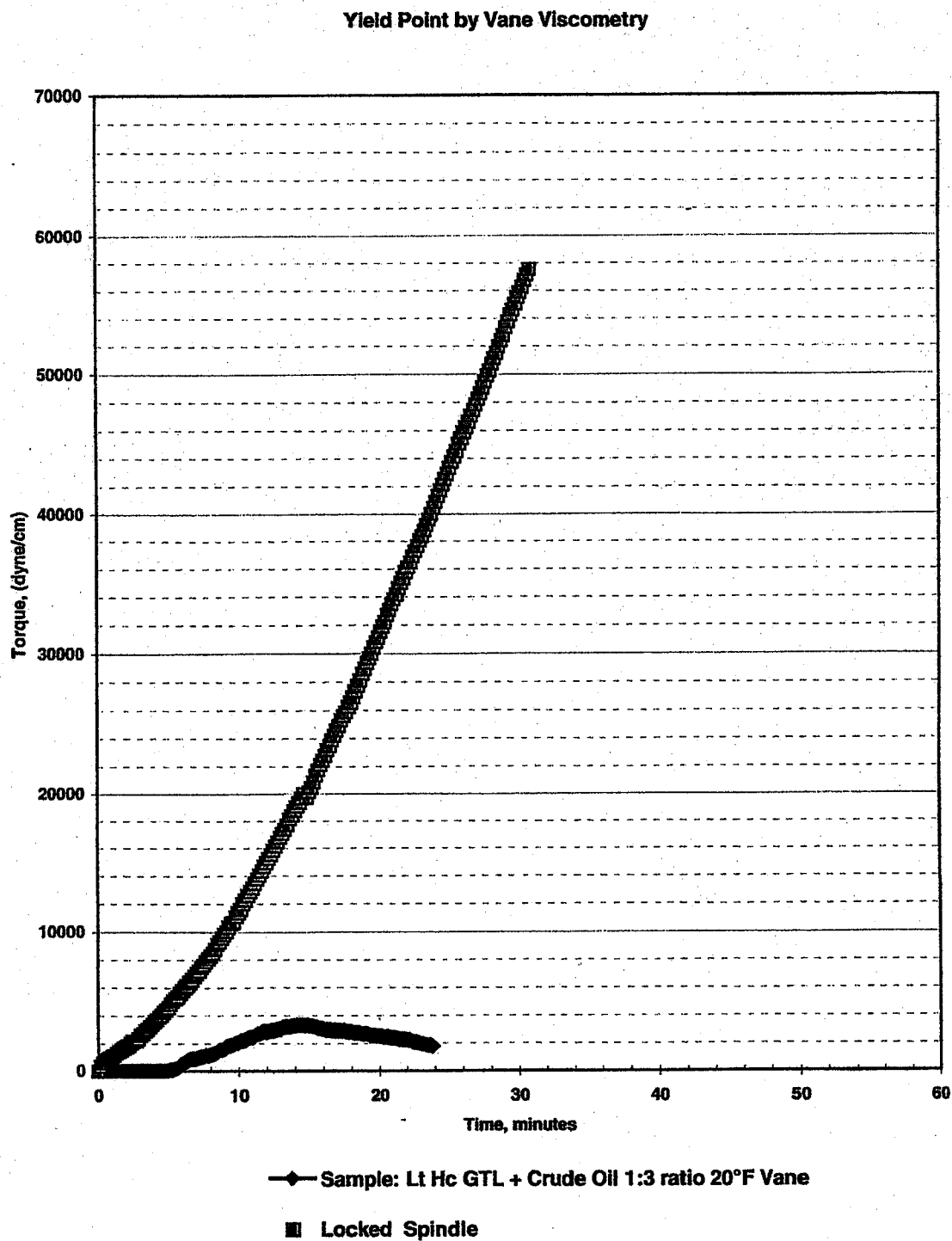


Figure 24: Sample (vi) at 9°F

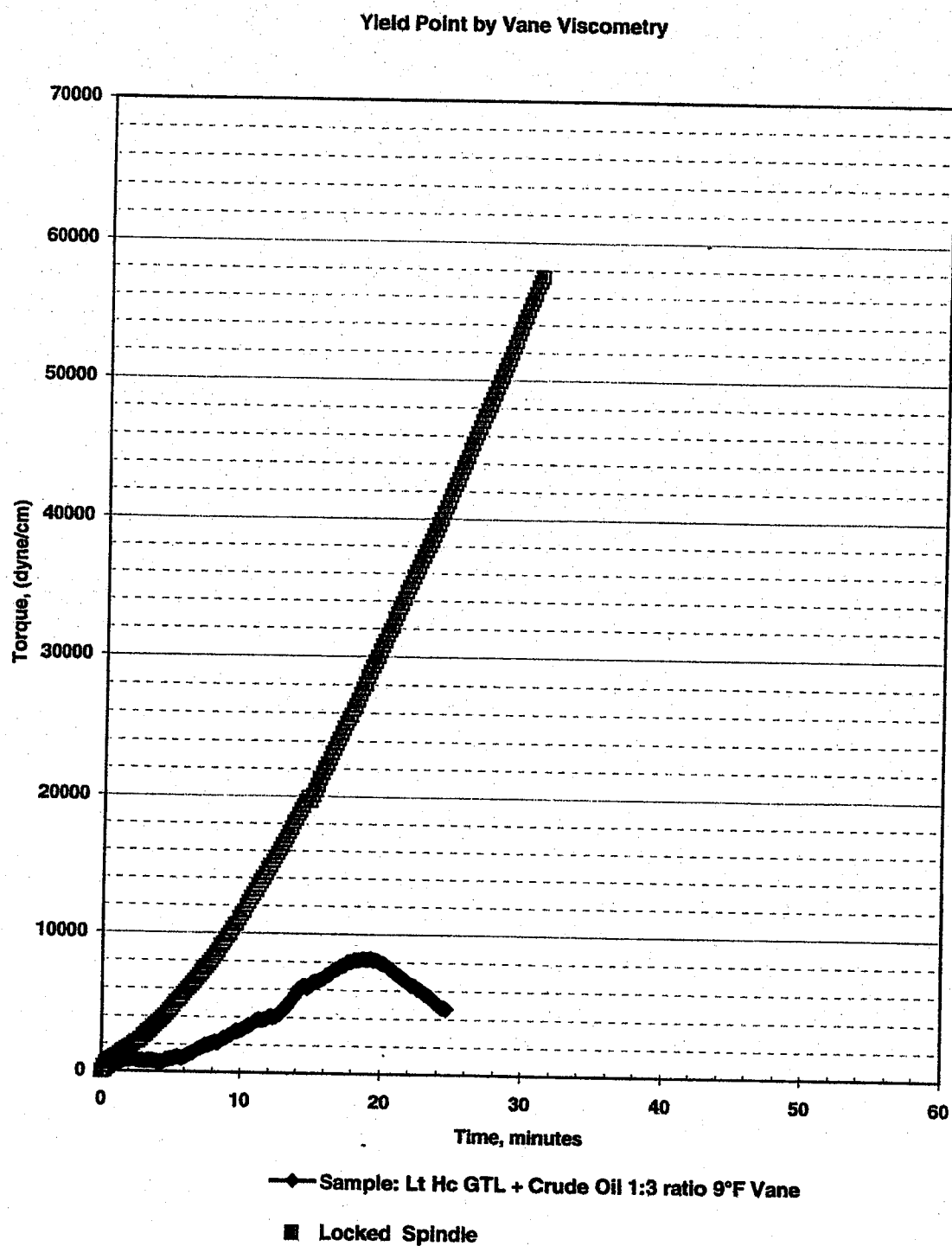


Figure 25: Sample (vi) at 9°F

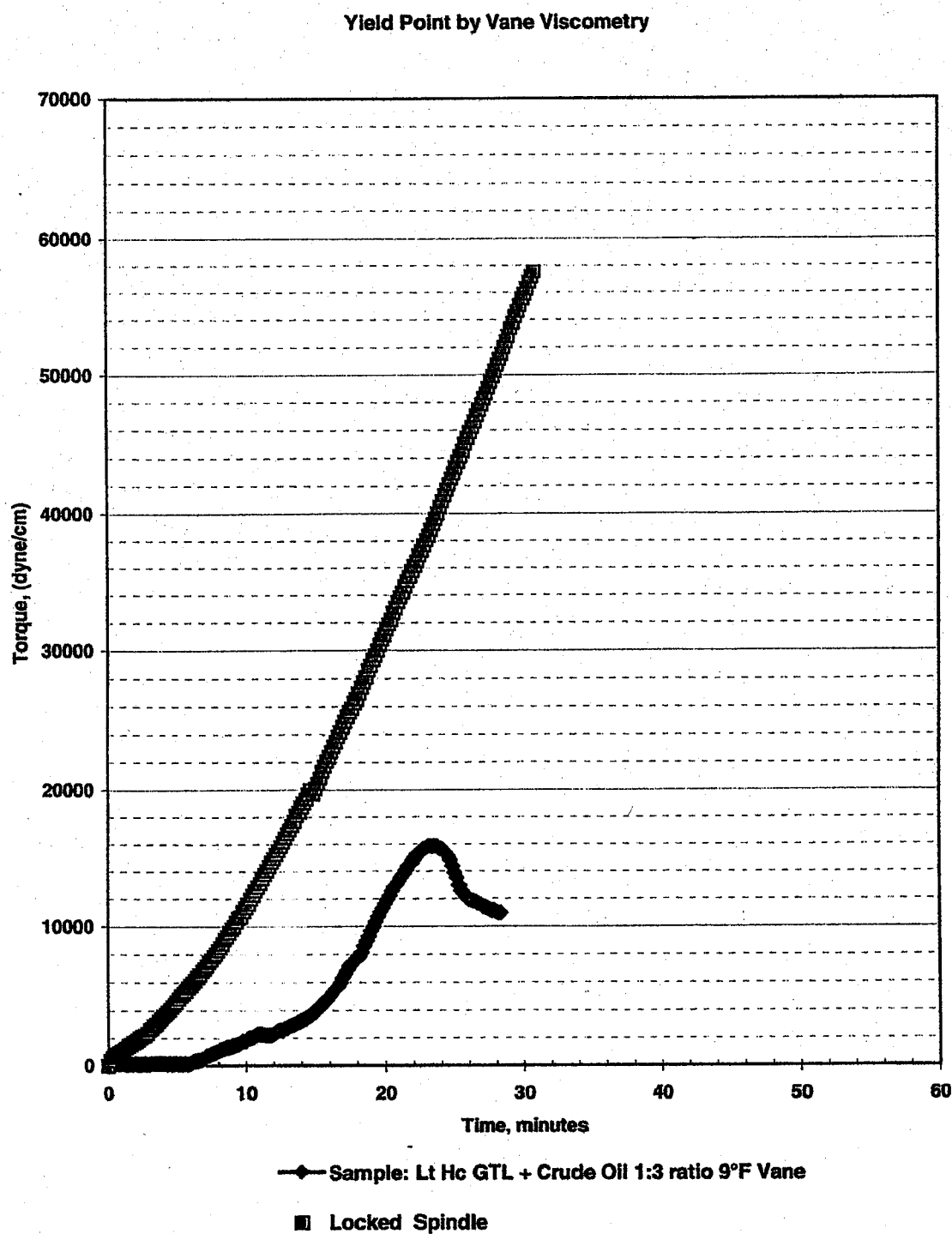
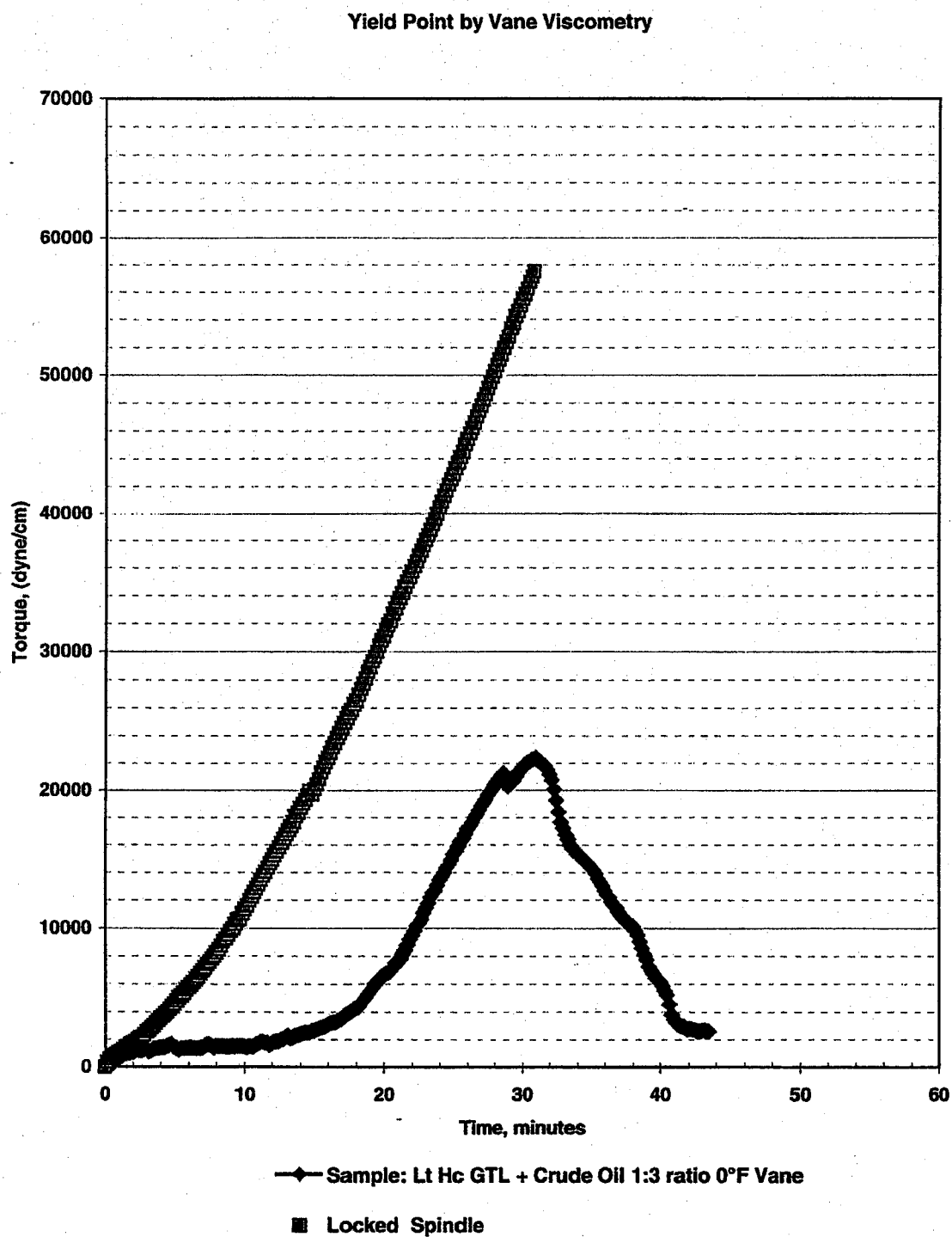


Figure 26: Sample (vi) at 0°F



SECTION 2

Quantitative Composition of GTL & Crude Oil Blends By Capillary Gas Chromatography

EXTENDED GAS CHROMATOGRAPHY - LIQUID HYDROCARBON ANALYSIS

This liquid hydrocarbon test method was developed to analyze a wide range of liquid samples from light condensate oils through heavy black oils. The GC apparatus has undergone extensive testing and modifications. It has proven to be a reliable means to obtain an accurate composition on most liquid hydrocarbon samples.

Liquid hydrocarbon samples may or may not require an internal standard to be added. All black oils require an internal standard for quantification, but condensates that elute completely do not. If a liquid is questionable, then the internal standard is added. Carbon disulfide is added to viscous samples.

Once the sample has been prepared, it is placed in an auto sampler vial. An auto sampler is used because the analysis time for a liquid is 90 minutes, and the samples are most often analyzed automatically over night. The gas chromatograph is connected to a personal computer for file storage and retrieval. Data can be recalled and re-analyzed using various parameters.

The GC instrument also undergoes a vigorous quality control scheme that takes almost the entire day due the length of the analysis. Quality Control samples are used prior to analyses of samples. They consist of a Discrimination Standard (Normal Alkanes prepared in Undecane) to check the system initially, an Aromatic Standard to calculate response factors for the desired aromatics, D-2887 Reference Gas Oil No.1, and either of two crude oil standards prepared and rigorously analyzed by various methods. Once the instrument meets all of these requirements, test samples are analyzed and the crude oil standard chosen will be analyzed after every fifth sample in the sequence.

For further detail, the standard laboratory procedure can be reviewed in Appendix C.

Compositional analyses are presented on the following pages in both tabular and graphical format. The two distillation wax and light hydrocarbon GTL mixtures at 25%:75% and 50%:50% weight ratios are presented first. Blended samples (i) through (iv) were also analyzed. The raw GTL and North Slope crude oil sample were similarly analyzed. The GTL and crude blends (samples v and vi) were not analyzed.

Quantitative Composition of GTL and Crude Oil Blends

Sample	Gas to liquids product (GTL)	25% Wax / 75% GTL	50% Wax / 50% GTL	TAPS Mix Crude Oil @ PS-1	25:75 Wax/GTL 80g @ 320g oil	25:75 Wax/GTL 100g @ 300g oil	50:50 Wax/GTL 80g @ 320g oil	50:50 Wax/GTL 100g @ 300g oil
ChemStation File	J261N.D	I865N.D	I866N.D	J260REG.D	I861IS0.D	I862IS0.D	I864IS0.D	I863IS0.D
Components	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%	Wt%
C2	0.002	0.003	0.003	0.009	0.000	0.001	0.002	0.001
C3	0.145	0.107	0.066	0.167	0.033	0.050	0.133	0.069
IC4	0.003	0.011	0.007	0.259	0.128	0.149	0.511	0.160
NC4	1.215	0.904	0.245	0.954	0.734	0.852	0.351	0.797
IC5	0.146	0.110	0.069	0.630	0.502	0.508	0.333	0.484
NC5	2.972	2.212	1.367	0.967	1.093	1.195	1.174	1.015
C6	7.826	5.800	3.901	1.836	2.758	3.050	2.443	2.463
BENZENE	0.003	0.002	0.001	0.340	0.270	0.255	0.271	0.244
C7	8.889	6.633	4.167	3.358	3.904	4.050	3.529	3.476
TOLUENE	0.029	0.022	0.016	0.792	0.623	0.538	0.421	0.565
C8	6.764	6.570	4.147	4.078	4.572	4.662	4.111	4.092
C9	8.539	6.384	4.071	4.115	4.506	4.579	4.142	4.048
C10	7.940	6.230	3.972	3.715	4.121	4.202	3.636	3.737
C11	7.290	5.607	3.989	3.174	3.663	3.760	3.291	3.367
C12	6.446	5.241	3.827	2.939	3.403	3.490	3.112	3.208
C13	5.748	4.908	3.554	3.308	3.554	3.640	3.160	3.413
C14	5.065	4.610	3.942	3.160	3.421	3.492	3.033	3.367
C15	4.414	4.367	4.101	3.108	3.312	3.359	3.266	3.342
C16	3.811	4.189	4.348	2.757	3.042	3.105	3.033	3.194
C17	3.273	4.096	4.699	2.636	2.914	2.985	3.047	3.184
C18	2.799	4.071	5.119	2.590	2.919	2.991	3.148	3.292
C19	2.389	4.070	5.522	2.543	2.847	2.923	3.184	3.329
C20	2.026	4.001	5.753	2.296	2.653	2.747	3.080	3.230
C21	1.705	3.795	5.674	2.134	2.493	2.571	2.876	3.079
C22	1.421	3.422	5.236	2.037	2.324	2.409	2.711	2.894
C23	1.165	2.914	4.511	1.898	2.122	2.163	2.456	2.600
C24	0.939	2.353	3.650	1.781	1.909	1.948	2.190	2.286
C25	0.747	1.816	2.304	1.669	1.723	1.744	1.929	1.984
C26	0.607	1.369	2.086	1.624	1.572	1.592	1.718	1.757
C27	0.583	1.094	1.584	1.557	1.470	1.478	1.563	1.570
C28	0.433	0.764	1.104	1.532	1.375	1.378	1.437	1.432
C29	0.247	0.458	0.710	1.482	1.249	1.274	1.321	1.270
C30+	2.418	1.866	2.457	14.506	28.757	26.796	23.444	27.061
Total	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

Wt% Wax	0.00	50.00	25.00	0.00	5.00	6.25	10.00	12.50
Wt% GTL	100.00	50.00	75.00	0.00	15.00	18.75	10.00	12.50
Wt% Crude	0.00	0.00	0.00	100.00	50.00	75.00	50.00	75.00

Figure 27

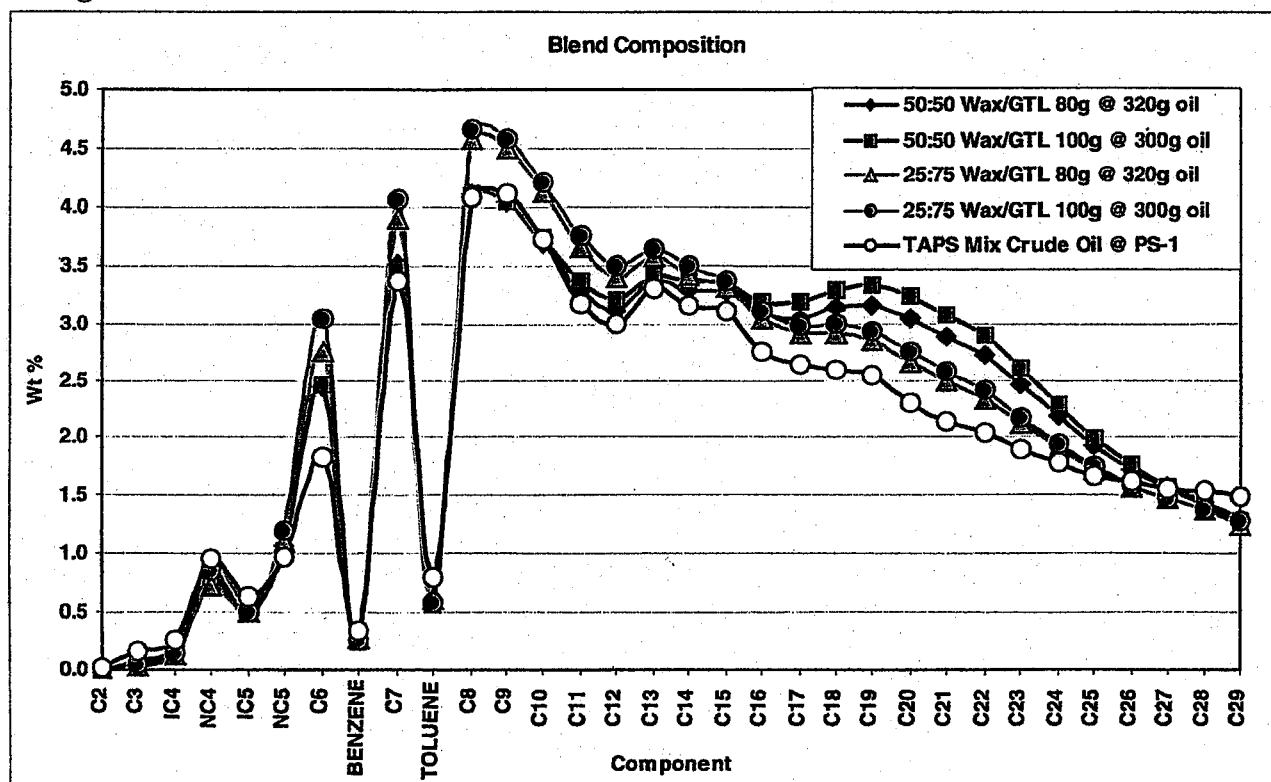


Figure 28

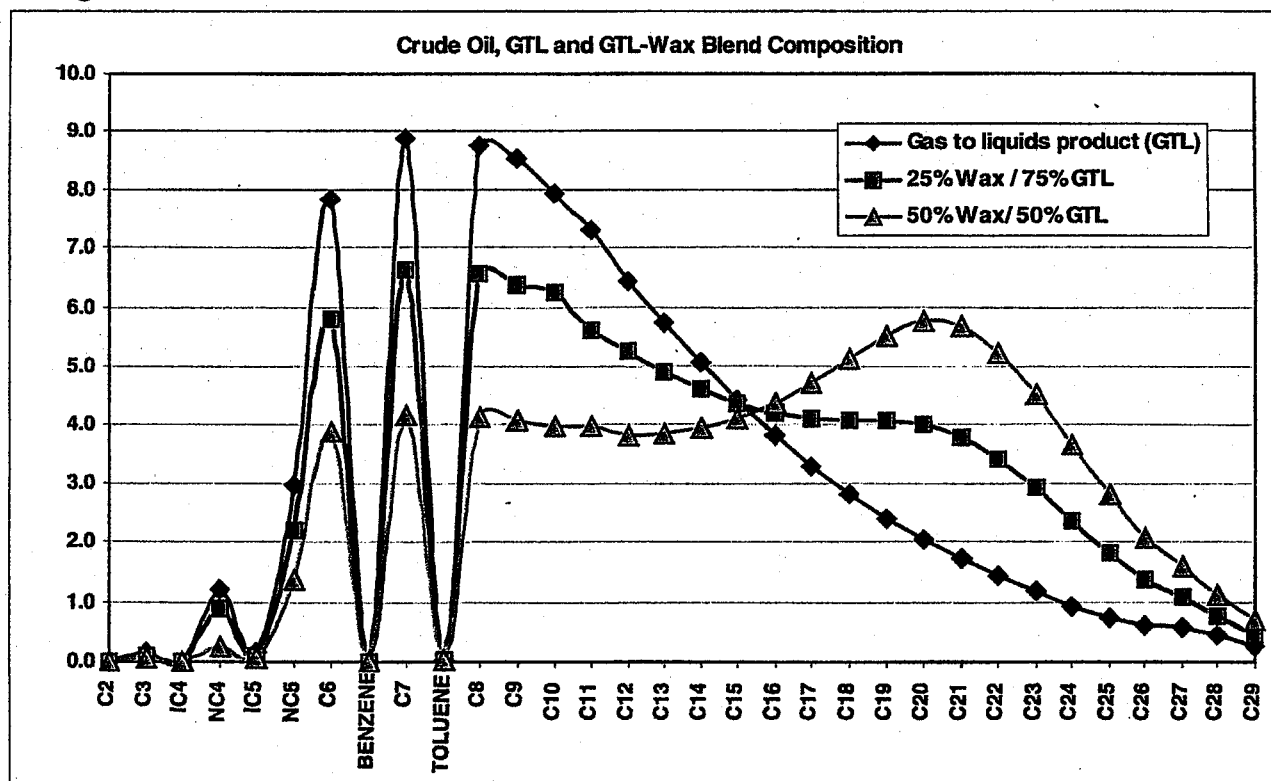


Figure 29

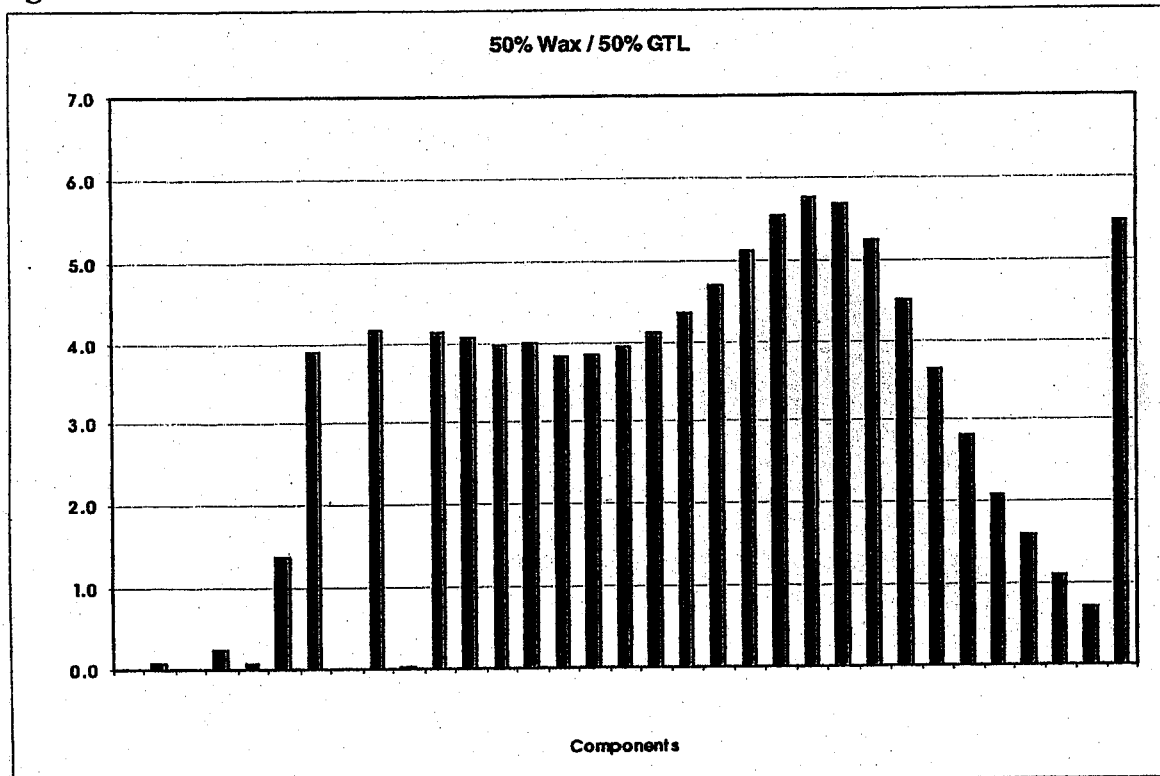


Figure 30

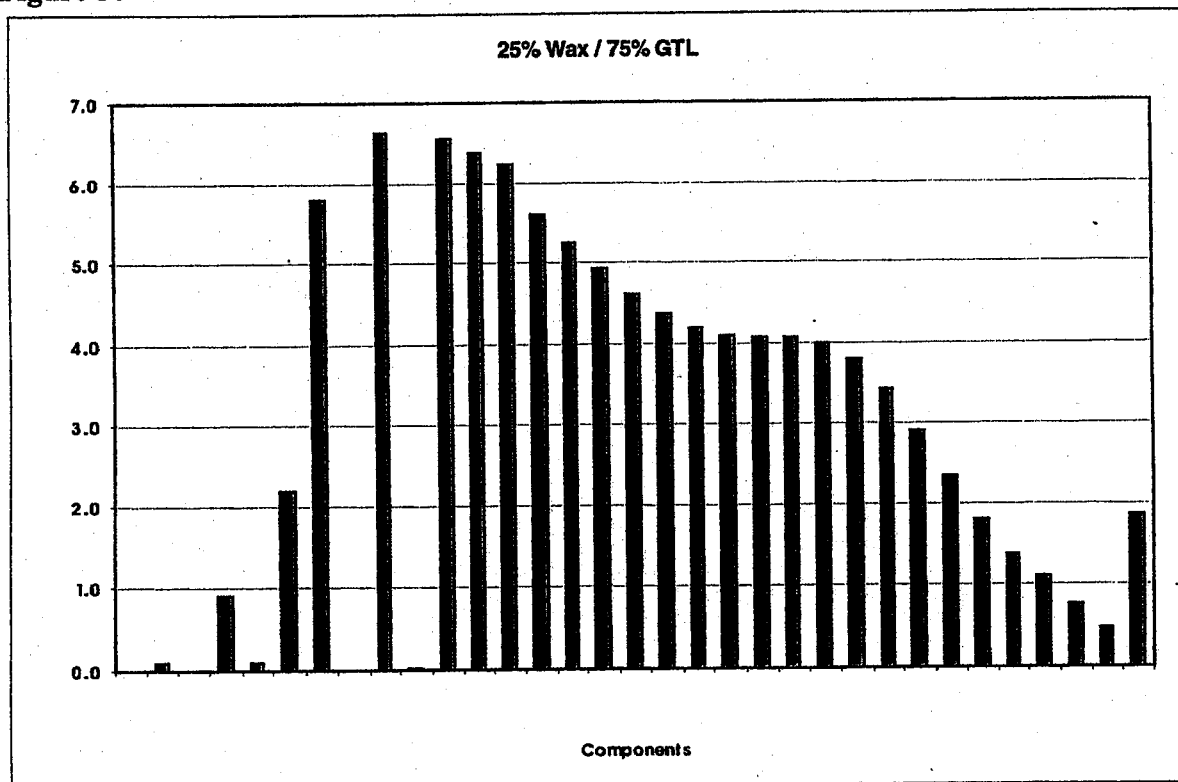


Figure 31

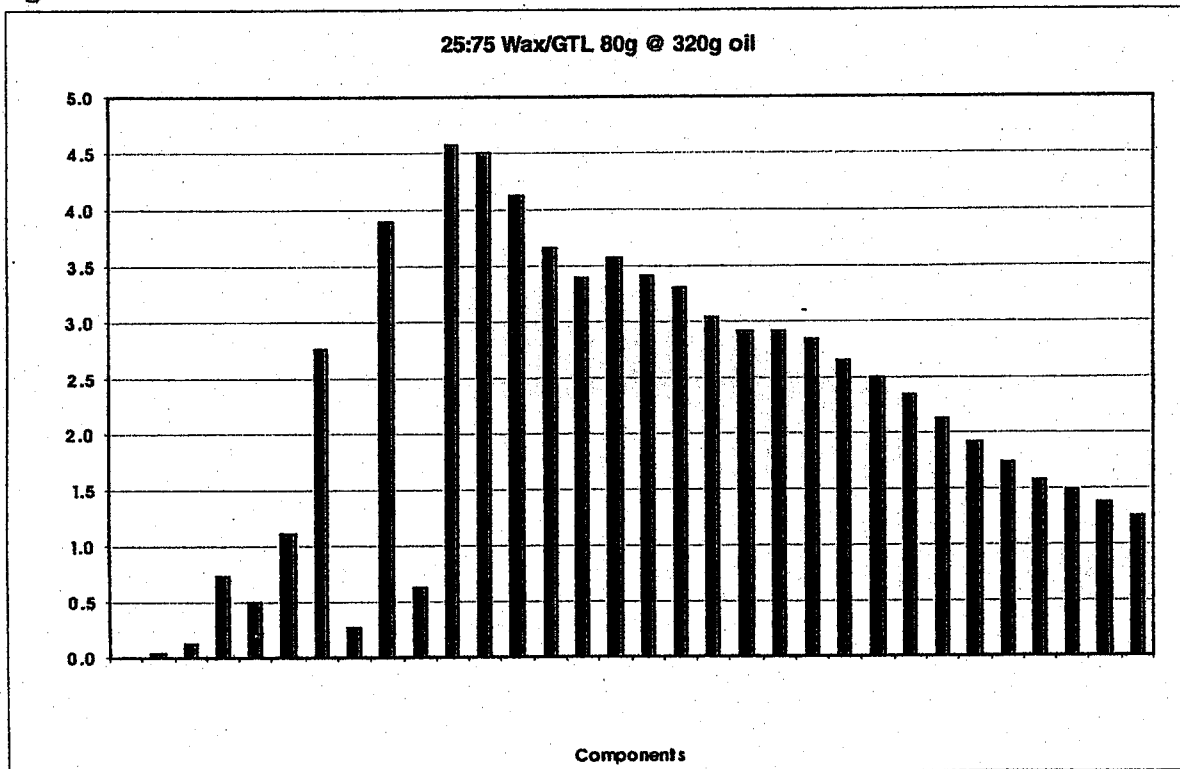


Figure 32

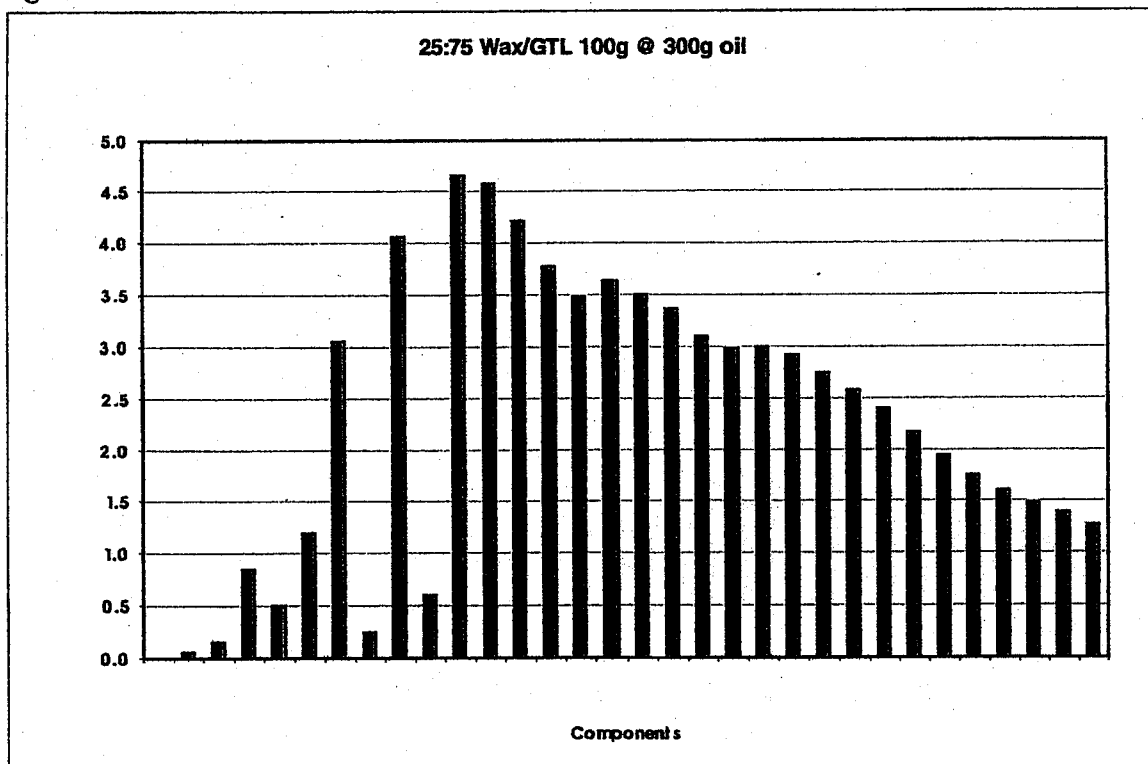


Figure 33

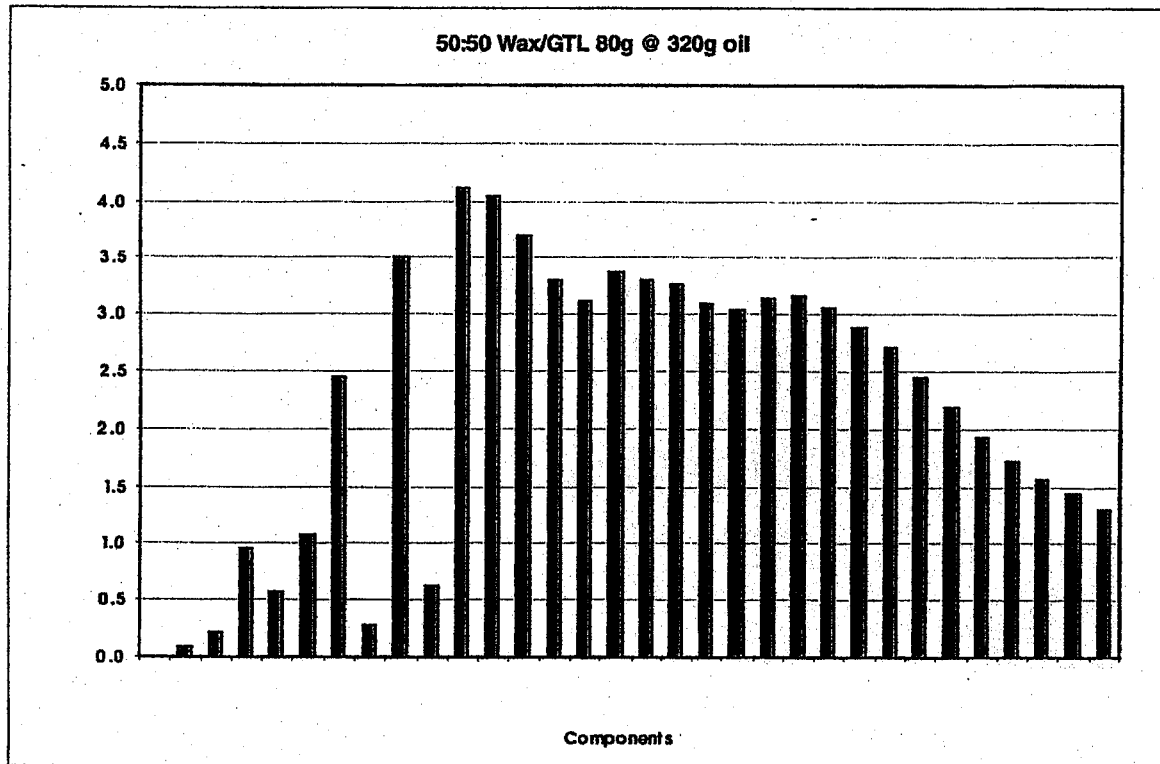
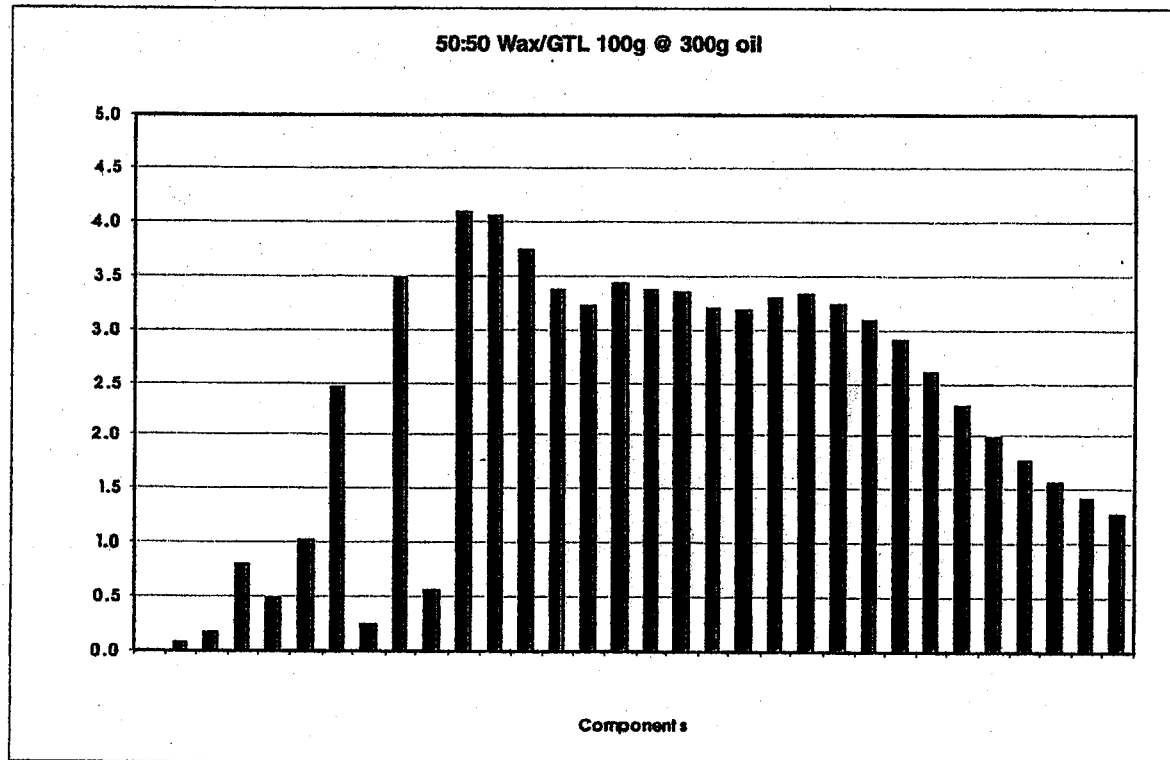


Figure 34



Sample (i)

25% Wax : 75% GTL + Crude Oil in the Ratio of 1:4

Sample: 25wax:75lt hc @ 1:4 crude oil ratio Temperature : 40°F Spindle: Vane Model: RV			Sample: 25wax:75lt hc @ 1:4 crude oil ratio Temperature : 20°F Spindle: Vane Model: HB			Sample: 25wax:75lt hc @ 1:4 crude oil ratio Temperature : 9°F Spindle: Vane Model: HB		
Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)
0.00	0.0	0.0	0.00	0.1	57	0.00	0.0	0
0.17	0.1	7.2	0.17	0.1	57	0.17	0.3	172
0.33	0.1	7.2	0.33	0.1	57	0.33	0.3	172
0.50	0.1	7.2	0.50	0.1	57	0.50	0.3	172
0.67	0.1	7.2	0.67	0.1	57	0.67	0.4	230
0.83	0.2	14.4	0.83	0.1	57	0.83	0.4	230
1.00	0.2	14.4	1.00	0.1	57	1.00	0.3	172
1.17	0.3	21.6	1.17	0.1	57	1.17	0.4	230
1.33	0.4	28.7	1.33	0.2	115	1.33	0.4	230
1.50	0.5	35.9	1.50	0.1	57	1.50	0.3	172
1.67	0.5	35.9	1.67	0.1	57	1.67	0.3	172
1.83	0.5	35.9	1.83	0.1	57	1.83	0.4	230
2.00	0.6	43.1	2.00	0.1	57	2.00	0.4	230
2.17	0.8	57.5	2.17	0.1	57	2.17	0.4	230
2.33	0.8	57.5	2.33	0.1	57	2.33	0.4	230
2.50	0.9	64.7	2.50	0.1	57	2.50	0.4	230
2.67	1.0	71.9	2.67	0.2	115	2.67	0.4	230
2.83	0.9	64.7	2.83	0.1	57	2.83	0.4	230
3.00	1.0	71.9	3.00	0.1	57	3.00	0.4	230
3.17	1.1	79.1	3.17	0.1	57	3.17	0.4	230
3.33	1.4	100.6	3.33	0.1	57	3.33	0.4	230
3.50	1.6	115.0	3.50	0.1	57	3.50	0.4	230
3.67	1.9	136.6	3.67	0.2	115	3.67	0.4	230
3.83	2.0	143.7	3.83	0.1	57	3.83	0.4	230
4.00	2.2	158.1	4.00	0.1	57	4.00	0.4	230
4.17	2.5	179.7	4.17	0.2	115	4.17	0.4	230
4.33	2.6	186.9	4.33	0.1	57	4.33	0.4	230
4.50	2.8	201.2	4.50	0.1	57	4.50	0.4	230
4.67	3.2	230.0	4.67	0.1	57	4.67	0.4	230
4.83	3.5	251.5	4.83	0.1	57	4.83	0.4	230
5.00	3.9	280.3	5.00	0.1	57	5.00	0.4	230
5.17	4.3	309.0	5.17	0.1	57	5.17	0.4	230
5.33	4.6	330.6	5.33	0.1	57	5.33	0.4	230
5.50	5.0	359.4	5.50	0.1	57	5.50	0.4	230
5.67	5.3	380.9	5.67	0.2	115	5.67	0.4	230
5.83	5.6	402.5	5.83	0.2	115	5.83	0.4	230
6.00	5.9	424.0	6.00	0.2	115	6.00	0.4	230
6.17	6.3	452.8	6.17	0.2	115	6.17	0.5	287
6.33	6.5	467.2	6.33	0.2	115	6.33	0.5	287
6.50	6.8	488.7	6.50	0.2	115	6.50	0.6	345
6.67	7.1	510.3	6.67	0.2	115	6.67	1.0	575
6.83	7.4	531.8	6.83	0.2	115	6.83	1.5	862
7.00	7.6	546.2	7.00	0.3	172	7.00	1.7	977
7.17	7.9	567.8	7.17	0.3	172	7.17	1.9	1092
7.33	8.2	589.3	7.33	0.3	172	7.33	2.0	1150
7.50	8.4	603.7	7.50	0.7	402	7.50	2.2	1265
7.67	8.7	625.3	7.67	1.1	632	7.67	2.4	1380
7.83	8.9	639.6	7.83	1.4	805	7.83	2.6	1495
8.00	9.1	654.0	8.00	1.5	862	8.00	2.7	1552
8.17	9.3	668.4	8.17	1.7	977	8.17	2.8	1610
8.33	9.5	682.8	8.33	1.9	1092	8.33	2.9	1667
8.50	9.7	697.1	8.50	2.1	1207	8.50	3.1	1782
8.67	9.8	704.3	8.67	2.2	1265	8.67	3.3	1897
8.83	10.0	718.7	8.83	2.3	1322	8.83	3.4	1955
9.00	10.0	718.7	9.00	2.3	1322	9.00	3.5	2012
9.17	10.2	733.1	9.17	2.5	1437	9.17	3.9	2242
9.33	10.3	740.3	9.33	2.5	1437	9.33	4.1	2357
9.50	10.3	740.3	9.50	2.7	1552	9.50	4.2	2415
9.67	10.3	740.3	9.67	2.8	1610	9.67	4.5	2587
9.83	10.4	747.4	9.83	2.9	1667	9.83	4.7	2702
10.00	10.4	747.4	10.00	3.1	1782	10.00	4.9	2817
10.17	10.4	747.4	10.17	3.5	2012	10.17	5.1	2932
10.33	10.4	747.4	10.33	3.5	2012	10.33	5.1	2932
10.50	10.4	747.4	10.50	3.8	2185	10.50	5.3	3047

Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio		
Temperature : 40°F			Temperature : 20°F			Temperature : 9°F		
Spindle: Vane			Spindle: Vane			Spindle: Vane		
Model: RV			Model: HB			Model: HB		
Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)
10.67	10.3	740.3	10.67	4.0	2300	10.67	5.7	3277
10.83	10.3	740.3	10.83	4.1	2357	10.83	5.9	3392
11.00	10.3	740.3	11.00	4.3	2472	11.00	6.0	3450
11.17	10.2	733.1	11.17	4.5	2587	11.17	6.4	3680
11.33	10.2	733.1	11.33	4.7	2702	11.33	6.6	3795
11.50	10.1	725.9	11.50	4.8	2760	11.50	6.7	3852
11.67	10.0	718.7	11.67	5.1	2932	11.67	7.0	4025
11.83	9.9	711.5	11.83	5.1	2932	11.83	7.1	4082
12.00	9.8	704.3	12.00	5.2	2990	12.00	7.4	4255
12.17	9.7	697.1	12.17	5.4	3105	12.17	7.7	4427
12.33	9.6	690.0	12.33	5.5	3162	12.33	7.7	4427
12.50	9.6	690.0	12.50	5.6	3220	12.50	8.0	4600
12.67	9.4	675.6	12.67	5.8	3335	12.67	8.2	4715
12.83	9.3	668.4	12.83	5.9	3392	12.83	8.4	4830
13.00	9.2	661.2	13.00	6.1	3507	13.00	8.6	4945
13.17	9.1	654.0	13.17	6.3	3622	13.17	8.8	5060
13.33	9.0	646.8	13.33	6.4	3680	13.33	9.0	5175
13.50	9.0	646.8	13.50	6.7	3852	13.50	9.2	5290
13.67	8.8	632.5	13.67	6.8	3910	13.67	9.4	5405
13.83	8.7	625.3	13.83	6.9	3967	13.83	9.6	5520
14.00	8.7	625.3	14.00	6.9	3967	14.00	10.0	5750
14.17	8.5	610.9	14.17	7.2	4140	14.17	10.3	5922
14.33	8.5	610.9	14.33	7.3	4197	14.33	10.5	6037
14.50	8.4	603.7	14.50	7.5	4312	14.50	10.8	6210
14.67	8.3	596.5	14.67	7.7	4427	14.67	11.3	6497
14.83	8.2	589.3	14.83	8.1	4657	14.83	11.8	6785
15.00	8.1	582.1	15.00	8.5	4887	15.00	12.1	6957
15.17	8.0	575.0	15.17	8.9	5117	15.17	12.0	6900
15.33	7.9	567.8	15.33	9.1	5232	15.33	12.2	7015
15.50	7.9	567.8	15.50	9.5	5462	15.50	12.7	7302
15.67	7.8	560.6	15.67	10.1	5807	15.67	13.2	7589
15.83	7.7	553.4	15.83	10.5	6037	15.83	13.7	7877
16.00	7.7	553.4	16.00	11.0	6325	16.00	13.7	7877
16.17	7.6	546.2	16.17	11.5	6612	16.17	13.6	7819
16.33	7.5	539.0	16.33	12.0	6900	16.33	13.8	7934
16.50	7.5	539.0	16.50	12.1	6957	16.50	14.2	8164
16.67	7.4	531.8	16.67	12.3	7072	16.67	14.6	8394
16.83	7.3	524.7	16.83	12.7	7302	16.83	15.1	8682
17.00	7.2	517.5	17.00	13.1	7532	17.00	15.7	9027
17.17	7.2	517.5	17.17	13.7	7877	17.17	16.4	9429
17.33	7.0	503.1	17.33	14.3	8222	17.33	17.1	9832
17.50	6.9	495.9	17.50	14.6	8394	17.50	17.7	10177
17.67	6.9	495.9	17.67	15.1	8682	17.67	18.4	10579
17.83	6.7	481.5	17.83	15.4	8854	17.83	19.1	10982
18.00	6.7	481.5	18.00	15.3	8797	18.00	19.7	11327
18.17	6.6	474.3	18.17	15.4	8854	18.17	20.2	11614
18.33	6.5	467.2	18.33	16.0	9199	18.33	20.9	12017
18.50	6.4	460.0	18.50	16.4	9429	18.50	21.5	12362
18.67	6.3	452.8	18.67	17.0	9774	18.67	22.2	12764
18.83	6.2	445.6	18.83	17.7	10177	18.83	22.9	13167
19.00	6.2	445.6	19.00	18.2	10464	19.00	23.5	13512
19.17	6.1	438.4	19.17	18.9	10867	19.17	24.1	13857
19.33	5.9	424.0	19.33	19.6	11269	19.33	25.0	14374
19.50	5.8	416.8	19.50	20.3	11672	19.50	25.6	14719
19.67	5.8	416.8	19.67	21.1	12132	19.67	26.2	15064
19.83	5.7	409.7	19.83	21.9	12592	19.83	27.0	15524
20.00	5.6	402.5	20.00	22.6	12994	20.00	27.7	15926
20.17	5.5	395.3	20.17	23.3	13397	20.17	28.3	16271
20.33	5.4	388.1	20.33	24.1	13857	20.33	28.9	16616
20.50	5.3	380.9	20.50	24.7	14202	20.50	29.6	17019
20.67	5.3	380.9	20.67	25.3	14546	20.67	30.0	17249
20.83	5.2	373.7	20.83	26.1	15006	20.83	30.6	17594
21.00	5.1	366.5	21.00	26.7	15351	21.00	31.3	17996
21.17	5.1	366.5	21.17	27.3	15696	21.17	31.8	18284

Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio		
Temperature : 40°F			Temperature : 20°F			Temperature : 9°F		
Spindle: Vane			Spindle: Vane			Spindle: Vane		
Model: RV			Model: HB			Model: HB		
Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)
21.33	5.0	359.4	21.33	28.1	16156	21.33	32.5	18686
21.50	4.9	352.2	21.50	28.8	16559	21.50	33.3	19146
21.67	4.8	345.0	21.67	29.3	16846	21.67	33.8	19434
21.83	4.7	337.8	21.83	30.1	17306	21.83	34.4	19779
22.00	4.6	330.6	22.00	30.8	17709	22.00	35.2	20239
22.17	4.6	330.6	22.17	31.4	18054	22.17	35.7	20526
22.33	4.6	330.6	22.33	32.2	18514	22.33	36.5	20986
22.50	4.4	316.2	22.50	32.9	18916	22.50	37.3	21446
22.67	4.4	316.2	22.67	33.4	19204	22.67	37.8	21733
22.83	4.3	309.0	22.83	34.1	19606	22.83	38.4	22078
23.00	4.2	301.9	23.00	34.8	20009	23.00	39.2	22538
23.17	4.2	301.9	23.17	35.3	20296	23.17	39.7	22826
23.33	4.1	294.7	23.33	36.0	20699	23.33	40.4	23228
23.50	4.1	294.7	23.50	36.7	21101	23.50	41.1	23631
23.67	4.0	287.5	23.67	37.1	21331	23.67	41.6	23918
23.83	4.0	287.5	23.83	37.8	21733	23.83	42.1	24206
24.00	3.9	280.3	24.00	38.4	22078	24.00	42.8	24608
24.17	3.8	273.1	24.17	38.8	22308	24.17	43.5	25011
24.33	3.7	265.9	24.33	39.4	22653	24.33	44.1	25356
24.50	3.7	265.9	24.50	40.0	22998	24.50	44.9	25816
24.67	3.7	265.9	24.67	40.4	23228	24.67	45.6	26218
24.83	3.6	258.7	24.83	40.9	23516	24.83	46.3	26621
25.00	3.6	258.7	25.00	41.5	23861	25.00	47.1	27081
25.17	3.5	251.5	25.17	41.9	24091	25.17	47.8	27483
25.33	3.6	258.7	25.33	42.4	24378	25.33	48.4	27828
25.50	3.5	251.5	25.50	43.0	24723	25.50	49.3	28346
25.67	3.5	251.5	25.67	43.4	24953	25.67	50.0	28748
25.83	3.5	251.5	25.83	43.9	25241	25.83	50.6	29093
26.00	3.4	244.4	26.00	44.5	25586	26.00	51.4	29553
26.17	3.3	237.2	26.17	44.9	25816	26.17	52.2	30013
26.33	3.4	244.4	26.33	45.3	26046	26.33	52.7	30300
26.50	3.3	237.2	26.50	45.7	26276	26.50	53.5	30760
26.67	3.3	237.2	26.67	46.1	26506	26.67	54.1	31105
26.83	3.3	237.2	26.83	46.4	26678	26.83	54.4	31278
27.00	3.2	230.0	27.00	46.9	26966	27.00	54.7	31450
27.17	3.2	230.0	27.17	47.1	27081	27.17	54.9	31565
27.33	3.2	230.0	27.33	47.3	27196	27.33	55.3	31795
27.50	3.2	230.0	27.50	47.7	27426	27.50	56.1	32255
27.67	3.2	230.0	27.67	47.9	27541	27.67	56.9	32715
27.83	3.1	222.8	27.83	47.9	27541	27.83	57.5	33060
28.00	3.2	230.0	28.00	47.9	27541	28.00	58.3	33520
28.17	3.1	222.8	28.17	47.2	27138	28.17	59.1	33980
28.33	3.1	222.8	28.33	46.1	26506	28.33	59.8	34383
28.50	3.1	222.8	28.50	46.3	26621	28.50	60.6	34843
28.67	3.1	222.8	28.67	46.5	26736	28.67	61.4	35303
28.83	3.1	222.8	28.83	46.5	26736	28.83	62.1	35705
29.00	3.1	222.8	29.00	46.5	26736	29.00	62.8	36107
29.17	3.1	222.8	29.17	46.4	26678	29.17	63.6	36567
29.33	3.1	222.8	29.33	46.0	26448	29.33	64.3	36970
29.50	3.0	215.6	29.50	45.5	26161	29.50	65.0	37372
29.67	3.0	215.6	29.67	45.0	25873	29.67	65.8	37832
29.83	3.0	215.6	29.83	44.1	25356	29.83	66.5	38235
30.00	3.0	215.6	30.00	43.3	24896	30.00	67.2	38637
30.17	2.9	208.4	30.17	42.4	24378	30.17	68.0	39097
30.33	3.0	215.6	30.33	41.5	23861	30.33	68.7	39500
30.50	3.0	215.6	30.50	40.6	23343	30.50	69.4	39902
30.67	3.0	215.6	30.67	39.9	22941	30.67	70.2	40362
30.83	3.0	215.6	30.83	39.2	22538	30.83	71.0	40822
31.00	3.0	215.6				31.00	71.6	41167
31.17	2.9	208.4				31.17	72.4	41627
31.33	2.9	208.4				31.33	73.2	42087
31.50	3.0	215.6				31.50	73.8	42432
31.67	3.0	215.6				31.67	74.6	42892
31.83	2.9	208.4				31.83	75.4	43352

Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio		
Temperature : 40°F			Temperature : 20°F			Temperature : 9°F		
Spindle: Vane			Spindle: Vane			Spindle: Vane		
Model: RV			Model: HB			Model: HB		
Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)
32.00	3.0	215.6				32.00	75.9	43639
32.17	2.9	208.4				32.17	76.7	44099
32.33	2.9	208.4				32.33	77.5	44559
32.50	2.9	208.4				32.50	76.1	44904
32.67	2.9	208.4				32.67	78.9	45364
32.83	2.9	208.4				32.83	79.7	45824
33.00	2.9	208.4				33.00	80.4	46227
33.17	2.9	208.4				33.17	81.1	46629
33.33	2.9	208.4				33.33	81.9	47089
33.50	2.9	208.4				33.50	82.6	47492
33.67	2.9	208.4				33.67	83.3	47894
33.83	2.9	208.4				33.83	84.2	48412
34.00	2.9	208.4				34.00	84.8	48757
34.17	2.9	208.4				34.17	85.6	49217
34.33	2.9	208.4				34.33	86.4	49677
34.50	2.8	201.2				34.50	87.0	50022
34.67	2.9	208.4				34.67	87.8	50481
34.83	2.9	208.4				34.83	88.6	50941
35.00	2.9	208.4				35.00	89.3	51344
35.17	2.9	208.4				35.17	90.0	51746
35.33	2.8	201.2				35.33	90.8	52206
35.50	2.8	201.2				35.50	91.4	52551
35.67	2.9	208.4				35.67	92.1	52954
35.83	2.8	201.2				35.83	92.9	53414
36.00	2.8	201.2				36.00	93.6	53816
36.17	2.8	201.2				36.17	94.2	54161
36.33	2.8	201.2				36.33	95.0	54621
36.50	2.8	201.2				36.50	95.7	55024
36.67	2.9	208.4				36.67	96.3	55369
36.83	2.8	201.2				36.83	97.2	55886
37.00	2.8	201.2				37.00	97.8	56231
37.17	2.9	208.4				37.17	98.3	56519
37.33	2.8	201.2				37.33	99.1	56979
37.50	2.8	201.2				37.50	99.8	57381
37.67	2.8	201.2				37.67	100.0	57496
37.83	2.8	201.2						
38.00	2.8	201.2						
38.17	2.7	194.0						
38.33	2.7	194.0						
38.50	2.7	194.0						
38.67	2.7	194.0						
38.83	2.7	194.0						
39.00	2.7	194.0						
39.17	2.7	194.0						
39.33	2.6	186.9						
39.50	2.6	186.9						
39.67	2.6	186.9						
39.83	2.6	186.9						
40.00	2.6	186.9						
40.17	2.5	179.7						
40.33	2.6	186.9						
40.50	2.5	179.7						
40.67	2.5	179.7						
40.83	2.5	179.7						
41.00	2.4	172.5						
41.17	2.4	172.5						
41.33	2.4	172.5						
41.50	2.4	172.5						
41.67	2.3	165.3						
41.83	2.3	165.3						
42.00	2.3	165.3						
42.17	2.3	165.3						
42.33	2.3	165.3						
42.50	2.3	165.3						

Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio			Sample: 25wax:75lt hc @ 1:4 crude oil ratio		
Temperature : 40°F			Temperature : 20°F			Temperature : 9°F		
Spindle: Vane			Spindle: Vane			Spindle: Vane		
Model: RV			Model: HB			Model: HB		
Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)	Cum. Time minutes	Torque %	Stress (dyne/cm)
42.67	2.2	158.1						
42.83	2.2	158.1						
43.00	2.2	158.1						
43.17	2.2	158.1						
43.33	2.1	150.9						
43.50	2.1	150.9						
43.67	2.1	150.9						
43.83	2.1	150.9						
44.00	2.1	150.9						
44.17	2.1	150.9						
44.33	2.1	150.9						
44.50	2.0	143.7						
44.67	2.0	143.7						
44.83	2.0	143.7						
45.00	1.9	136.6						
45.17	2.0	143.7						
45.33	1.9	136.6						
45.50	2.0	143.7						
45.67	1.9	136.6						
45.83	1.9	136.6						
46.00	1.9	136.6						
46.17	1.8	129.4						
46.33	1.8	129.4						
46.50	1.8	129.4						
46.67	1.8	129.4						
46.83	1.8	129.4						
47.00	1.8	129.4						
47.17	1.8	129.4						
47.33	1.7	122.2						
47.50	1.8	129.4						
47.67	1.7	122.2						
47.83	1.7	122.2						
48.00	1.7	122.2						
48.17	1.7	122.2						
48.33	1.7	122.2						
48.50	1.7	122.2						
48.67	1.7	122.2						
48.83	1.7	122.2						
49.00	1.7	122.2						
49.17	1.7	122.2						
49.33	1.6	115.0						
49.50	1.7	122.2						
49.67	1.7	122.2						
49.83	1.6	115.0						
50.00	1.6	115.0						
50.17	1.7	122.2						
50.33	1.6	115.0						
50.50	1.6	115.0						
50.67	1.7	122.2						
50.83	1.6	115.0						
51.00	1.6	115.0						
51.17	1.6	115.0						
51.33	1.6	115.0						
51.50	1.6	115.0						
51.67	1.6	115.0						
51.83	1.7	122.2						
52.00	1.6	115.0						
52.17	1.7	122.2						
52.33	1.7	122.2						
52.50	1.7	122.2						
52.67	1.7	122.2						
52.83	1.7	122.2						
53.00	1.7	122.2						
53.17	1.7	122.2						