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RE: Analytical Summary of Bradenhead and Sight Samples for Synergy Resources Corporation

Project Overview

Hydrocarbon samples were collected from the Bradenhead and Separator Sight Glass at six locations in unpressurized 1L tin cans. The samples were then transferred into water-displacement cylinders in the lab and run through a Gas Chromatograph for an extended C10BTEx characterization out to C31+. The locations analyzed were Wolfson #26-2, Wolfson #26-6, SRC State #14-16D, Klein #34-8D, Hall #19-31 and Wolfson #23-25.

Data Summary

Table 1 summarizes the breakdown of major C1-C10 components. Concentrations of light-end hydrocarbons including Methane (range from 0.023 – 1.10) and Ethane (range 0.243 – 0.923) are low, which is to be expected as these components flash off when the sample is depressurized. Heavy-end hydrocarbons dominate the sample compositions, particularly the Decanes+ fraction. The Decanes+ fraction averages 53.84 mole% with a range from a minimum of 29.2 mole % to a maximum of 67.66 mole %. The high concentration of heavy-end hydrocarbons is consistent with depressurized samples where the light-end hydrocarbons have flashed off. The Bradenhead compositions for Wolfson #26-6 and Hall #19-31 are heavier than their corresponding Sight Glass compositions. For Wolfson #26-2, SRC State #14-16D and Wolfson #23-15, the Decanes+ composition between Bradenhead and Sight Glass samples are similar, with the Sight Glass being slightly heavier. A large discrepancy exists between the Bradenhead and Sight Glass samples for Klein #34-8D. The Bradenhead composition has far less Decanes+ and more light-end components similar to a condensate-grade crude whereas the composition of the Sight Glass sample is significantly heavier and reflective of a mid-heavy grade crude. In fact, the Decanes+ concentrations for the two Klein #34-8D samples represent both the minimum and maximum of the data set for that respective component in this data set.

Components (mole %)	Wolfson #26-2 Bradenhead	Wolfson #26-2 Sight Glass	Wolfson #26-6 Bradenhead	Wolfson #26-6 Sight Glass	SRC State #14-16D Bradenhead	SRC State #14-16D Sight Glass	Klein #34-8D Bradenhead	Klein #34-8D Sight Glass	Hall #19-31 Bradenhead	Hall #19-31 Sight Glass	Wolfson #23-15 Bradenhead	Wolfson #23-15 Sight Glass
Carbon Dioxide	0.000	0.000	0.000	0.011	0.008	0.000	0.000	0.000	0.004	0.004	0.008	0.015
Nitrogen	0.023	0.023	0.946	0.423	0.832	0.706	1.100	0.154	0.093	0.855	0.515	0.509
Methane	0.007	0.008	0.008	0.038	0.097	0.075	0.116	0.065	0.043	0.092	0.123	0.227
Ethane	0.510	0.520	0.626	0.839	0.645	0.518	0.243	0.923	0.343	0.608	0.628	0.655
Propane	2.761	2.812	2.108	2.944	2.812	1.323	2.815	2.536	1.368	5.335	2.622	2.630
iso-Butane	3.405	3.468	1.224	1.604	1.806	0.812	4.368	1.043	0.668	2.176	1.718	1.741
n-Butane	8.025	8.177	5.141	6.114	7.693	4.204	13.99	4.434	4.741	8.051	6.193	6.418
iso-Pentane	3.960	4.033	2.323	2.178	3.007	1.605	7.398	1.864	2.990	2.834	3.742	3.530
n-Pentane	2.249	2.291	1.703	1.349	1.899	1.438	8.687	2.157	3.588	3.248	4.114	3.349
n-Hexane	4.000	2.414	3.111	2.964	2.694	2.282	4.776	1.675	2.404	1.537	2.933	2.862
Heptanes	8.002	3.770	6.868	7.909	6.339	6.069	8.810	4.744	5.608	3.881	7.119	6.945
Octanes	6.803	6.149	6.474	9.276	6.734	6.685	6.628	5.142	5.109	4.322	7.126	6.941
Nonanes	4.408	6.423	4.473	5.470	4.119	4.820	3.304	2.602	2.826	2.868	4.405	4.307
Decanes+	48.433	51.325	56.62	49.50	53.74	62.92	29.24	67.660	64.316	60.753	50.134	51.43

Table 1: Major hydrocarbon components for Bradenhead and Sight Glass samples.

Sample Comparison

In order to compare the Bradenhead and Sight Glass samples for each location the acceptable % reproducibility limits were calculated according to GPA 2186 guidelines (the calculation of acceptable reproducibility limits takes into account the amount of each component in the product) and compared these against the observed reproducibility limits. The results are listed in Table 2. This method of comparison is mainly valid for identical samples run in duplicate as a check of analytical reproducibility. Thus, although the samples are not identical and therefore the method is not directly applicable, it still provides a baseline for comparing how closely related the samples are. For all six locations, the overwhelming majoring of components do not reproduce with acceptable limits. The best replication is observed in the Wolfson #26-2 and Wolfson #23-15 samples where half of the components are reproduced within acceptable limits. No components are reproduced for Wolfson #26-6 and Klein #34-8D. In the Wolfson #26-2, #26-6 and # 23-15 samples, C1-C6 components which miss acceptable reproducibility do so by a small margin. This is not surprising because the concentration of these components are low to begin with and nearly zero after flashing off the sample. The widest range of differences exist in the Decanes+ fraction of these samples however, in general, there is no single component that reproduced better than the others.

Components	Wolfson #26-2		Wolfson #26-6		SRC State #14-16D		Klein #34-8D		Hall #19-31		Wolfson #23-15	
	Limit	Obsv.	Limit	Obsv.	Limit	Obsv.	Limit	Obsv.	Limit	Obsv.	Limit	Obsv.
Methane	0.019	0.001	0.02	0.03	0.04	0.02	0.04	0.05	0.03	0.05	0.04	0.10
Ethane	0.066	0.010	0.07	0.21	0.07	0.13	0.05	0.68	0.06	0.27	0.07	0.03
Propane	0.107	0.051	0.10	0.84	0.09	1.49	0.11	0.28	0.09	3.97	0.11	0.01
iso-Butane	0.114	0.063	0.08	0.38	0.08	0.99	0.12	3.33	0.07	1.51	0.09	0.02
n-Butane	0.145	0.152	0.13	0.97	0.12	3.49	0.17	9.56	0.12	3.31	0.13	0.22
iso-Pentane	0.119	0.073	0.10	0.15	0.09	1.40	0.14	5.53	0.11	0.16	0.12	0.21
n-Pentane	0.101	0.042	0.09	0.35	0.09	0.46	0.15	6.53	0.12	0.34	0.12	0.77
n-Hexane	0.119	1.586	0.11	0.15	0.10	0.41	0.13	3.10	0.10	0.87	0.11	0.07
Heptanes	0.145	4.232	0.14	1.04	0.13	0.27	0.15	4.07	0.13	1.73	0.14	0.17
Octanes	0.138	0.654	0.14	2.80	0.14	0.05	0.14	1.49	0.13	0.79	0.14	0.19
Nonanes	0.122	2.015	0.12	1.00	0.13	0.70	0.11	0.70	0.11	0.04	0.12	0.10
Decanes+	0.242	2.892	0.25	7.12	0.26	9.18	0.21	38.42	0.26	3.56	0.24	1.30

Table 2: Calculated limits of % difference and observed % difference for all six locations. Green denotes passing limits while orange denotes failing limits.

Summary

For the 6 locations all compositions (except for Klein #34-8D Bradenhead) reflect those of mid to heavy grade crude oils. Direct comparison of the Bradenhead and Sight Glass samples for each location do not meet the GPA requirements to be considered identical. However, one caveat to comparing the oil streams is the unpressurized nature of the sample. In particular, the amount of time spent unpressurized. The oil at the Sight Glass has remained pressurized all the way through the separator whereas the oil at the Bradenhead is unpressurized and likely spent a longer time weathering. Therefore, this extra weathering time allows for further light-end hydrocarbon loss and makes the composition of the oil heavier over time. This can account for the wide range of variability in Decanes+ percent differences observed in these samples. Also, the oil from the Sight Glass is being processed and has likely been altered to some degree since leaving the wellhead. Thus, it is difficult to conclusively determine whether or not the oil between the Bradenhead and Sight Glass is the same due to these considerations, however, it seems highly likely that for all but the Klein #34-8D location, the oil at the Bradenhead and Sight Glass are related.

Regards,

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