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A COMPARISON OF GEOCHEMICAL ANALYSES WITH THE HYDROCARBON CONTENT OF THE DITCH GAS ON WELL 30/6-5, OVER THE INTERVAL 2542M TO 2830 M KB

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Den norske stats oljeselskap a.s

Introduction

Geochemistry samples are collected at wellsite over a preset series of intervals, in this case every 6 metres. Samples are stored in air tight containers, traditionally tins, in order to preserve any volatile contents, prior to shipment and analysis onshore.

This is a comparison of the Geochemical Analysis over the interval of 2542m to 2830m KB, with the Ditch Gas hydrocarbon content over the same interval as logged by the Analysts.

Sources of Data

Geochemistry Analyses:	Institutt For Kontinentalsokkelundersøkelser (IKU)
Ditch Gas:	The Analysts Mud Log

Initial Observations on Geochemistry Analyses

a. The relationships between the H/C present in the Headspace and those present in the cuttings are dependent on factors which include the following:
   1. The ability of the sample can to preserve a perfect seal to retain the volatiles.
   2. The relative mobility of the various H/C components.
   3. The ability of a rock type to give up the H/C before analysis can occur.

b. It is apparent that whether the total H/C's in any individual sample be relatively high or low, the closest correlation between total $C_1 - C_4$ (Headspace) and total $C_1 - C_4$ (cuttings) occurs when the dominant H/C's are the heavier ones, i.e. $C_3 - C_5+$

c. Low readings in this interval are most likely due to less than perfect seals on the sample tins. There are no apparent changes in lithology which may explain it.

d. The wetness of a paricular sample appears to have no effect on results - samples varied in wetness from 29.38% to 98.58%.

e. Two samples were not analysed because they had open lids. (2704m and 2752m KB)

Relationships between Geochemistry Analyses and Ditch Gas H/C Content

Any relationship is likely to be qualitative and not quantitative. As far as it can be ascertained over this interval, the mud log Ditch Gas H/C curve follows fairly well the trends of the H/C content from Geochemistry Analysis. The Ditch Gas Curve is closest to the two curves representing the Total H/C Content and the H/C content of the Cuttings. The H/C in the Headspace Curve is subject to fluctuations at those depths where non-perfect seals on the sample tins are suspected. This can be seen on the graph comparisons.

Conclusions

In order to maintain the quality and value of a geochemistry sample, it is important that immediately after collection, the sample is stored in an air tight container to preserve any volatiles that may be present. Tins used at the wellsite, once correctly sealed are very robust and effective,however, with experience there are a number of drawbacks.

1. A presealed tin is a very weak and flimsy structure and often many tins are damaged before reaching the wellsite by transportation in weak cardboard boxes inside freight containers.
2. A tin needs to be only very slightly out in size or shape, before the mechanical canning machines are unable to seal it. The canners accept only very small tolerances in both size and shape, and a bad batch of tins could be virtually useless.
3. Great care has to be taken by the sample collector in order to ensure that he does not distort the tin's shape while collecting the sample and attempting to seal the can. Furthermore, safeguards must ensure that the canner is set up correctly.
4. Recognisably unsealed tins are not analysed.

5. When sampling over longer intervals instances have been known where a 30 m sample,for example,actually consists of three separate samples taken at 10 m intervals, making two samples exposed in an unsealed tin until the third sample is caught.

Recommendations

A more efficient and convenient receptacle could be considered to maintain the value of geochemical sampling, e.g. a plastic container with an air tight screw or clip top, or alternatively using good quality tins to keep lost or affected results to a minimum.

TABLE I a.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN HEADSPACE.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
K8249	2542	25339	11703	28731	3429	14917	12952	84119	58780	69.88	.23
K8251	2548	74336	38528	91510	9938	44337	37222	258649	184313	71.26	.22
K8253	2554	55134	23748	49242	5173	20409	14076	153706	98572	64.13	.25
K8255	2560	7465	3214	7256	738	2760	1594	21433	13968	65.17	.27
K8257	2566	4777	2231	4555	447	1671	1005	13681	8904	65.09	.27
K8259	2572	5576	2706	5750	578	2405	1659	17014	11438	67.23	.24
K8261	2578	7408	3871	8570	913	3906	3064	24668	17260	69.97	.23
K8263	2584	6010	3636	8203	866	3835	3241	22550	16541	73.35	.23
K8265	2590	7718	4883	12126	1353	5912	5233	31992	24273	75.87	.23
K8267	2596	3570	1914	4898	561	1963	1215	12906	9336	72.34	.29
K8269	2602	12791	6150	17641	2538	10199	9724	49318	36528	74.07	.25
K8271	2608	8154	2553	7388	1241	5906	10291	25242	17088	67.70	.21
K8273	2614	1360	833	2365	324	1423	1612	6305	4945	78.43	.23
K8275	2620	4012	2105	6035	800	3265	2726	16217	12205	75.26	.24
K8277	2626	3958	1842	3532	365	1316	779	11013	7055	64.06	.28
K8279	2632	4096	2597	5624	574	2124	1343	15015	10919	72.72	.27
K8281	2638	4660	2712	5573	533	1973	1024	15451	10791	69.84	.27
K8283	2644	6824	4046	8636	860	2936	1660	23301	16478	70.71	.29
K8285	2650	8512	4451	7841	702	2442	1434	23948	15436	64.46	.29
K8287	2656	97	54	115	11	37	23	313	216	69.06	.30
K8289	2662	7091	3298	5862	558	1564	693	18373	11282	61.41	.36
K8291	2668	98	56	103	10	28	15	295	197	66.82	.36
K8293	2674	753	326	986	138	483	381	2686	1933	71.97	.29
K8295	2680	2694	1289	2152	218	612	324	6967	4273	61.33	.36

TABLE I b.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN CUTTINGS.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4/nC4
K8249	2542	1534	3873	28648	4918	23151	9147	62123	60589	97.53	.21
K8251	2548	870	3126	25809	4437	22503	9732	56745	55875	98.47	.20
K8253	2554	2699	3931	23001	4643	23111	9628	57384	54685	95.30	.20
K8255	2560	1387	3489	23058	3776	18174	6943	49884	48497	97.22	.21
K8257	2566	874	2786	17291	2871	14153	6557	37975	37101	97.70	.20
K8259	2572	247	652	4105	696	3409	1448	9110	8863	97.28	.20
K8261	2578	39	87	550	88	425	177	1188	1149	96.75	.21
K8263	2584	6	9	89	19	90	49	213	207	97.12	.20
K8265	2590	19	61	522	99	517	247	1217	1198	98.45	.19
K8267	2596	712	2166	16486	3196	17037	10267	39596	38885	98.20	.19
K8269	2602	502	773	8408	2186	10987	8314	22855	22354	97.81	.20
K8271	2608	228	284	4417	1087	7383	17327	13399	13171	98.30	.15
K8273	2614	266	447	5101	1303	7664	9902	14780	14515	98.20	.17
K8275	2620	417	667	5793	1330	7549	9395	15756	15339	97.36	.18
K8277	2626	680	913	8866	1564	8764	7026	20786	20106	96.73	.18
K8279	2632	487	1036	9846	1664	9372	8965	22405	21918	97.83	.18
K8281	2638	674	1790	11748	1645	9645	7626	25502	24828	97.36	.17
K8283	2644	651	2183	15599	2251	12439	8843	33124	32473	98.03	.18
K8285	2650	1004	3194	19346	2546	13732	8994	39823	38819	97.48	.19
K8287	2656	1380	4005	23215	3092	15243	10211	46936	45556	97.06	.20
K8289	2662	11344	28051	125938	18093	64977	46329	248404	237059	95.43	.28
K8291	2668	13949	35988	153051	21705	75723	59143	300417	286468	95.36	.29
K8293	2674	1695	3544	33939	7666	37334	55490	84179	82484	97.99	.21
K8295	2680	4888	19372	102725	16686	66341	82767	210012	205123	97.67	.25

TABLE I c.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS (Ia + Ib).

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
K8249	2542	26874	15575	57379	8346	38068	22099	146242	119369	81.62	.22
K8251	2548	75206	41654	117319	14375	66840	46954	315394	240188	76.16	.22
K8253	2554	57833	27679	72242	9816	43520	23704	211090	153257	72.60	.23
K8255	2560	8851	6704	30315	4514	20934	8537	71317	62466	87.59	.22
K8257	2566	5651	5017	21846	3318	15824	7562	51655	46005	89.06	.21
K8259	2572	5823	3358	9855	1274	5814	3107	26124	20301	77.71	.22
K8261	2578	7447	3957	9120	1001	4330	3241	25856	18409	71.20	.23
K8263	2584	6016	3646	8292	884	3926	3290	22764	16748	73.57	.23
K8265	2590	7737	4944	12648	1452	6428	5480	33209	25472	76.70	.23
K8267	2596	4282	4080	21384	3757	19001	11482	52503	48221	91.84	.20
K8269	2602	13292	6922	26049	4724	21186	18038	72174	58882	81.58	.22
K8271	2608	8382	2837	11806	2327	13289	27618	38641	30259	78.31	.18
K8273	2614	1626	1280	7466	1627	9087	11514	21086	19460	92.29	.18
K8275	2620	4429	2772	11827	2130	10815	12121	31972	27544	86.15	.20
K8277	2626	4638	2755	12398	1929	10079	7805	31799	27161	85.41	.19
K8279	2632	4583	3633	15470	2239	11496	10308	37420	32837	87.75	.19
K8281	2638	5334	4502	17321	2178	11618	8650	40953	35619	86.98	.19
K8283	2644	7475	6229	24235	3112	15375	10503	56426	48950	86.75	.20
K8285	2650	9516	7645	27188	3248	16174	10427	63771	54256	85.08	.20
K8287	2656	1477	4058	23330	3103	15280	10234	47249	45772	96.87	.20
K8289	2662	18435	31349	131800	18652	66541	47021	266777	248341	93.09	.28
K8291	2668	14047	36044	153155	21716	75751	59158	300712	286665	95.33	.29
K8293	2674	2448	3870	34926	7805	37817	55871	86865	84417	97.18	.21
K8295	2680	7583	20662	104877	16904	66953	83091	216978	209396	96.51	.25

TABLE I a.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN HEADSPACE.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
K8297	2686	67995	3717	7737	839	2382	1386	82669	14674	17.75	.35
K8299	2692	12336	6305	11757	1155	3146	1532	34698	22362	64.45	.37
K8301	2698	8919	4791	9610	1143	2981	1917	27445	18526	67.50	.38
K8303	2704	O P E N		L I D .							
K8305	2710	5400	3995	13479	2040	5877	4969	30791	25391	82.46	.35
K8307	2716	5440	4732	16170	2539	7447	6077	36328	30888	85.03	.34
K8309	2722	4608	3407	10856	17257	4917	3730	41044	36436	88.77	3.51
K8311	2728	4432	2845	9202	1545	4314	3377	22338	17906	80.16	.36
K8313	2734	12327	7957	19748	2643	7891	5845	50566	38239	75.62	.33
K8315	2740	5116	5981	20052	2950	9925	10064	44024	38908	88.38	.30
K8317	2746	4993	3955	12532	1758	5870	5346	29108	24115	82.85	.30
K8319	2752	O P E N		L I D .							
K8321	2758	2938	2538	8710	1561	4539	4312	20286	17348	85.52	.34
K8223	2764	2548	2341	9253	1686	5194	5606	21023	18475	87.88	.32
K8325	2770	5	6	28	6	16	19	61	56	91.59	.35
K8327	2776	2738	2305	5854	953	2619	2103	14469	11731	81.08	.36
K8329	2782	5663	5564	13126	1929	5680	6254	31962	26299	82.28	.34
K8831	2788	6890	6894	14405	1935	5654	4095	35777	28888	80.74	.34
K8333	2794	4585	5977	14609	2115	6454	6343	33739	29154	86.41	.33
K8335	2800	4536	6030	15290	2327	6993	6212	35176	30640	87.10	.33
K8337	2806	496	229	664	123	358	307	1870	1374	73.49	.34
K8339	2812	590	799	3253	800	2709	2934	8151	7560	92.76	.30
K8341	2818	780	767	2958	629	2305	3702	7439	6659	89.51	.27
K8343	2824	3	1	1	1	1	2	6	4	58.67	1.56

TABLE I b.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS IN CUTTINGS.

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
K8297	2686	500	1408	6603	1086	4726	3797	14322	13822	96.51	.23
K8299	2692	1602	4961	21247	3662	13658	4674	45130	43528	96.45	.27
K8301	2698	1193	3906	19978	3846	14470	5558	43394	42201	97.25	.27
K8303	2704										
K8305	2710	304	939	8146	2310	10391	6428	22090	21786	98.62	.22
K8307	2716	327	959	8520	2764	11943	7944	24513	24186	98.67	.23
K8309	2722	348	1063	8767	2666	11276	7871	24121	23772	98.56	.24
K8311	2728	400	984	8262	2670	11269	8541	23585	23186	98.30	.24
K8313	2734	383	1309	10452	2997	13372	10129	28514	28131	98.66	.22
K8315	2740	277	1116	9106	2627	11125	7536	24251	23974	98.86	.24
K8317	2746	347	1067	9626	2848	12616	8416	26504	26157	98.69	.23
K8319	2752										
K8321	2758	358	973	8264	2931	12109	9330	24636	24278	98.55	.24
K8223	2764	284	678	6500	2745	11489	9225	21696	21412	98.69	.24
K8325	2770	199	515	4214	1740	7631	8119	14300	14100	98.61	.23
K8327	2776	327	850	6131	2214	9860	7859	19383	19056	98.31	.22
K8329	2782	250	851	6561	2425	9749	7961	19835	19585	98.74	.25
K8331	2788	230	1174	8224	2734	10460	7448	22822	22592	98.99	.26
K8333	2794	386	1061	7824	2881	917	10564	13069	12683	97.05	3.14
K8335	2800	356	1382	9254	3196	13067	9285	27255	26899	98.69	.24
K8337	2806	24	88	607	182	666	1024	1567	1543	98.45	.27
K8339	2812	56	43	833	598	16	74	1545	1489	96.40	7.37
K8341	2818	6	3	6	25	1066	127	1108	1102	99.44	.02
K8343	2824	5	3	48	29	131	474	215	210	97.66	.22

TABLE I c.

CONCENTRATION (ul Gas / kg Rock) OF C1 - C7 HYDROCARBONS (Ia + Ib).

IKU No.	DEPTH (m)	C1	C2	C3	iC4	nC4	C5+	SUM C1-C4	SUM C2-C4	WET-NESS (%)	iC4 / nC4
K8297	2686	68495	5125	14340	1924	7107	5183	94991	28496	29.38	.27
K8299	2692	13938	11266	33004	4817	16803	6205	79828	65891	82.54	.29
K8301	2698	10112	8698	29589	4989	17451	7475	70839	60727	85.73	.29
K8303	2704	O P E N		L I D .							
K8305	2710	5704	4934	21624	4351	16268	11397	52881	47176	89.21	.27
K8307	2716	5767	5692	24690	5304	19390	14022	60842	55075	90.52	.27
K8309	2722	4956	4469	19623	19923	16194	11601	65165	60208	92.39	1.23
K8311	2728	4832	3829	17464	4216	15583	11918	45923	41092	89.48	.27
K8313	2734	12710	9266	30200	5640	21263	15974	79079	66370	83.93	.27
K8315	2740	5393	7097	29159	5577	21049	17600	68275	62882	92.10	.26
K8317	2746	5339	5022	22159	4606	18485	13762	55612	50272	90.40	.25
K8319	2752	O P E N		L I D .							
K8321	2758	3296	3511	16974	4492	16648	13642	44922	41626	92.66	.27
K8223	2764	2832	3019	15754	4432	16683	14831	42719	39887	93.37	.27
K8325	2770	205	520	4243	1746	7647	8138	14361	14156	98.58	.23
K8327	2776	3065	3156	11985	3167	12480	9962	33852	30787	90.95	.25
K8329	2782	5913	6415	19687	4354	15428	14215	51797	45885	88.58	.28
K8831	2788	7120	8068	22629	4669	16114	11543	58599	51479	87.85	.29
K8333	2794	4971	7038	22433	4996	7371	16907	46808	41837	89.38	.68
K8335	2800	4892	7413	24544	5522	20059	15497	62431	57539	92.16	.28
K8337	2806	520	318	1271	305	1024	1331	3437	2917	84.87	.30
K8339	2812	646	841	4086	1398	2725	3008	9696	9050	93.34	.51
K8341	2818	786	771	2964	654	3371	3829	8547	7761	90.80	.19
K8343	2824	8	4	48	30	132	476	222	214	96.57	.23

NB#10 SEC S33 SF 12 1/2" 3x13 14 JETS IN AT 2515 CLASS 1-1-6
FLOW CH - NEG
SHORT TRIP
PUMP P 192
LPM 1979
WIPER TRIP
PUMP P: 194
LPM: 1938
50 — ROP M/HR
30 — WOB TONNE
200 — RPM
BIT #10 MADE 157M IN 37.7 HRS
T REVS 223.2K T:6 B:6 G:1/8
NB# 11 SEC S33SF 12.25" IN AT 2672M 2x13, 1x14 JETS
PUMP P 177
LPM. : 1966
BIT #11 MADE 93M IN 23.8 HRS
T REVS 141.9K T:6 B:5 G: IN
NB# 12 HTC X3A 12.25" IN AT 2765M 2x14, 1x13 JETS
PUMP P: 159
LPM : 2067
BIT #12 MADE 41M IN 11.4 THOS
TREVS 63.4 T:2 B:2 IN
NB# 13 SEC S33 8.5"
3X10/32 JETS IN AT 280
FLOW CH: NEG
2525
2550
2575
2600
2625
2650
2675
2700
2725
2750
2775
2800
2825
T.G 1.1%
RECALIBRATE GAS SYSTEM
NO STG
W.T.G 0.5%
TOTAL GAS % — 4
C_1% — 4
C_2% — 4
C_3% — 2
C_4% — 2
T.G. 0.9%
T.G. 3%
9 5/8 CSG SHOE AT 2789M
LEAK OFF TEST 1.65 S.G.
08/07/81
CLYST, A/A, BEC CALC.
TR PYR
SLTST, DK BRN, SFT-FRM, BLKY, NON CALC, ALSO LT GY, GY/GRN, SFT-FRM, BLKY, SUB FIS, SL CALC GRDG I/P TO CLYST, LT GY, FM, BLKY, CALC.
TR CALCITE
08/07/81
09/07/81
TR SD
TR LST, CRM, HD, BLKY, MOD N
CLYST, GY, SFT, AMORPH, SL CALC
SLTST: GY, BRN, SFT-FM, BLKY, SL CAL
TR LMST: CRM, FM, MICXLN, BLKY
09-07-81
10-07-81
TR PYRITE
CLYST: GY, OFF WH, SFT-FM, BLKY
TR SND: CLR, V FN GN, W SRTD, SUB ANG-SUB RND.
SLTST: GY, BRN, SFT-FM, BLKY, SL CALC.
10-07-81
11-07-81
CLYST: GY, LT GY, LT GN, RD BRN, SFT
SLTST: GY, GY/GN, BRN, SPKLD, SFT-FRM, BLKY.
TR SD: CLR-MLKY, MED GRN, ANG-SUB ANG.
LST: WH, OFF WH, XLN, SFT-FRM, HD I/P, DULL ORG FLUOR, NO CUT.
TR DEAD OIL, SLW STMG CUT, DULL GLD FLUOR.
CLYST: GY, LT GY, LT GN, SFT-MOD FRM, CALC.
11-07-81
12-07-81
SLTST: GY-DK GY, SFT-FM, BLKY
CLYST: LT-DK GY, SFT-MOD, HD, SL CAL.
12-07-81
17-07-81
CLYST: LT GY, DK GY, OCC GY GN, MOD FM-FM, OCC CALC
SLTST: GY, LT GY, SFT-MOD FM, SPKLD, BLKY
LIG: BLK, MOD HD, SUB FIS.
SLTST: GY-DK GY, OCC LT BRN, SFT-BRIT, NON CALC, MIC I/P.
TOP BRENT NESS
2842m
INC MW TO 1.43 SG
MUD DATA
MW 1.43
VIS 50
PV 18
YP 17
GEL 4/27
pH 10.6
WL 14.0
CHL 19K
Ca 200
SOL 18
SD TR
H_2O 82
D.S. 1° N55E
D.S. 1/2° N22W
MUD DATA
WT 1.43
VIS 52
PV 21
YP 15
GELS 3/20
pH 10
Cl 19.5K
Ca 220
OIL 0
SOL 19
H_2O 81
SD TR
D.S. 1/8° N22W
DS 1/8 N22E
MUD DATA
MW 1.25
VIS 47
PV 15
YP 10
GELS 2/10
WL 6.3
CL 18K
Ca 320
SOL 15
SD TR
50 — POROSITY % — 0
0.2 — 'd' EXPONENT
S.G
2 — PORE PRESSURE
S.G
2 x x MUD WEIGHT x x

(UL GAS/KG ROCK)

CONCENTRATION OF H/C GASES

5%
4%
3%
2%
1%
0%

300 000
100 000
50 000
10000
5000
≤1000

OPEN LID - NOT ANALYSED

OPEN LID - NOT ANALYSED

DITCH GAS (%)
FROM ANALYSTS MUDLOG

GRAPH COMPARING TOTAL H/C (C_1 - C_4) CONTENT OF THE "CUTTINGS" AND "HEADSPACE" IN GEOCHEMISTRY SAMPLES WITH THE DITCH LINE H/C CONTENT, FROM 2542 m TO 2830 m KB

C_1 - C_4 IN HEADSPACE
C_1 - C_4 IN CUTTINGS
C_1 - C_4 TOTAL

2500
2600
2700
2800
2900

SAMPLE DEPTHS (m KB)