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Classification

Requested by

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Subtitle

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Title

Composition of Reservoir Fluid
Well 31/3-1
DST 1 and 2

STATOIL
EXPLORATION & PRODUCTION
LABORATORY

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LAB 84.228

Prepared

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9.03.21 A

CONTENTS

INTRODUCTION

The present report gives the composition of the reservoir fluid from Well 31/3-1, DST 1 and 2, as calculated from analysis of separator samples and gas oil ratios supplied by LET/S. Sampling details are on page 2.

The quality of the samples was checked by measuring bubble points of the separator liquids and compositions of the separator gases .

One sample set from DST 1 and two from DST 2 were analysed as requested. In addition, as a check on the separator liquid composition from DST 1, one additional separator liquid bottle from DST 1 was analysed. The liquid from DST 1 was analysed at the given separator temperature, those from DST 2 at ambient temperature. In the latter case a small correction was applied to the measured shrinkage to correct for the differense between the separator and analysis temperature.

The composition of the separator liquids was determined through a single flash to standard conditions. The composition of the reservoir fluid was calculated by recombining the separator gas and separator liquid composition according to a separator gas oil ratio calculated from the supplied stock tank ratios and the measured shrinkage.

Extended reservoir compositions to C20+ and C18+ for DST 1 and 2 respectively, were calculated by combining the calculated compositions with compositions obtained from a TBP distillation on stock tank oil. The TBP distillation data are reported separately.

*)

SAMPLING CONDITIONS

FIELD	TROLL
WELL	31/3-1
TEST	DST 1
RESERVOIR FLUID	GAS CONDENSATE
SAMPLE TYPE	SEPARATOR
Separator liquid	Bottle 83081703
Separator gas	Bottle A14399
	Bottle A14792
Separator liquid	Bottle 83081911
SEPARATOR PRESSURE	31.3 BAR
SEPARATOR TEMPERATURE	31 C
GAS OIL RATIO	53000 Sm3/Sm3 stock tank oil
TEST	DST 2
RESERVOIR FLUID	GAS CONDENSATE
SAMPLE TYPE	SEPARATOR
Set # 1	
Separator liquid	Bottle 83081316
Separator gas	Bottle A14776
	Bottle A14777
SEPARATOR PRESSURE	26.9 BAR
SEPARATOR TEMPERATURE	4.4 C
GAS OIL RATIO	61500 Sm3/Sm3 stock tank oil
Set # 2	
Separator liquid	Bottle 83081319
Separator gas	Bottle A14795
	Bottle A14803
SEPARATOR PRESSURE	24.8 BAR
SEPARATOR TEMPERATURE	7.8 C
GAS OIL RATIO	74700 Sm3/Sm3 Stock tank oil

*)
Data supplied by STATOIL, LET/S

WELL : 31/3-1
DST : 1

SEPARATOR GAS COMPOSITION
MOL %

	BOTTLE A14792	BOTTLE A14399
NITROGEN	1.593	1.606
CARBONDIOXIDE	0.378	0.363
METHANE	92.984	92.947
ETHANE	3.640	3.619
PROPANE	0.534	0.530
i-BUTANE	0.352	0.352
n-BUTANE	0.081	0.081
i-PENTANE	0.069	0.072
n-PENTANE	0.027	0.029
HEXANES	0.096	0.107
HEPTANES	0.144	0.175
OCTANES	0.071	0.092
NONANES	0.016	0.017
DECANES PLUS	0.017	0.010
	100.000	100.000
MOLECULAR WEIGHT	17.50	17.54
GASGRAVITY (air=1)	0.604	0.605

WELL : 31/3-1
DST : 1
BOTTLE: 83081703

BUBBLE POINT OF SEPARATOR LIQUID AT 31C

	PRESSURE BARG	REL VOL V/Vb
	155.4	0.9852
	140.0	0.9869
	121.2	0.9890
	107.7	0.9904
	89.1	0.9927
	71.6	0.9948
	57.7	0.9965
	42.9	0.9985
	34.6	0.9995
Pb =	31.0	1.0000
	29.9	1.0050
	26.8	1.0776
	20.7	1.2890
	16.1	1.5511
	8.9	2.5233

WELL : 31/3-1
DST : 1
BOTTLE: 83081911

BUBBLE POINT OF SEPARATOR LIQUID AT 31.0C

	PRESSURE BARG	REL VOL V/Vb
	199.9	0.9871
	171.8	0.9847
	148.0	0.9870
	120.0	0.9898
	90.5	0.9930
	71.5	0.9952
	53.1	0.9973
	41.9	0.9987
	34.5	0.9994
Pb =	31.0	1.0000
	28.5	1.0507
	24.1	1.1665
	19.5	1.3648
	16.3	1.5583
	14.0	1.7507

WELL : 31/3-1
DST : 1
BOTTLE: 83081703

COMPOSITION OF SEPARATOR LIQUID
(Single flash to stock tank conditions)

	STOCK TANK OIL MOL%	EVOLVED GAS MOL%	RECOMBINED LIQUID WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	0.25	0.01	28.0	0.04
CARBONDIOXIDE	0.00	0.74	0.05	44.0	0.12
METHANE	0.00	71.55	1.68	16.0	11.44
ETHANE	0.10	13.48	0.62	30.1	2.24
PROPANE	0.30	4.41	0.39	44.1	0.96
i-BUTANE	0.87	4.00	0.73	58.1	1.37
n-BUTANE	0.36	0.98	0.24	58.1	0.46
i-PENTANE	0.89	0.92	0.59	72.2	0.89
n-PENTANE	0.50	0.33	0.31	72.2	0.47
HEXANES	4.24	1.09	2.87	83.7	3.74
HEPTANES	15.27	1.50	10.75	89.7	13.07
OCTANES	22.35	0.64	18.20	105.1	18.88
NONANES	15.30	0.10	14.18	120.1	12.87
DECANE PLUS	39.82	0.01	49.37	160.9	33.46
	100.00	100.00	100.00		100.00
MOL WEIGHT	125.1	24.68			109.00

Gas oil ratio	=	28.5	Sm3/Sm3 STO
Flash formation volume factor of bubble point liquid	=	1.141	m3/Sm3 STO
Density at bubble point	=	0.721	g/cm3
Density of STO	=	0.793	g/cm3 at 15C
Gas gravity (air=1)	=	0.852	
Density of C10+	=	0.828	g/cm3

WELL : 31/3-1
DST : 1
BOTTLE: 83081911

COMPOSITION OF SEPARATOR LIQUID
(Single flash to stock tank conditions)

	STOCK TANK OIL MOL%	EVOLVED GAS MOL%	RECOMBINED LIQUID WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	0.27	0.01	28.0	0.04
CARBONDIOXIDE	0.00	0.77	0.04	44.0	0.11
METHANE	0.00	71.15	1.42	16.0	9.88
ETHANE	0.04	14.31	0.54	30.1	2.02
PROPANE	0.24	4.61	0.33	44.1	0.84
i-BUTANE	0.85	3.98	0.67	58.1	1.28
n-BUTANE	0.35	0.97	0.23	58.1	0.43
i-PENTANE	0.92	0.84	0.59	72.1	0.91
n-PENTANE	0.52	0.32	0.32	72.2	0.50
HEXANES	4.30	1.02	2.88	83.7	3.84
HEPTANES	15.43	1.28	10.83	89.9	13.46
OCTANES	21.56	0.46	17.51	105.0	18.63
NONANES	14.87	0.02	13.77	120.2	12.80
DECANE PLUS	40.93	0.00	50.86	161.2	35.26
	100.00	100.00	100.00		100.00
MOL WEIGHT	125.8	24.35			111.72

Gas oil ratio	=	24.1	Sm3/Sm3 STO
Flash formation volume factor of bubble point liquid	=	1.089	m3/Sm3 STO
Density at bubble point	=	0.752	g/cm3
Density of STO	=	0.794	g/cm3 at 15C
Gas gravity (air=1)	=	0.841	
Density of C10+	=	0.828	g/cm3

Set # 1

WELL : 31/3-1
DST : 2

SEPARATOR GAS COMPOSITION
MOL %

	BOTTLE A14776	BOTTLE A14777
NITROGEN	1.592	1.601
CARBONDIOXIDE	0.425	0.421
METHANE	93.268	93.216
ETHANE	3.621	3.626
PROPANE	0.482	0.484
i-BUTANE	0.338	0.341
n-BUTANE	0.060	0.061
i-PENTANE	0.053	0.053
n-PENTANE	0.017	0.018
HEXANES	0.059	0.068
HEPTANES	0.061	0.081
OCTANES	0.017	0.026
NONANES	0.002	0.003
DECANES PLUS	0.004	0.002
	100.000	100.000
MOLECULAR WEIGHT	17.30	17.33
GASGRAVITY (air=1)	0.597	0.598

WELL : 31/3-1
DST : 2

Set # 2

SEPARATOR GAS COMPOSITION
MOL %

	BOTTLE A14803	BOTTLE A14795
NITROGEN	1.589	1.588
CARBONDIOXIDE	0.430	0.429
METHANE	93.152	93.169
ETHANE	3.629	3.625
PROPANE	0.486	0.485
i-BUTANE	0.345	0.344
n-BUTANE	0.062	0.061
i-PENTANE	0.059	0.058
n-PENTANE	0.019	0.019
HEXANES	0.076	0.075
HEPTANES	0.103	0.100
OCTANES	0.039	0.036
NONANES	0.006	0.005
DECANES PLUS	0.005	0.004
	100.000	100.000
MOLECULAR WEIGHT	17.38	17.37
GASGRAVITY (air=1)	0.600	0.600

WELL : 31/3-1
DST : 2
BOTTLE: 83081316

Set # 1

BUBBLE POINT OF SEPARATOR LIQUID AT 18.9C

	PRESSURE BARG	REL VOL V/Vb
	148.4	0.9862
	130.7	0.9881
	111 1	0.9902
	91.3	0.9924
	72.4	0.9944
	56.2	0.9963
	43.4	0.9978
	37.3	0.9986
	31.0	0.9998
Pb =	27.5	1.0000
	27.3	1.0108
	23.5	1.1266
	19.6	1.2968
	16.5	1.4940
	14.3	1.6863
	11.9	1.9714

WELL : 31/3-1
DST : 2
BOTTLE: 83081319

Set # 2

BUBBLE POINT OF SEPARATOR LIQUID AT 20.0C

	PRESSURE BARG	REL VOL V/Vb
	151.0	0.9858
	126.7	0.9873
	112.1	0.9888
	97.8	0.9904
	82.8	0.9910
	67.8	0.9938
	53.3	0.9954
	37.3	0.9974
	25.2	1.0004
Pb =	25.0	1.0000
	23.1	1.1061
	17.7	1.3810
	13.5	1.7568
	10.2	2.0343

Set # 1

WELL : 31/3-1
DST : 2
BOTTLE: 83081316

COMPOSITION OF SEPARATOR LIQUID
(Single flash to stock tank conditions)

	STOCK TANK OIL MOL%	EVOLVED GAS MOL%	RECOMBINED LIQUID WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	0.28	0.01	28.0	0.04
CARBONDIOXIDE	0.00	0.99	0.07	44.0	0.16
METHANE	0.00	68.73	1.78	16.0	11.03
ETHANE	0.15	14.25	0.73	30.1	2.41
PROPANE	0.38	4.99	0.50	44.1	1.12
i-BUTANE	1.32	5.43	1.16	58.1	1.98
n-BUTANE	0.42	1.09	0.31	58.1	0.53
i-PENTANE	1.33	1.18	0.95	72.2	1.30
n-PENTANE	0.63	0.38	0.43	72.1	0.59
HEXANES	6.47	1.37	4.75	83.5	5.65
HEPTANES	21.46	1.15	16.32	89.1	18.20
OCTANES	27.32	0.16	24.18	104.6	22.96
NONANES	13.79	0.00	13.83	118.6	11.58
DECANE PLUS	26.73	0.00	34.99	154.9	22.44
	100.00	100.00	100.00		100.00
MOL WEIGHT	113.5	25.24			99.34

Gas oil ratio	=	30.8	Sm3/Sm3 STO
Flash formation volume factor of bubble point liquid	=	1.099	m3/Sm3 STO
Density at bubble point	=	0.735	g/cm3
Density of STO	=	0.775	g/cm3 at 15C
Gas gravity (air=1)	=	0.871	
Density of C10+	=	0.827	g/cm3

Set # 2

WELL : 31/3-1
DST : 2
BOTTLE: 83081319

COMPOSITION OF SEPARATOR LIQUID
(Single flash to stock tank conditions)

	STOCK TANK OIL	EVOLVED GAS	RECOMBINED LIQUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.00	0.21	0.01	28.0	0.03
CARBONDIOXIDE	0.00	1.02	0.07	44.0	0.16
METHANE	0.00	65.47	1.65	16.0	10.25
ETHANE	0.09	15.00	0.73	30.1	2.42
PROPANE	0.34	5.20	0.49	44.1	1.10
i-BUTANE	1.25	5.47	1.11	58.1	1.91
n-BUTANE	0.41	1.11	0.30	58.1	0.52
i-PENTANE	1.27	1.19	0.91	72.2	1.26
n-PENTANE	0.62	0.40	0.43	72.2	0.59
HEXANES	6.45	1.67	4.77	83.5	5.70
HEPTANES	22.45	2.31	17.33	89.5	19.30
OCTANES	27.32	0.81	24.34	104.7	23.17
NONANES	13.65	0.10	13.58	117.4	11.53
DECANE PLUS	26.15	0.04	34.27	154.7	22.07
	100.00	100.00	100.00		100.00
MOL WEIGHT	113.1	27.20			99.65

Gas oil ratio	=	30.0	Sm3/Sm3 STO
Flash formation volume factor of bubble point liquid	=	1.156	m3/Sm3 STO
Density at bubble point	=	0.700	g/cm3
Density of STO	=	0.774	g/cm3 at 15C
Gas gravity (air=1)	=	0.939	
Density of C10+	=	0.827	g/cm3

WELL : 31/3-1
DST : 1

CALCULATED COMPOSITION OF RESERVOIR FLUID

	SEPARATOR LIQUID	SEPARATOR GAS	RECOMBINED FLUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.04	1.59	2.50	28.0	1.59
CARBONDIOXIDE	0.12	0.38	0.93	44.0	0.38
METHANE	11.44	92.98	83.51	16.0	92.71
ETHANE	2.24	3.64	6.14	30.1	3.63
PROPANE	0.96	0.53	1.33	44.1	0.54
i-BUTANE	1.37	0.35	1.16	58.1	0.36
n-BUTANE	0.46	0.08	0.27	58.1	0.08
i-PENTANE	0.89	0.07	0.29	72.2	0.07
n-PENTANE	0.47	0.03	0.12	72.1	0.03
HEXANES	3.74	0.10	0.50	83.2	0.11
HEPTANES	13.07	0.14	0.93	89.0	0.19
OCTANES	18.88	0.07	0.78	103.3	0.13
NONANES	12.87	0.02	0.40	120.7	0.06
DECANES PLUS	33.46	0.02	1.15	158.2	0.13
	100.00	100.00	100.00		100.00
MOL WEIGHT	109.0	17.50			17.81
MOL RATIO	0.34	99.66			100.00
MASS RATIO	2.05	97.95			100.00

GASS OIL RATIO 46450 Sm3 gas/m3 separator oil

Separator gas sample :A14792
Separator liquid sample:83081703

WELL : 31/3-1

EXTENDED RESERVOIR FLUID COMPOSITION 1)

COMPONENT	WEIGHT%	MOL WEIGHT	MOL%	DENSITY g/cm3 at 15C
N2	2.50	28.0	1.587	--
CO2	0.93	44.0	0.377	
C1	83.51	16.0	92.710	
C2	6.14	30.1	3.635	
C3	1.33	44.1	0.535	
iC4	1.16	58.1	0.356	
nC4	0.27	58.1	0.082	
iC5	0.29	72.2	0.072	
nC5	0.12	72.1	0.029	
C6	0.50	83.2	0.108	0.660
C7	0.93	89.0	0.187	0.670
C8	0.78	103.3	0.134	0.710
C9	0.40	120.7	0.059	0.720
C10	0.31	133.0	0.043	0.807
C11	0.22	148.0	0.027	0.819
C12	0.13	161.0	0.015	0.834
C13	0.12	173.0	0.013	0.839
C14	0.09	186.0	0.009	0.845
C15	0.07	200.0	0.007	0.848
C16	0.07	210.0	0.006	0.851
C17	0.03	230.0	0.003	0.848
C18	0.04	242.0	0.003	0.851
C19	0.01	252.0	0.001	0.858
C20+	0.05	321.0	0.003	0.897
	100.00		100.000	

1) Data to C9 based on single flash, remaining on TBP distillation

Set # 1

WELL : 31/3-1
DST : 2

CALCULATED COMPOSITION OF RESERVOIR FLUID

	SEPARATOR LIQUID	SEPARATOR GAS	RECOMBINED FLUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.04	1.59	2.53	28.0	1.59
CARBONDIOXIDE	0.16	0.43	1.06	44.0	0.42
METHANE	11.03	93.27	84.96	16.0	93.01
ETHANE	2.41	3.62	6.19	30.1	3.62
PROPANE	1.12	0.48	1.22	44.1	0.48
i-BUTANE	1.98	0.34	1.14	58.1	0.34
n-BUTANE	0.53	0.06	0.20	58.1	0.06
i-PENTANE	1.30	0.05	0.24	72.2	0.06
n-PENTANE	0.59	0.02	0.08	72.1	0.02
HEXANES	5.65	0.06	0.36	82.9	0.08
HEPTANES	18.20	0.06	0.59	88.4	0.12
OCTANES	22.96	0.02	0.52	103.9	0.09
NONANES	11.58	0.00	0.26	119.0	0.04
DECANES PLUS	22.44	0.00	0.65	154.1	0.07
	100.00	100.00	100.00		100.00
MOL WEIGHT	99.3	17.30			17.56
MOL RATIO	0.31	99.69			100.00
MASS RATIO	1.76	98.24			100.00

GASS OIL RATIO 55960 Sm3 gas/m3 separator oil

Separator gas sample :A14776
Separator liquid sample:83081316

Set # 1

WELL : 31/3-1

EXTENDED RESERVOIR FLUID COMPOSITION 1)

COMPONENT	WEIGHT%	MOL WEIGHT	MOL%	DENSITY g/cm3 at 15C
N2	2.53	28.0	1.587	
CO2	1.06	44.0	0.425	
C1	84.96	16.0	93.012	
C2	6.19	30.1	3.618	
C3	1.22	44.1	0.484	
iC4	1.14	58.1	0.343	
nC4	0.20	58.1	0.061	
iC5	0.24	72.2	0.057	
nC5	0.08	72.1	0.019	
C6	0.36	82.9	0.077	0.660
C7	0.59	88.4	0.117	0.670
C8	0.52	103.9	0.088	0.710
C9	0.26	119.0	0.038	0.720
C10	0.22	136.0	0.029	0.807
C11	0.14	150.0	0.016	0.820
C12	0.09	163.0	0.011	0.835
C13	0.07	179.0	0.007	0.841
C14	0.05	192.0	0.005	0.847
C15	0.03	207.0	0.003	0.854
C16	0.02	218.0	0.002	0.861
C17	0.01	232.0	0.000	0.864
C18+	0.03	296.0	0.002	0.904
	100.00		100.000	

1) Data to C9 based on single flash, remaining on TBP distillation

Set # 2

WELL : 31/3-1
DST : 2

CALCULATED COMPOSITION OF RESERVOIR FLUID

	SEPARATOR LIQUID	SEPARATOR GAS	RECOMBINED FLUID		
	MOL%	MOL%	WEIGHT%	MOL WT	MOL%
NITROGEN	0.03	1.59	2.52	28.0	1.58
CARBONDIOXIDE	0.16	0.43	1.08	44.0	0.43
METHANE	10.25	93.15	84.74	16.0	92.94
ETHANE	2.42	3.63	6.20	30.1	3.63
PROPANE	1.10	0.49	1.22	44.1	0.49
i-BUTANE	1.91	0.35	1.15	58.1	0.35
n-BUTANE	0.52	0.06	0.21	58.1	0.06
i-PENTANE	1.26	0.06	0.25	72.2	0.06
n-PENTANE	0.59	0.02	0.08	72.2	0.02
HEXANES	5.70	0.08	0.43	82.9	0.09
HEPTANES	19.30	0.10	0.77	88.7	0.15
OCTANES	23.17	0.04	0.58	103.2	0.10
NONANES	11.53	0.01	0.24	118.4	0.04
DECANES PLUS	22.07	0.00	0.53	153.6	0.06
	100.00	100.00	100.00		100.00
MOL WEIGHT	99.7	17.38			17.59
MOL RATIO	0.26	99.74			100.00
MASS RATIO	1.45	98.55			100.00

GASS OIL RATIO 64620 Sm3 gas/m3 separator oil

Separator gas sample :A14803
Separator liquid sample:83081319

Set # 2

WELL : 31/3-1

1)

EXTENDED RESERVOIR FLUID COMPOSITION

COMPONENT	WEIGHT%	MOL WEIGHT	MOL%	DENSITY g/cm3 at 15C
N2	2.52	28.0	1.585	
CO2	1.08	44.0	0.430	
C1	84.74	16.0	92.939	
C2	6.20	30.1	3.626	
C3	1.22	44.1	0.488	
iC4	1.15	58.1	0.349	
nC4	0.21	58.1	0.063	
iC5	0.25	72.2	0.062	
nC5	0.08	72.2	0.020	
C6	0.43	82.9	0.091	0.660
C7	0.77	88.7	0.153	0.670
C8	0.58	103.2	0.099	0.710
C9	0.24	118.4	0.035	0.720
C10	0.16	136.0	0.024	0.807
C11	0.11	150.0	0.014	0.820
C12	0.08	163.0	0.009	0.835
C13	0.05	179.0	0.005	0.841
C14	0.04	192.0	0.004	0.847
C15	0.02	207.0	0.002	0.854
C16	0.02	218.0	0.001	0.861
C17	0.00	232.0	0.000	0.864
C18+	0.02	296.0	0.001	0.904
	100.00		100.000	

1)
Data to C9 based on single flash, remaining on TBP distillation