



DRILLING FLUIDS

CASING INTERVAL

COMPANY Statoil Well No. 24/12 no.1 Page 1 of 4

Casing Size 30 " from floor sea Footage to 186 m (Bit Size) 36 " hole from floor sea Footage to 186 m

Material Consumption for Interval:

Product	Units	Size	Cost/Unit	Total Cost
Barite	57	bulk	84.71	4,828.47
Bentonite	53	bulk	132.30	7,011.90
Caustic	14	50 kg	22.24	311.86
Lime	6	25 kg	2.77	16.62
Soda Ash	4	50 kg	9.73	38.92
Lignosulfonate	5	25 kg	10.70	53.50
Kwick Seal	28	40 lb	18.32	512.96
Nut Plug	74	25 kg	10.45	773.30

Material Cost for Interval \$ 13,547.53 meter Average Cost per ~~MBK~~ meter \$ 72.84

Number of Days 3 Average Cost per Day \$ 4,515.84

Comments:

1/13



DRILLING FLUIDS

CASING INTERVAL

COMPANY Statoil Well No. 24/12 no.1 Page 2 of 4

Casing Size 20 " from - to 756 m. (Bit Size) 17 1/2+reamer hole from - to 771 m.

Material Consumption for Interval:

Product	Units	Size	Cost/Unit	Total Cost
Barite	66	bulk	84.71	5,590.86
Bentonite	29	bulk	132.30	3,836.70
Bentonite	381	50 kg	8.10	3,086.10
Caustic	19	50 kg	22.24	422.56
Caustic	98	25 kg	11.12	1,089.76
Lignosulfonate	34	25 kg	10.70	363.80
CMC	31	25 kg	40.40	1,252.40
Drispac regular	4	50 lb	98.30	393.26
Desco	4	25 lb	18.89	75.56

Material Cost for Interval \$ 16,110.94 Average Cost per ^{meter} Foot \$ 27.54

Number of Days 6 Average Cost per Day \$ 2,685.16

Comments:



CASING INTERVAL

COMPANY StatOil Well No. 24/12 no.1 Page 3 of 4

Casing Size 13 3/8 " from seabed to 2855 m (Bit Size) 17 1/2 " hole from 756 to 2874 m Footage

Material Consumption for Interval:

Product	Units	Size	Cost/Unit	Total Cost
Barite	583	bulk	84.71	49,385.93
Bentonite	1792	50 kg	8.10	14,515.20
Caustic	806	25 kg	11.12	8,962.72
Lignosulfonate	1372	25 kg	10.78	14,790.16
Soda-Ash	12	50 kg	9.73	116.76
C.M.C.	117	25 kg	40.46	4,733.82
Soltex	90	50 lb	33.87	3,058.28
Drispac reg.	23	50 lb	98.30	2,260.90
Nut Plug Fine	438	50 lb	10.45	4,577.10
Nut Plug Med.	309	50 lb	10.45	3,299.05
Mica Fine	362	25 kg	9.74	3,525.88
Mica Med.	242	25 kg	9.74	2,357.08
Lubrisal	7	55 gal	441.00	3,087.00

Material Cost for Interval \$ 114,599.88 Average Cost per ~~meter~~ meter \$ 54.12

Number of Days 33 Average Cost per Day \$ 3,472.72

Comments:



DRILLING FLUIDS

CASING INTERVAL

COMPANY Statoil Well No. 24/12 no.1 Page 4 of 4

Casing Size 9 5/8 " floor Footage (Bit Size) 12 1/4 " Footage
" from sea to T.D. " hole from 2874 m to 3980 m

Material Consumption for interval:

Product	Units	Size	Cost/Unit	Total Cost
Barite	790	bulk	84.71	66,920.90
Bentonite	643	50 kg	8.10	5,208.30
Caustic	411	25 kg	11.12	4,570.32
Lignosulfonate	601	25 kg	10.78	6,478.78
Drispac reg.	58	50 lb	98.30	5,701.40
Desco	79	25 lb	18.89	1,492.31
C.M.C.	376	25 kg	40.46	15,212.96
Soltex	60	50 lb	33.98	2,038.80
Lignite	239	25 kg	10.66	2,547.74
Nut Plug	50	50 lb	10.45	522.50

Material Cost for interval \$ 110,860.56 meter Average Cost per E&B \$ 100.23

Number of Days 35 Average Cost per Day \$ 3,162.68

Comments:



TOTAL MUD MATERIALS USED FOR WELL

COMPANY Statoil WELL NO 24/12 no.1 PAGE 1 of 1

Quantity	Material	Unit Weight	Unit Cost	Total Cost	%
1426	Barite	bulk	84.71	126,726.16	
82	Bentonite	bulk	132.30	10,848.60	
2816	Bentonite	50 kg	8.10	22,809.60	
33	Caustic Soda	50 kg	22.24	733.92	
1315	Caustic Soda	25 kg	11.12	14,622.80	
2012	Lignosulfonate	25 kg	10.18	20,482.16	
83	Desco	25 lb	18.89	1,567.87	
524	C.M.C.	25 kg	40.46	21,201.04	
75	Drispac regular	50 lb	98.30	7,372.50	
150	Soltex	50 lb	33.98	5,097.00	
239	Lignite	25 kg	10.66	2,547.74	
7	Lubrisal	55 gal	444.00	3,087.00	
28	Kwick Seal	40 lb	18.32	512.96	
242	Mica med.	25 kg	9.74	2,357.08	
362	Mica - fine	25 kg	9.74	3,525.88	
383	Plug - med.	25 kg	10.45	4,002.35	
488	Plug - Fine	50 lb	10.45	5,099.60	
16	Soda Ash	50 kg	9.73	155.68	

TOTAL COST FOR WELL \$ 257,444.94
meters

DEPTH AT T.D. 3980 meters AVERAGE COST per meter for WELL \$ 64.68

AVERAGE COST per DAY \$ 3,101.73

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem INT. LTD.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
16/1																		Build Spud Mud
17/1																		" " "
18/1																		Prehyd. Bentonite
19/1			130+															Spud mud
20/1	375	9.2	75	38		15	41	25/49	4	8.5	1.1	14.5	160		1/2	7		
"	450	9.2	55	37.2		11	37	20/43	4	9.0	1.0	16	180		1/2	7		
"	534	9.2	55	38.6		10	40	20/40	4	8.5	1.0	16	200		1/2	7		
21/1	644	9.2	44	28.3		9	26	19/31	3	9.5	.9	13.5	100		1	6		
"	644	9.2	44	26.5		13	30	20/35	3	9.5	.9	14	140		1	6		
"	680	9.2	45	24.6		11	30	23/35	3	9.5	1.1	14	140		1	6		
22/1		9.2	40	29.6		7	30	20/31	4	9.5	.8	13.5	200		1	6		
"	771	9.2	43	32.1		9	30	21/33	4	9.0	.8	14.2	280		1	6		
23/1		9.1	40	38.4		9	28	21/38	4	9.0	1.9	14.9	220		1/2	6		
"	519	9.1	42	40.1		7	31	20/30	4	9.5	2.5	15.2	160		1/2	6		
"	572	9.1	42	39.3		8	29	19/30	4	9.5	2.1	15.4	160		1/2	6		
24/1		9.1	42	29.5		10	31	22/34	4	9.5	2.0	15.4	120		1/2	6		
"	771	9.4	42	30.8		8	29	22/33	4	9.5	1.8	15.2	120		1/2	6		
"	771	10.1	41	30.1		9	27	20/28	4	9.5	1.8	15.2	160		1/2	7		
25/1																		Mixing mud
26/1		9.1	48	26.8		8	31	20/31	4	9.5	1.8	15.2	120		1/4	6		

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake 32nd	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
27/1		9.1	49	27.0		9	30	20/31	4	9.5	1.8	15	120		1/4	6		
28/1	774	9.1	43	25.0		20	27	20/24	4	11.0	1.5	13	160		1/4	5		
29/1	845	9.2	46	28.0		7	45	24/45	4	10.0	1.4	13	160		1/4	5		
"	1012	9.2	43	24.0		8	40	31/42	4	10.0	1.2	12	80		1/4	6		
"	1118	9.6	42	29.0		8	30	20/31	4	10.5	1.4	13	80		1/4	8		
30/1	1208	9.6	40	24.0		6	24	16/26	4	11.0	1.6	12	80		1/4	8		
"	1274	9.6	40	19.0		7	12	12/19	3	9.0	.9	13	140		1/4	9		
31/1	1347	9.6	41	9.0		10	16	12/19	2	11.6	1.8	11	160		1/4	10		
"	1437	9.6	42	9.6		13	10	8/20	2	10.0	1.1	13	200		1/4	11		
1/2	1552	9.9	47	8.5		17	9	4/30	2	10.5	1.4	13	120		1/4	11		
"	1668	9.9	44	8.8		14	9	4/16	2	10.5	1.6	13	120	TR	1/4	11.5		
2/2	PIT	10.3	44	8.5		14	12	6/25	2	10.5	2.0	14.5	120	3	1/4	13		
"	Flowl.	10.5	55	8.5		16	11	6/26	2	10.5	1.7	14.5	160	2	1/2	13		
3/2	sucti.	10.6	39	11		12	8	10/28	2	11.0	2.5	18	200	2	1/4	13		
"	flowl.	10.7	57	10.5		14	14	13/28	2	11.0	2.3	18	160	2	1/2	15		
4/2	suction	10.6	40	11.5		13	11	8/29	2	10.5	2.2	18	160	1	1/4	16		
"	flowl.	10.7	65	11.5		15	15	9/30	2	10.5	2.1	18	160	1	1/2	17		
5/2	suct.	10.6+	39	10.6		12	6	3/27	2	11.0	2.1	17	100	1	TR	15		
"	flowl.	10.7	57	11.5		15	10	3/27	2	11.0	2.1	19	200	1	1/4	15		

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gel. 0/10	Filter cake 32nd	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														OW	Sand	Solids		
6/2	Flowl.	10.8	51	9.8		15	10	2/14	2	11	2.0	18	200	1	1/2	15	25	
"	Suct.	10.7	42	9.6		13	9	2/11	2	10.5	1.8	18	180	1	1/4	13	25	
7/2	2390	10.7	51	10.1		13	10	3/15	3	10.5	1.2	19	220	TR	3/4	15	27½	
"	2446	10.6	57	11		17	10	6/33	2	11	1.8	17	120	TR	1/4	14	30	
8/2		10.5	58	9.8	28.6	17	16	10/24	3	11	1.9	17	120	TR	1/4	14	30	
"		10.5	58	9.5	28	14	9	3/19	2	11.5	.9	17	200	TR	1	15	30	
9/2	2472	10.5	53	9.5	26	15	9	3/20	2	10.5	1.1	16	200	TR	1	14	30	
"	2478	10.6	55	8.0		17	8	2/22	3	10.5	.9	17	240	TR	3/4	15	35	
10/2	2490	10.5	48	9.0		15	10	2/14	2	10.5	1.0	17	160		1 1/2	14		
"	2503	10.5	49	8.6	26	16	10	2/16	2	10.5	1.0	17	160		1/2	15	32½	
"	2515	10.5	57	8.4		20	13	2/30	2	10.5	1.2	17	160		1 1/2	14	37½	
11/2	2532	10.5	51	8.9		19	6	2/20	2	10.0	.8	16	240		1 1/2	13	40	
12/2		10.5	43	9.5		13	9	2/10	2	9.5	.8	13	240		1/4	15	35	
"	2554	10.5	51	9.0		16	9	2/11	2	10.0	1.2	14	180		1/4	15	35	
13/2	2585	10.5	44	9.5		15	9	3/25	2	11.0	1.6	14.5	80		1/2	14	40	
"	2610	10.5	45	9.0		15	10	3/25	2	10.5	1.4	14	80		1/4	15	40	
14/2	2648	10.5	48	9.2		16	9	2/10	2	10.0	.8	14	80		1/2	15	40	
"	2669	10.5	45	8.6		15	8	2/14	2	10.5	1.2	16	80		1/2	16	40	
15/2	2698	10.5	44	9.2		13	9	2/18	2	10.5	1.4	15.5	100		1/4	16	40	
"		10.5	53	9.0		16	11	3/24	2	10.5	1.5	15	100		1/4	15	40	

DRILLING FLUID PROPERTIES



Well: 24/12-1

Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
16/2	2719	10.5	46	9.9		13	10	2/16	2	10.5	1.0	15.5	100		1/4	13	40	
"	Flowl.	10.6	52	10.2		15	9	2/22	2	10.0	.8	15.5	60		1/4	14		
"		10.5	48	9.2		16	13	2/13	2	10.5	1.0	17.5	100		1/4	14	40	
17/2	2744	10.4+	45	9.6		12	11	2/14	2	10.5	1.0	17.5	100		1/4	14	40	
"	2746	10.6	56	9.5		16	10	23/23	2	10.0	.8	19	200		1/4	14	40	
18/2	2796 ⁱⁿ	10.5	44	10.5		13	11	3/28	2	11.0	1.7	19	100		1/4	14	40	
"	"out	10.5	58	11.0		15	11	3/35	2	11.0	1.7	19	100		1/4	15	40	
19/2	2832 ⁱⁿ	10.5	44	10.3		15	10	2/22	2	11.0	1.7	19	120		1/4	13	40	
"	"out	10.6	54	10.8		16	14	3/30	2	11.0	1.7	19	120		1/4	14	40	
20/2	2874	10.5	53	7.8		16	16	2/20	1	11.0	1.9	20.5	100		1/4	15	40	
21/2																		
22/2	2874 ⁱⁿ	10.5	42	8.0		15	9	1/15	2	11.0	2.2	20	100		1/4	13	40	
"	"out	10.5	51	8.0		16	10	1/6	2	11.0	2.2	20	100		1/4	14	40	
23/2		10.4+	42							10.5								
24/2		10.4+																
25/2	2874	10.4+																
26/2	2874	10.5																
27/2	2874	10.4	46	8.0		10	6	2/12	2	9.7	.4	21	200		TR	14	40	
28/2	2874	10.4	41															
1/3	2874	10.5	52	8.2		24	9	3/15	2	10.5	.8	20.5	TR	54	1/4	17	35	

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
2/3	PIT	10.5	56	5.5		17	10	1/10	1	10.5	1.8	20.5	160	8	1	16	35	
"	Out	10.5	69	6.2		18	11	1/11	1	10.5	1.9	20.5	140	7	3/4	16	35	
"	Out	10.5	63	6.1		18	10	1/9	1	10.5	1.8	20.5	120	7	3/4	14	35	
3/3	2874	10.5+	59	6.8		18	12	2/12	1	10.5	1.7	20.5	160	7	1/2	14	35	
4/3		10.5	49	6.9	28.4	17	9	1/10	1	10.5	1.6	20.5	160	6	3/8	14	35	
5/3		10.5	55	6.1	17.4	18	10	1/9	1/4	10.5	2.1	20.5	160	5	3/8	13	35	
"	2878	10.5	46	6.9	17.8	17	11	1/10	1/5	11.0	2.8	20.5	120	5	1/4	13	35	
6/3		10.5	41	6.8	18.8	14	6	1/7	1/4	10.5	2.5	20.5	160	4	3/16	14	37½	
"	2878	10.5	48	6.7	18.0	14	8	1/8	1/4	10.5	2.4	20.5	160	4	1/8	14	37½	
7/3	2905	10.4+	46	7.0	18.2	14	7	1/7	4	10.5	1.3	21	140	4	1/8	14	37½	
"		10.5	45	6.3	18.0	14	6	1/7	1	10.5	1.2	21	140	4	TR	14	37½	
"	2923	10.5	52	6.4	18.6	15	8	1/8	4	10.5	1.1	21	140	4	1/4	15	37½	
8/3		10.4	50	6.4	18.0	15	7	1/6	4	10.5	1.6	21	140	3	TR	14	37½	
"	2953	10.2	42	6.8	18.6	13	6	1/8	4	10.5	1.5	21	140	5	1/8	14	37½	
"	2957	10.3	52	6.7	19.0	15	9	1/11	4	10.5	1.4	21	140	5	1/8	15	37½	
9/3	2963	10.1	42	7.6	24.0	11	6	1/9	4	10.5	1.4	21	140	5	TR	12		
"	2997	10.0	51	8.0		10	6	1/12	2	10.5	1.0	20	140	4	TR	12		
"	3017	10.0	43	8.0	25.0	11	8	2/16	4	11.0	1.2	20	100	4	TR	12		

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK Pm	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
10.3	Flow Line	10.0+	58	8.1	26.5	14	9	2/30	1/32	11	1.8	20	80	4	TR	13	52.5	
"	Suction	10.0	43	8.0	-	13	8	2/27	1/32	11	1.6	20	80	4	TR	12	-	
"	Flow Line	10.0	57	8.0	-	15	10	3/35	1/32	10.5	.5	20	80	4	TR	13	-	Adding CMC+Unical to Pit. Caustic to flowline.
"	PIT	10.0	43	7.8	-	14	8	2/29	1/32	10.5	-	20						
11.3	Flow Line	10.0	59	8.5	-	17	12	3/26	1/32	10.0	1.0	20	100	5		13		"
"	PIT	10.0	44	7.5	-	16	8	2/22	1/32	10.0		20	100	4		13		"
"	Flow	10.0	56	7.3	20.6	16	11	2/21	1/32	10.0	1.0		80	4	TR	13	45	
"	Flow	10.1	55	7.0		18	10	2/21	1/32	10.0		21		4		14		
"	PIT	10.0	45	7.0		16	10	2/19	1/32	10.0	1.5	21	80	3	TR	13		
12.3	Flow	10.0	60	7.2		20	12	3/18	1/32	10.0	1.6	21	160	3		14		
"	PIT	10.0+	44	6.8		14	7	1/16	1/32	10.0	2.0	21	160	4	TR	11		
"	Flow	10.0	44	6.8	18.0	14	7	1/10	1/32	10.5	1.9	21	100	3	TR	12	30	POOH at 12:45 hrs.
"	Flow	10.0	50	6.4		15	7	1/10	1/32	10.5	1.9	21	100	3	TR	12		
"	PIT	10.0	42			15	7	1/10										
13.3	Flow	10.0	53	6.6		17	7	2/8	1/32	10.5	2.2	22	160	4		11	45	
"	PIT	10.0	44	6.5		14	7	1/10	1/32	10.5	2.6	23		4		12		
"	Flow	10.1	50	6.2	18.0	15	7	1/9	1/32	10.5	1.8	22	80	3	TR	12		Stopped Caustic at 18:00 hrs.
"	PIT	10.0	42	6.2		13	6	1/10	1/32	10.5	1.2	22	100	3	1/4	13		
14.3	Flow	10.0	47	6.4		15	8	2/8	1/32	10.5	1.3	23	100	3	TR	11		
"	PIT	9.9+	43	6.0		15	7	1/8	1	10.0	1.0	23	100	3		13	35	

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel visc.	Water loss	Hi-temp filter lost	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK Pm	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														OH	Sand	Solids		
14.3	3276	10.0	50	6.0	18.6	15	7	1/9	1/32	10.0	.5	23	120	3	1/4	13	35	Lost 11.5 bbl mud over shakers due to breakdown+barge pitching. Added mud reserve - active.
"		10.0	44	5.9		14	6	1/9	1/32	10.0	1.0	23	100	3	TR	13		
15.3	3307	10.2+	48	6.2		15	6	1/6	1	10.0	1.4	24	160	3	TR	11		Adding 2 Caustic /hr.
"		10.0	44	7.0		17	10	2/11	1	10.5	2.7	22	100	3	TR	12	40	
"	3347	10.1	49	6.2	19.2	14	6	1/8	1/32	10.5	1.2	21	100	2	1/4	12	35	
"	3372	10.0	42	6.4		12	6	1/9	1/32	9.5	.6	22	160	2	1/4	12		
16.3	3392	10.1	49	6.6		15	7	1/6		10.0	.7	21	160	2	1/4	13		Start add pre-hyd gel.
"		10.0+	42	5.8		14	7	1/7		10.5				2		13		
"	3400	10.0	43	5.7	18.0	14	6	1/8	1/32	10.5	2.8	23	100	2	TR	12	32.5	
17.3	3460	10.0	42	6.1	18.5	13	6	1/6	1/32	10.0	1.5	21	120	2	TR	12	32.5	
"	3480	10.1	47	6.5	19.5	14	7	1/6	1/1		1.0	20	120	2	1/8	15	32.5	
18.3	3502	10.0	42	6.2		14	7	1/9	1/32	10.0	1.7	21	120	2	1/8	13	35	
"	3524	10.1+	48	5.9		16	8	1/8	1/32	10.0	1.4	20	160	1	1/4	14		
"	3543	10.0	43	6.2		15	10	2/9	1/32	10.0	1.5	20	120	1	1/8	13	35	
19.3	3570	10.1	48	6.2		17	9	2/8		10.5	1.8	20	120	1	1/8	13	35	
"	3592	10.0	42	5.5	17.8	14	8	1/11	1/32	10.0	3.0	20	120	1	TR	13	35	
22.3	3592	10.0	46	6.0		14	7	1/10	1/32	10.0	1.6	19	120	1	1/8	12		Circulating Add pre-hyd.gel. Start weight up to 10.0
"	3601	9.9+	42	6.2		13	6	1/7	1/32	10.0	1.7	20	100	1	1/8	12		
"	3616	10.7	40	6.3		15	6	1/8	1/32	10.0	1.6	21	120	1	1/4	16		
"	3616	11.0	50	6.5	18.0	18	9	2/8		10.0	1.5	21	100	1	1/4	17	35	

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt	Funnel visc.	Water loss	HI-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK Pm	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
22.3	3636	10.9	43	6.4		16	8	1/10	1/32	10.5	1.6	20	80	1/2	1/8	14	35	Stop adding Caustic 0200 Shaker no.3 CK.
23.3	3661	10.0	44	6.2		17	8	1/11	1/32	10.5	.8	19	80	1/2	1/8	14	32½	Add 1 Caustic/Hr.
"	3688	11.1	50	6.3		18	8	2/10	1/32	10.0	.5	22	120	1/2	1/8	15		Start weighing up to 11.1. Adding 2
"	3703	11.4	43	6.3		19	11	2/13		10.5	.6	22	80	TR	1/4	15		Caustic/hr.-wt to 11.4 to 12.0 lb/gal
24.3	3714	11.4																
"	3723	11.9	44	5.8		20	12	2/15		11.0	3.5	21	40	TR	1/8	17	32½	
"	3745	12.2	54	5.8		20	13	2/15	1	10.5	1.6	22	100	TR	1/8	18		Wt to 12.2 lb/gal. Kill mud pit 5.
"		12.2	43	5.6		18	13	2/17	1		.6	22	120	TR	1/4	19		13.1 lb/gal - wt up to 12.5 lb/gal.
25.3	3770	12.6	53	5.8		25	15	2/14	1	10.0	1.0	23	120	1	1/8	18		
"	3790	12.5	45	5.4		21	14	2/17	1	10.5	1.8	24	120	1	1/8	17	25	
"	3791	12.5	53	5.6		20	14	2/17	1	10.5		22	120					P.O.H.
26.3	3796	12.4+	46	5.4		20	12	2/16	1	10.0	.8	23	120	1		18	22	
"	3807	12.5	53	5.8		22	12	2/15		10.0	.5	23	100	TR	1/8	19		2 Caustic /hr. wt up to 13.0
"	3814	13.0	43															Add 1 lb/bbl Nut-lug.
"		13.0	55	5.6		24	11	2/15		10.0	.9	23	100	TR	1/8	21		
27.3	3823	13.2	54	5.4		26	14	2/15		10.5	1.2	24	100	TR	1/4	20		
"	3830	13.3	60	5.4		24	12	2/17		10.5	1.0	23	100	TR	1/4	21		

DRILLING FLUID PROPERTIES



Well: 24/12-1 Mud company: Milchem Int. Ltd.

Date	Depth	Mud wt.	Funnel vis.	Water loss	Hi-temp filter loss	P.V.	Y.P.	Gels. 0/10	Filter cake	PH	ALK	Cl x 1000	Ca	Volume %			Cation exchng. capacity	Remarks
														Oil	Sand	Solids		
27.3	3842	13.4	44	5.0		22	11	2/16	1	10.5	1.2	23	120	TR	1/4	23		
28.3	3850	13.4	55	5.4		26	13	2/16	1	10.5	2.0	25	120	TR		21		
"	3857	12.0	47	6.2		18	13	3/20		10.5	1.6	17	130	Boiled over				Reduced up to 12.0 lb/gal too low. Error in meas.
29.3	3857	12.0	44	6.4		20	14	3/26	1	10.0	1.8	20	120	TR	1/8	12	15	
"	3869	12.0	52	6.0		18	12	2/16	1	10.5	1.7	18	100	TR	1/4	15		
"	3882	12.0	44	5.4		19	11	2/17	1	10.5	1.6	18	120	TR	1/8	15		Adding 1 CMC/LB and 1 cal/l Caustic per hr.
30.3	3889	11.9	50	5.8		20	12	2/15	1	10.5	2.0	19	120	TR		15		Reduce wt to 11.5 lb/gal
"	3896	11.8	46	5.8		19	10	2/14	1	10.5	2.0	19	120	TR	1/8	16	15	
"	3911	11.6	44	5.6		17	11	1/15	1	10.5	1.9	19	120	TR		15		
"	3917	11.6	52	6.0		20	12	2/	1	10.5	1.9	19.5	100	TR		16		
31.3	3921	11.6	52	6.1		21	12	2/18	1	10.5	2.3	17	120	TR		15		
1.4	3938	11.6	46	5.7		19	13	2/20	1	10.5	1.8	17.5	120		1/8			
"	3963	11.7	43	5.6		19	11	2/19	1	10.5	1.7	17.9	120	TR	TR	16		Increase wt to 11.7 ppg. + POOH to E-log.
"	3980	11.7	51	5.9	18.8	20	11	2/18	1	10.5	1.8	18	120	TR	TR	17		Increase wt to 12.5 ppg. + POOH to E-log + Dump sand traps.
3.4	3980	12.5	53	5.8		22	12	2/17	1	10.5	2.3	18.6	120		1/8			
"	3980	13.5	48	5.9		23	11	2/15	1	10.5	1.6	20	120	0	TR	23		
5.4	3980	13.5	50	5.8		23	12	2/16	1	10.5	1.6	20	120	0	TR	23		

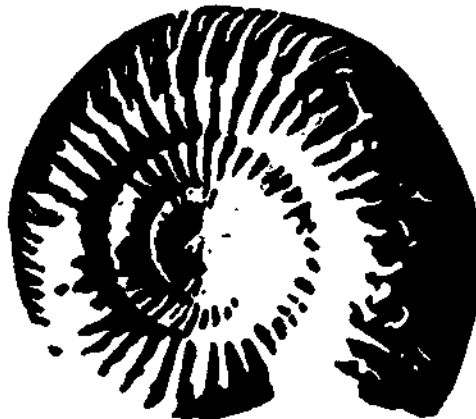
U-189

24/6 Feb. 3

SLR

<p>REPORT TITLE</p> <p>Source Rock evaluation of Well 24/12-1. Section I</p>
<p>CONTRACTOR</p> <p>Statoil</p>

IKU



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EXPERIMENTAL

The canned samples were washed with tempered water on a 0,125 mm sieve to remove drilling mud and thereafter dried at 35°C.

Light Hydrocarbons

Aliquotes of the samples were dried at room temperature after washing and sieving. The cuttings with a grain size between 1 and 2 mm were used for light hydrocarbon determination. These were treated with 6N HCl in a closed evacuated system, thereafter flushed with water and the released gas analysed gaschromatographic. The results are shown in Table I.

Total Organic Carbon (TOC)

Aliquotes of the samples were treated with hot 6N HCl to remove carbonates, and then analysed on a Leco 12 carbon determinator, to determine the total organic carbon (TOC). Table II.

Extractable Organic Matter (EOM)

From the TOC results, samples were selected and extracted with DCM in soxhlet apparatus for 48 h., and the amount of extractable organic matter was determined. Table III.

Chromatographic Separation

The extracts were separated on columns packed with 2/3 silica and 1/3 alumina, by eluting with hexane, benzene and methanol. Table III. The saturated fractions were analysed gaschromatographic on a 25 mm glass capillary column, using a Carlo Erba FV 2150 chromatograph. The measurements from the gaschromatograms are shown in Table VII.

Vitrinite Reflectance

Five sidewall cores and six cutting samples were sent for vitrinite reflectance measurements at Geoconsultants, Newcastle upon Tyne. Upon receipt, the samples were soaked in warm water and sieved through 72 mesh

to remove drilling mud. After oven drying at 40°C, they were mounted in Bakelite resin blocks; care being taken during the setting in the plastic to avoid temperatures in excess of 100°C. The samples were then ground, initially on a diamond lap followed by two grades of corundum paper. All grinding and subsequent polishing stages in the preparation were carried out using isopropyl alcohol as lubricant since water leads to the swelling and disintegration of the clay fraction of the samples.

Polishing of the samples was performed on Selvyt cloths using three grades of alumina, 5/20, 3/50 and Gamma, followed by careful cleaning of the surface.

Reflectance determinations were carried out on a Leitz M.P.V. microphotometer under oil immersion, R.I. 1,516, at a wavelength of 546 nm. The field measured was varied to suit the size of the organic particle but was usually of the order of 2 micron diameter.

The surface of the polished block was searched by the operator for suitable areas of vitrinitic material in the sediment. The reflectance of the organic particle was determined relative to optical glass standards of known reflectance. Where possible, a minimum of twenty individual particles of vitrinite was measured although in many cases this number could not be achieved. The search for vitrinitic material was maintained for approximately 45 minutes on each sample before termination if the operator considered that no more vitrinitic particles were likely to be located.

Visual Kerogen

Samples for visual kerogen were picked from the screening analyses. The samples were crushed, treated with HCl and HF to remove the rock matrix, centrifuged and mounted on slides.

Maturity of the individual samples was determined by visual estimation of the colours of pollen, spores, cuticles, wood remains, and finely dispersed organic matter.

The colour tones are given according to Burgess's index (Burgess, J.D., 1974. *Geol.Soc.Amer.Spec.Paper*, 153, 19-30).

T. A B L E I

Concentration (μl gas / kg rock) of $C_1 - C_4$ hydrocarbons in cuttings.

Depth (m)	C_1	C_2	C_3	iC_4	nC_4	Tot. C_1-C_4	Tot. C_2-C_4	% Gas wetness	iC_4/nC_4
3610 - 40	4118	219	50	5	14	4405	287	6.51	0.34
3640 - 70	1971	92	16	0	1	2081	110	5.28	
3670 - 700	4373	234	33	2	5	4647	274	5.90	0.46
3700 - 30	4488	232	33	4	6	4764	275	5.78	0.73
3730 - 60	4207	255	49	35	70	4557	350	7.67	0.50
3760 - 90	1558	78	12	1	1	1651	93	5.63	0.74
3790 - 820	2261	224	85	15	30	2614	353	13.52	0.50
3820 - 50	865	137	59	10	20	1091	226	20.69	0.48
3850 - 80	2041	265	112	23	41	2481	440	17.74	0.56
3880 - 910	2303	298	135	20	49	2805	503	17.91	0.41
3910 - 40	1257	135	55	8	19	1475	218	14.79	0.42
3940 - 70	1020	131	65	8	24	1250	229	18.32	0.35

T A B L E I

Concentration (μl gas / kg rock of $\text{C}_1 - \text{C}_4$ hydrocarbons i cuttings.

Depth (m)	C_1	C_2	C_3	$i\text{C}_4$	$n\text{C}_4$	Tot. C_1-C_4	Tot. C_2-C_4	% Gas wetness	$i\text{C}_4/n\text{C}_4$
3250 - 80	2098	168	33	4	6	2309	212	9.16	0.78
3280 -310	456	37	5	1	1	499	43	8.62	0.77
3310 - 40	1664	134	29	9	7	1842	178	9.67	1.28
3340 - 70	1418	135	39	12	11	1615	197	12.21	1.03
3370 -400	1714	117	28	5	8	1872	158	8.46	0.66
3400 - 30	613	41	10	1	3	668	55	8.21	0.32
3430 - 60	3068	386	171	17	57	3700	632	17.07	0.30
3460 - 90	3069	435	241	22	91	3858	789	20.45	0.24
3490 -520	1859	148	54	8	18	2086	228	10.91	0.42
3520 - 50	1441	96	23	7	6	1573	131	8.36	1.13
3550 - 80	3212	251	89	9	28	3590	378	10.52	0.33
3580 -610	1693	100	24	1	6	1824	131	7.16	0.22

T A . B L E I

Concentration (μl gas / kg rock) of $C_1 - C_4$ hydrocarbons in cuttings

Depth (m)	C_1	C_2	C_3	iC_4	nC_4	Tot. C_1-C_4	Tot. C_2-C_4	% Gas wetness	iC_4/nC_4
2830 - 60	1786	319	116	34	40	2295	509	22.16	0,84
2860 - 90	23323	5217	2863	194	1019	32616	9293	28.49	0.19
2890 -920	2941	541	251	49	93	3875	934	24.09	0.52
2920 - 50	4128	371	89	14	23	4625	497	10.75	0.64
2950 - 80	3857	402	97	17	22	4395	538	12.24	0.77
2980-3010	4233	350	74	11	14	4682	449	9.59	0.78
3010 - 40	5092	421	88	13	16	5630	538	9.55	0.77
3040 - 70	3713	302	72	7	17	4111	398	9.68	0.44
3070 -100	2174	165	34	4	5	2382	208	8.74	0.72
3100 - 30	2323	226	66	6	10	2631	309	11.73	0.63
3130 - 60	1854	161	35	7	6	2062	209	10.13	1.04
3160 - 90	1732	178	55	9	16	1989	257	12.93	0.56
3190 -220	2814	330	135	15	43	3348	524	15.70	0.35
3220 - 50	1208	125	53	7	17	1410	202	14.32	0.38

T A B L E II

Lithology and Total Organic (TOC) Measurements.

Sample Depth (m)	TOC %	Lithology
2830 - 60	0.22 0.74	80 % Limestone, white to light grey. 20 % Claystone to Marl, grey, sometimes brownish greenish. Obs. Quartz; Pyrite.
2860 - 90	0.43 0.85	90 % Limestone, white to grey and brownish. 10 % Claystone to Marl, grey to greenish grey. % Lignosulphonate Obs. Quartz; Pyrite.
2890 - 920	0.27 0.42	80 % Limestone, light grey to brown grey 19 % Marl to Claystone, grey. 1 % Lignosulphonate
2920 - 50	0.43 0.24	80 % Marl to Claystone, sometimes sultry, grey. 20 % Limestone, light grey to brown grey. Obs. Pyrite.
2950 - 80	0.31 0.71	60 % Limestone, light grey to brown grey. 40 % Marl to Claystone, sometimes silty, light grey to grey.
2980-3010	0.51	98 % Marl to Claystone, light grey to grey. 2 % Limestone, light grey to brown grey.
3010 - 40	0.56	100 % Marl to Claystone, light grey to grey. Sm.am.Limestone, light grey to white and brownish.
3040 - 70	0.21	100 % Marl to Claystone, light grey to grey.
3070 - 100	0.52 0.21	50 % Marl to Claystone, light grey to grey. 50 % Limestone, light grey to brownish.
3100 - 130	0.44	95 % Marl, brownish grey to red brown (48 %), light grey and partly grey (47 %). 5 % Limestone, light grey.
3130 - 60	0.59	100 % Marl, grey brown (55%), light grey and some grey (45 %). Obs. Lignosulphonate
3160 - 90	0.45	100 % Marl, brownish grey to red brown (55%), light grey and grey (45 %). Sm.am.Limestone, white to light grey.
3190 - 220	0.35	100 % Marl, grey brown to red brown (50%), light grey to grey (50 %).

T A B L E II

Lithology and Total Organic (TOC) Measurements.

Sample Depth (m)	TOC %	Lithology
3220 - 50	0.32	100 % Marl, red brown (70 %), light grey and some grey (30 %).
3250 - 80	0.40	100 % Marl, light grey, partly grey
3280-3310	0.30 0.48	70 % Limestone, light grey to white and brownish. 30 % Marl, light grey to grey.
3310 - 40	0.29 0.55	60 % Limestone, light grey to white and some brownish. 40 % Marl, light grey to grey.
3340 - 70	0.24 0.78	75 % Limestone, light grey to white and some brownish. 25 % Marl, light grey to grey.
3370 -400	0.32 0.85	75 % Limestone, light grey to white, partly brownish. 25 % Marl, light grey to grey. Sm.am.Lignosulphonate
3400 - 30	0.66 0.24	55 % Marl to Claystone, light grey to grey 45 % Limestone, light grey to grey.
3430 - 60	0.23 0.72	50 % Limestone, light grey to white. 50 % Marl to Claystone, light grey to grey.
3460 - 90	0.19 0.92	80 % Limestone, light grey to white and brownish. 20 % Marl to Claystone, light grey to grey. Sm.am.Lignoşulphonate
3490-3520	0.22 1.98	50 % Limestone, light grey to white and brownish. 50 % Marl to Claystone, grey to light grey. Sm.am.Lignosulphonate.
3520 - 50	1.23 0.27	55 % Marl to Claystone, light grey to grey. 45 % Limestone, light grey to white and brownish. Sm.am.Lignosulphonate.
3350 - 80	0.76 0.21	55 % Marl to Claystone, light grey to gry 45 % Limestone, light brownish, grey to white. Obs. Lignosulphonate
3580-3610	1.01	100 % Marl to Claystone, light grey to grey. Sm.am.Limestone, white to light grey; Lignosulphonate Obs. Glauconite.

T A B L E II

Lithology and Total Organic (TOC) Measurements.

Sample Depth (m)	TOC %	Lithology
3610 - 40	0.89	100 % Marl to Claystone, light grey to grey. Sm.am.Limestone, white to light grey, Lignosulphonate.
3640 - 70	1.60	100 % Marl to Claystone, light grey to grey. Sm.am.Limestone, white to light grey; Lignosulphonate.
3670 -700	1.33	98 % Marl to Claystone, light grey to grey. 2 % Limestone, white to light grey. Sm.am.Lignosulphonate.
3700 - 30	0.97	100 % Marl to Claystone, light grey to grey. Sm.am.Limestone, white to light grey and brownish. Obs. Lignosulphonate
3730 - 60	1.31	99 % Marl to Claystone, light grey to grey. 1 % Limestone, white to light grey and brownish. Sm.am.Lignosulphonate
3760 - 90	0.58	98 % Marl to Claystone, light grey to grey. 2 % Limestone, white to light grey and brownish. Sm.am.Lignosulphonate.
3790 -820	5.08	98 % Marl to Claystone, light grey to grey. 2 % Siltstone, redbrown (from mud). Sm.am.Lignosulphonate. Obs.Glauconite.
820 - 50	1.19	100 % Claystone, light grey to grey. 2 % Limestone, light grey to white. Sm.am.Lignosulphonate; Glauconite; Siltstone with glauconite, light. Obs. Pyrite.
3850 - 80	1.95	99 % Claystone, light grey to grey. 1 % Limestone, white to light grey and brownish. Obs. Lignosulphonate; Siltstone, redbrown (from mud); Glauconite; Quartz.
3880-3910	0.88	100 % Claystone, light grey to grey, some redbrown fragments. Sm.am.Limestone.

T A B L E II

Lithology and Total Organic (TOC) Measurements.

Sample Depth (m)	TOC %	Lithology
3910 - 40	0.70	100 % Claystone, light grey to grey, some redbrown fragments. Sm.am.Limestone Obs. Pyrite.
3940 - 70	0.74	100 % Claystone, light grey to grey, some redbrown fragments. Obs. Pyrite.

T A B L E III

Weight (mg) of EOM and chromatographic fractions.

Depth (m)	Rock extracted (g)	EOM	Sat	Aro	Hydrocarbons HC	Non Hydrocarbons
2950 - 2980	40.000	30.8	9.0	9.0	18.0	9.5
3130 - 3160	100.000	50.7	10.1	18.1	28.2	22.4
3370 - 3400	100.000	53.8	12.3	16.9	29.2	22.6
3490 - 3520	100.000	65.1	10.6	21.6	32.2	32.0
3520 - 3550	100.000	68.1	11.7	24.2	35.9	30.9
3640 - 3670	100.000	50.6	9.2	14.2	23.4	25.2
3730 - 3760	100.000	29.9	5.6	8.6	14.2	13.2
3790 - 3820	100.000	59.3	7.3	14.0	21.3	35.6
3850 - 3880	45.000	16.5	1.3	3.1	4.4	9.9
3940 - 3970	85.000	92.1	10.3	32.1	42.4	45.0

T A B L E IV

Concentration of EOM and chromatographic fractions
(Weight ppm of rock).

Depth (m)	EOM	Sat	Aro	Total hydrocarb.	Non hydrocarb.
2950 - 2980	770	225	225	450	237
3130 - 3160	530	101	181	282	224
3370 - 3400	540	123	169	292	226
3490 - 3520	650	106	216	322	320
3520 - 3550	680	117	242	359	303
3640 - 3670	510	92	142	234	252
3730 - 3760	300	56	86	142	132
3790 - 3820	590	70	140	213	356
3850 - 3880	370	29	69	98	220
3940 - 3970	1080	121	378	499	529

T A B L E V

Concentration of EOM and chromatographic fractions (mg/gTOC).

Depth (m)	EOM	Sat	Aro	Total hydrocarb.	Non hydrocarb.
2950 - 2980	110.0	32.1	32.1	64.2	33.9
3130 - 3160	89.3	17.1	30.7	47.8	38.0
3370 - 3400	63.3	14.5	19.9	34.4	26.6
3490 - 3520	32.9	5.4	10.9	16.3	16.2
3520 - 3550	53.4	9.5	16.7	29.2	24.6
3640 - 3670	31.6	5.8	8.9	14.7	15.8
3730 - 3760	22.8	4.3	6.6	10.9	10.1
3790 - 3820	11.7	1.4	2.8	4.2	7.0
3850 - 3880	18.8	1.5	3.5	5.0	11.3
3940 - 3970	146.4	16.4	51.0	67.4	71.5

T A B L E VI

Composition in % of the organic material extracted from the rock.

Depth (m)	<u>Sat</u> <u>EOM</u>	<u>Aro</u> <u>EOM</u>	<u>HC</u> <u>EOM</u>	<u>Sat</u> <u>Aro</u>	<u>Non HC</u> <u>EOM</u>	<u>HC</u> <u>Non HC</u>
2950 - 2980	29.2	29.2	58.4	100.0	30.8	189.5
3130 - 3160	19.2	34.4	53.5	55.8	42.5	125.9
3370 - 3400	22.9	31.4	54.3	72.8	42.0	129.2
3490 - 3520	16.3	33.2	49.5	49.1	49.2	100.6
3520 - 3550	17.2	35.5	52.7	48.4	44.5	118.5
3640 - 3670	18.2	28.1	46.3	64.8	49.8	92.9
3730 - 3760	18.7	28.8	47.5	65.1	44.2	107.6
3790 - 3820	12.3	23.6	35.9	52.1	60.0	59.8
3850 - 3880	7.9	18.8	26.7	41.9	60.0	44.4
3940 - 3970	11.2	34.9	46.0	32.1	48.9	94.2

T A B L E VII

Tabulation of data from the gaschromatograms.

Depth (m)	Pristane/nC ₁₇	Pristane/Phytane	CPI
2950 - 2980			
3130 - 3160			
3370 - 3400			
3490 - 3520	0.37	1.23	1.6
3520 - 3550	0.39	1.14	1.4
2640 - 3670	0.34	1.15	1.4
3730 - 3760	0.43	1.13	1.3
3790 - 3820	0.41	1.10	1.1
3850 - 3880	0.50	1.14	1.4
3940 - 3970	0.46	1.28	1.1

T A B L E VIII
Vitrinite Reflectance and Visual Kerogen Estimation

Depth (m)	Vitrinite reflectance			Colour index	Type of organic matter
2830 - 2860	0.37(3)	0.73(11)	1.58(5)		
2950 - 2980	0.43(5)				
2958 - 2961				2+	Am.
3164		0.67(1)	1.69(19)	2+/3-	Am.
3243 - 3246				2+	Am.
3250 - 3280		1.11(5)			
3369 - 3372				2+	He/Am
3370 - 3400	0.39(23)	0.79(1)			
3453 - 3456				2+	Am/He
3490 - 3520	0.35(23)				
3495 - 3498				2+	He/Am
3537 - 3540				2+	Am/He
3590 - 3593				2+	He/Am
3668		1.00(20)		3-	Am/He
3708 - 3711				3-	Am
3730 - 3760	0.33(18)	0.62(7)			
3747 - 3750				3-/3	Am

T A B L E VIII

Depth (m)	Vitrinite Reflectance		Colour index	Type of organic matter
3795	0.67(5)	1.64(15)		
3801 - 3804			3	Am
3850		1.58(20)		
3858 - 3861			3+	He/Am
3894 - 3897			3+	He/Am
3915 - 3918			3+	Am/He
3966 - 3969			3+	Am
3973	0.52(1)	1.65(19)		

Am: Amorphous

He: Herbaceous