



WELL 6407/9-1  
 PRODUCTION TEST SUMMARY PT-1 INTERVAL : 1632 - 1638 m bdf

TEST	DATE	CHOKE (1/64")	DURATION (hrs)	OIL RATE (stb/d)	GOR (scf/stb)	BSW (%)	THP (psig)	GAUGE DEPTH (m bdf)	BHP (psia)	PI (b/d/psi)	Kh (Dft)	Skin <sup>4)</sup>	REMARKS (b/d/psi)
PT-1A	20.09.84	8	4	190	310	0	477	1616.1	2351.5				no pressure
(BACK SURGE)	21.09.84		2	0			486		2351.5				increased observed
GRAVEL PACK INSTALLATION													
PT-1B	24.08.84	24	5	1166	194	tr	357	no bottom hole gauge		5-10			PI-estimate
(CLEAN UP)	25.08.84	40	4	2398	233	0	269			5-10			from THP
ACIDISATION													
PT-1C	26.08.84	20	7	1330	240	0	540	no bottom hole gauge					
	27.08.84	28	3.5	2310	207	0	520						
RUN GAUGES													
		20	3.7	1460	230	0	558	1611.8	2329.5	75			
		28	3.5	2360	207	0	535		2314.5	71			
		40	4.5	4100	190	0	467		2282.6	61			
		128	2.5	8361	215	0	225		2193.1	54			
	28.08.84		8.5	0			581	1611.8/1615.0	2348.2/ 2353.4				FIRE ON RIG SURFACE SHUT-IN
PT-1D	28.08.84	8	3.5	240	240	0	570	1564.4	2291.5	no pressure drawdown detected			BOTTOM HOLE
PT-1E		28	3	2500	215	0	536	1611.8	2321	93	43		SAMPLING
		40	3	4200	191	0	468		2293	76	77		
		56	3	6000	219	0	381		2262	70	95		
	29.08.84	128	24	8500	211	0	228		2213	63	113		
	30.08.84	128	24	8320	212	0	230	1611.8/1615.0	2216	63	110		
									2230.3				
PT-1F	31.08.84		6	0			200/652		2345.4/ 2350.4		1088	93	BOTTOM HOLE SHUT-IN
	31.08.84	3.8	3	250	302	0	580	1567.8	2296	no pressure drawdown detected			BOTTOM HOLE SAMPLING

COMMENTS:

1. The above listed rates were approximately stable during the duration time given.
2. Oil gravity: 0.826 (water = 1) (40 deg API); separator gas gravity: 0.89 (air = 1); CO<sub>2</sub>: 1%; H<sub>2</sub>S: 0%.
3. Reservoir pressure from Production Test: 2394 psia at 1630 m ss (cf. RFT : 2394 psia), oil gradient 0.325 psi/ft, water gradient 0.451 psi/ft
4. Rate-dependent skin (see: Horner analysis PT-1E).
5. RT elevation is 25 m above msl.

TABLE 1

TABLE 2  
PT-1: SEQUENCE OF EVENTS

COMPANY : NORSKE SHELL  
AREA : HALTENBANKEN  
WELL : 6407/9-1  
ZONE :  
Page 1 of 2

FLOW PER.	TIME OF START	TIME OF END	DURATION HOURS	CUMULATIVE PROD	FINAL PROD RATE (OIL) stb/d	COMMENTS
PT1A	20.08.84					2 Mk III - gauges Perf:
1Dd	14:41	16:45	1.9333	Clean-up	approx 375	1632-1638 m bdf
2Dd	16:45	19:00	2.2500			gas to surface
3Dd	19:00	23:30	4.5000		174	to separator
4Bu	23:30	01:35	2.0833			Build-up Kill well. Pulled gauges

GRAVEL PACKED RAN COMPLETION STRING

PT1B	24.08.84			0		
1Dd	04:40	09:15	4.5833	Clean-up	Well dying	
				31.7	25	
2Bu	09:15	18:10	8.9167	set plug, diesel,	open SSD, close SSD,	displace to pull plug
3Dd	18:10	23:15	5.0833	45.9	200 - 300	Clean-up
					85 % brine	
4Dd	23:15	07:00	7.7500	128.7	200 - 300	gas to surface clean-up
	25.08.84					
5Dd	07:00	11:45	4.7500	270	400 - 1000	
6Dd	11:45	13:30	1.7500		810	to separator
7Dd	13:30	19:00	5.5000		1166	24/64" bean.
8Dd	19:00	19:45	0.7500		-	70/64" bean.
9Dd	19:45	00:00	4.2500		2398	40/64" bean.
	26.08.84					
10Bu	00:00					Close well prior acidisation

Acidised with 45 bbls acid

PT1C	26.08.84			0		
1Dd	03:00	06:15	3.2500	25.7		
2Bu	06:15	13:37	7.3667	Displace	tbg to diesel	
				0		
3Dd	13:37	14:40	1.0500	40		Clean-up
4Dd	14:40	18:00	3.3333		1000-1400	Gas to surface
5Dd	18:00	21:30	3.5000		1159	to separator
6Dd	21:30	01:00	3.5000		2312	28/64" bean.
7Bu	01:00	05:15	Ran 2SDP	gauges+1	Amerada	Shut in
			+gradient	+survey		
	27.08.84					
8Dd	05:15	09:00	3.7500	228	1460	20/64" bean.
9Dd	09:00	12:30	3.5000	578	2398	28/64" bean.
10Dd	12:30	17:00	4.5000	1346	4096	40/64" bean.
11Dd	17:00	19:32	2.5333	2230	8361	128/64" bean.
12Bu	19:32	04:00	8.4667	-	0	Shut in for

TABLE 2  
PT-1: SEQUENCE OF EVENTS

COMPANY : NORSKE SHELL  
AREA : HALTENBANKEN  
WELL : 6407/9-1  
ZONE :  
Page 2 of 2

FLOW TIME OF PER.	TIME OF START	TIME OF END	DURATION HOURS	CUMULATIVE PROD	FINAL PROD RATE (OIL) stb/d	COMMENTS
13Bu	28.08.84 04:00	06:15	2.2500		0	engine room fire Pull gauges + gradient survey
PT1D 1Bu	28.08.84 06:15	07:35	1.3333	SDP gange 1564.4 m	at bdf	Run tandem BHS 1+2+ gauge SDP.
2Dd	07:35	11:15	3.6667		253	8/64" bean take BHS.
3Bu	11:15	14:50	3.5833		0	Pull samplers Run gauges + gradient survey.
PT1E 1Dd	28.08.84 14:50	18:00	3.1667		2478	28/64" bean
2Dd	18:00	21:00	3.0000		4203	40/64" bean
3Dd	21:00	24:00	3.0000		5974	56/64" bean
4Dd	29.08.84 00:00	24:00	24.0000		8410	128/64" bean
5Dd	30.08.84 00:00	24:00	24.0000		8311	128/64" bean
6Bu	31.08.84 00:00	06:00	6.0000		0	Shut in down hole PBU survey
7Bu	06:00	09:30	3.5000		0	Pull gauges + gradient survey
PT1F 1Bu	31.08.84 09:30	10:10	0.6667		0	3BHS+SDP gange
2Dd	10:10	14:00	3.8333		249	Take samples
3Bu	14:00	15:00	1.0000			Pull BHS, Ran sand bailer
4Bu	15:00	17:40	2.6667			HUD=1790.3 m Kill well

Date Time	THP psig °F	Oilrate stb/d	GOR scf/stb	Separator		BHP psia	Comments
				Press. psig	Temp. °F		
20.08.84 (56°F)							
20:30	483	219	288	26	92	-	PT1A-3Dd 8/64" bean
21:00	487	204	273	32	93		PVT-1 sample
21:30	481	174	332	31	91		(811506,1044)
22:00	479	207	279	31	91		
22:30	476	186	310	31	91		PVT-2 sample
23:00	477	180	309	32	91		(811447,1016)
23:30	477	174	307	33	91	2351	
						2351.5	Final BHP
25.08.84 (52°F)							
12:30	354	1091	171	100	100		PT1B-6Dd
13:00	358	686	236	90	110		20/64" bean
13:30	362	810	206	90	110		
25.08.84 (50°F)							
14:30	335	1074	191	105	103		PT1B-7Dd 24/64" bean
15:00	338	1042	206	102	100		1.5% Co <sub>2</sub>
15:30	340	1090	199	103	100		
16:00	345	1107	199	104	102		Oil grav =
16:30	347	1122	196	104	98		0.8259
17:00	347	1125	196	104	98		
17:30	350	1141	194	104	96		Gas grav =
18:00	352	1147	195	106	96		0.908 (air=1)
18:30	355	1167	192	106	96		
19:00	357	1166	194	106	98		
25.08.84 (56°F)							
20:30	270	2213	294	103	158		PT1B-9Dd 40/64" bean
21:00	266	2324	261	100	130		Oil grav =
21:30	267	2324	254	101	120		0.8297
22:00	266	2343	249	101	120		
22:30	268	2371	232	104	120		Gas grav =
23:00	269	2362	233	104	120		1.08 (air=1)
23:30	269	2375	235	104	120		
24:00	269	2398	233	104	120		1 % Co <sub>2</sub>

Date Time	THP psig OF	Oilrate stb/d	GOR scf/stb	Separator		BHP psia	Comments
				Press. psig	Temp. OF		
26.08.84 (54°F)							
18:30	531	1278	245	107	116		PT1C-5Dd
19:00	530	1342	234	107	120		20/64" bean
19:30	533	1296	245	107	118		Oil grav. = 0.8266
20:00	535	1333	239	107	118		Gas grav. =
20:30	537	1316	242	107	118		0.970(air=1)
21:00	541	1327	240	107	118		1.5 % CO <sub>2</sub>
21:30	543	1159	275	107	118		
26.08.84 (59°F)							
22:30	515	2314	208	142	118		PT1C-6Dd
23:00	517	2319	207	141	118		28/64" bean
23:30	518	2384	200	140	120		Oil grav. = 0.8293
24:00	519	2257	213	140	120		Gas grav. =
00:30	521	2280	208	144	120		0.918(air=1)
01:00	521	2312	207	144	120		1 % CO <sub>2</sub>
27.08.84 (55°F)							
06:00	550	1492	206	112	100	2330	PT1C-8Dd
06:30	555	1408	230	109	114	2330	20/64" bean
07:00	556	1434	233	105	116	2329	Oil grav. = 0.8261
07:30	557	1475	222	110	117	2330	Gas grav. =
08:00	558	1425	231	106	117	2330	0.96(air=1)
08:30	559	1458	229	107	117	2329	1 % CO <sub>2</sub>
09:00	558	1460	230	108	117		
27.08.84 (65°F)							
09:30	527	2397	201	144	117	2314	PT1C-9Dd
10:00	529	2340	209	145	117	2314	28/64" bean
10:30	531	2358	207	146	117	2315	
11:00	532	2349	208	149	119	2314	PVT-3 sample
11:30	533	2368	209	146	120	2315	(811510,1041)
12:00	534	2395	204	147	120	2315	
12:30	535	2358	207	147	120		

## Summary of Separator Data

Date Time	THP psig °F	Oilrate stb/d	GOR scf/stb	Separator		BHP psia	Comments
				Press. psig	Temp. °F		
27.08.84 (74°F)							PT1C-10Dd
13:30	462	3938	201	162	120		40/64" bean
14:00	462	4023	194	166	120	2282	
14:30	464	4040	196	165	120	2282	
15:00	465	4066	195	163	120	2282	PVT-4 sample
15:30	466	4074	197	162	120	2282	(810694,1037)
16:00	466	4109	196	163	120	2281	PVT-5 sample
16:30	467	4070	197	167	120	2281	(810820,1046)
17:00	467	4096	190	167	120		
27.08.84 (82°F)							PT1C-11Dd
18:00	225	8379	216	97	96		128/64" bean
18:30	225	8361	215	97	95		Oil grav =
19:00	225	8361	215	98	95		0.8228
19:30	225	8361	215	99	95	2193	Gas grav = 0.884(air=1)
28.08.84 (52°F)							PT1D-2Dd
8:30	577	334	186	27	94	2291	8/64" bean
9:00	575	242	250	26	100	2291	Oil grav =
9:30	572	266	213	27	102	2291	0.8240
10:00	571	232	244	26	101	2291	Gas grav =
10:30	570	246	233	27	101	2291	1.140(air=1)
11:00	570	253	227	27	101	2292	BHS-1 sample (811513)
28.08.84 (57°F)		Gauge Depth = 1611.8 m bdf					PT1E-1Dd
15:30	525	2533	195	151	120	2321	28/64" bean
16:00	530	2524	205	153	121	2321	Oil grav =
16:30	532	2515	208	153	122	2321	0.8265
17:00	534	2487	211	154	122	2320	Gas grav =
17:30	535	2533	212	153	123	2320	0.912(air=1)
18:00	536	2478	217	153	124	2321	1 % CO <sub>2</sub>
28.08.84 (66°F)							PT1E-2Dd
18:30	463	4152	201	170	124	2294	40/64" bean
19:00	464	4126	204	170	126	2294	
19:30	465	4219	202	170	126	2293	
20:00	467	4253	187	180	126	2293	
20:30	468	4280	188	186	126	2293	
21:00	468	4203	191	186	126		

Date Time	THP psig OF	Oilrate stb/d	GOR scf/stb	Separator		BHP psia	Comments
				Press. psig	Temp. OF		
28.08.84 (72 <sup>0</sup> F)							
22:00	381	6042	216	149	124	2263	PT1E-3Dd 56/64" bean
22:30	381	6034	218	148	124	2262	
23:00	381	6025	218	148	124	2262	
23:30	381	5931	220	151	124	2262	
24:00	379	5974	217	149	124	2262	
29.08.84 (79 <sup>0</sup> F)							
00:30	227	8370	214	100	100	2215	PT1E-4Dd 128/64" bean
1:00	227	8531	212	100	100		
2:00	228	8504	211	101	98		
3:00	228	8504	211	102	98	2213	
4:00	229	8486	211	103	97		
5:00	229	8495	210	102	98	2213	
6:00	229	8500	212	102	98		
7:00	229	8500	212	102	98	2212	
8:00	229	8486	213	100	98		PVT-6 sample (811086,1017)
9:00	229	8477	213	100	98		
10:00	229	8509	211	99	98		
11:00	229	8450	214	99	98	2212	PVT-7 sample (810829,1045)
12:00	229	8455	214	97	98		
13:00	229	8468	211	98	98	2212	
14:00	229	8468	214	98	98		
15:00	229	8491	212	98	98	2213	
16:00	229	8473	216	97	98		
17:00	229	8464	212	98	98		Oil grav =
18:00	230	8450	212	99	98		0.8197
19:00	230	8473	211	99	98		Gas grav =
20:00	230	8463	211	100	98	2213	0.890(air=1) 1 % CO <sub>2</sub>
21:00	230	8437	210	100	98		
22:00	230	8432	211	100	98		
23:00	230	8401	211	101	98		
24:00	230	8410	210	101	98		
30.08.84 (79 <sup>0</sup> F)							
01:00	230	8405	212	100	98	2215	PT1E-5Dd 128/64" bean
02:00	230	8387	211	101	98		
03:00	230	8392	212	100	98		
04:00	231	8410	210	105	98		
05:00	231	8338	212	103	98		
06:00	231	8378	211	102	98		
07:00	231	8347	212	102	98		
08:00	231	8338	214	101	98		
09:00	231	8419	214	99	98	2215	
10:00	231	8356	218	99	98		
11:00	230	8369	217	99	98		



Date Time	THP psig °F	Oilrate stb/d	GOR scf/stb	Separator		BHP psia	Comments
				Press. psig	Temp. °F		
30.08.84 (79°F)							
12:00	230	8414	212	102	98		
13:00	230	8369	217	100	98	2216	(other gauge =
14:00	230	8347	218	98	98		2230 psia at
15:00	230	8343	219	97	98		1615.0 m bdf)
16:00	229	8356	221	93	98		
17:00	229	8352	220	93	98		Oil grav =
18:00	230	8343	215	95	97		0.8214
19:00	230	8343	213	97	97		Gas grav =
20:00	230	8325	213	98	97		0.882(air=1)
21:00	230	8298	213	99	97		
22:00	230	8307	212	99	97		1 % CO <sub>2</sub>
23:00	230	8325	212	99	97		
24:00	230	8311	212	99	97	2216	
31.08.84 (51°F)							
11:30	586	304	242	25	102	2296	PT1D-2Dd
12:00	586	244	320	25	104	2296	8/64" bean
12:30	584	251	296	26	104	2296	Oil grav =
13:00	582	258	288	26	104	2296	0.8273
13:30	580	246	315	26	103	2296	Gas grav =
14:00	579	249	298	26	103	-	1.220(air=1)
							BHS-2 sample
							(811514)
							BHS-3 sample
							(810822)

## PRODUCTIVITY INDEX VERSUS OILRATE

Test	Oilrate stb/d	PI stb/d/psi
PT1C- 8Dd	1475	80.2
	1425	77.5
	1458	75.2
PT1C- 9Dd	2349	68.3
	2368	70.9
	2395	71.7
PT1C-10Dd	4074	61.4
	4109	61.0
	4070	60.4
PT1C-11Dd	8361	53.8
PT1E- 1Dd	2487	91.1
	2533	92.8
	2478	90.8
PT1E- 2Dd	4219	76.3
	4253	76.9
	4280	77.4
PT1E- 3Dd	6025	69.8
	5931	68.7
	5974	69.2
PT1E- 4Dd	8463	62.5
PT1E- 5Dd	8419	63.1
	8325	62.8

TABLE 5

## GRADIENT SURVEYS WELL : 6407/9-1

Date Time	Depth m bdf	THP psig	Top Press psia	Gauge Temp °F	Bottom Press psia	Gauge Temp °F	Remarks
27.08.84							
04:13	1422.8	559	2145.3	134.1	-	-	PT1C-7Bu
04:40	1522.8	557	2249.8	143.2	-	-	
05:14	1611.8	557	2348.4	146.3	-	-	
28.08.84							
04:35	1611.8	583	2348.3	149.6	2353.0	149.7	PT1C-13Bu
04:53	1522.8	581	2250.8	144.6	2255.6	144.6	
05:13	1422.8	581	2144.8	139.0	2149.1	139.2	
28.08.84							
13:34	1422.8	563	2148.9	132.0	-	-	PT1E
14:10	1522.8	560	2253.3	143.0	-	-	
14:50	1611.8	563	2348.3	151.3	-	-	
31.08.84							
07:25	1611.8	645	2345.4	152.9	2350.4	152.6	PT1E-7Bu
07:43	1522.8	645	2247.3	149.8	2252.7	149.7	
08:00	1422.8	645	2141.6	145.6	2146.2	145.6	
08:30	276.8	645	899.1	79.6	905.5	83.3	

1) Bottom gauge pressure is recorded 3 m deeper

Average gradient interval 1422.8 - 1611.8 m = 0.285 psi/ft

Average gradient interval 1522.8 - 1611.8 m = 0.329 psi/ft

TABLE 6

## RESERVOIR FLUID PROPERTIES

FIELD/COUNTRY	:	DRAUGEN/NORWAY
WELL	:	6407/9-1
Reference PVT Report nr./date	:	Corelab RFLN 840033-6-9-1984
Sample cylinders	:	RFT - one gallon chamber (811106)
" "	:	-
Perforated Interval	bdf	RFT-sampled at 1633 m bdf
Separator press/temp.	psig/DF	150/61
Bobf	rb/stb	1.207
Rsif	Mscf/stb	0.292
Bobd	rb/stb	1.331
Rsid	Mscf/stb	.425
Gravity tank oil	API/60 DF:	39.6
Gravity tank gas	air = 1	1.394
Gravity sep. gas	air = 1	0.737
Sep. gas/oil ratio	Mscf/stb	.151
Tank gas/oil	Mscf/stb	.141
BHT	DF	149
Bubble point pressure	psig	790

Press psig	Bo rb/stb	Bg rb/Mscf	Rs Mscf/stb	Uo cP 149 DF	Ug cP 149 DF	Z -	Oil.Dens. gr/cc 149 DF	E scf/rcf
118	1.118	22.5966	0.0979					7.88
200	1.131	13.8237	0.1324	0.826	0.0113	0.968	0.7593	12.88
300	1.151	9.3428	0.1641	0.786	0.0118	0.959	0.7542	19.06
400	1.163	7.0953	0.1922	0.752	0.0121	0.951	0.7506	25.10
500	1.175	5.6349	0.2195	0.721	0.0124	0.946	0.7469	31.61
600	1.187	4.6892	0.2458	0.693	0.0127	0.940	0.7434	37.98
700	1.205	4.0196	0.2702	0.666	0.0129	0.937	0.7400	44.31
790	1.207		0.2920	0.642				50.1
1000	1.2045		0.2920	0.657				63.6
1200	1.2021		0.2920	0.672				76.4
1500	1.1990		0.2920	0.695				95.6
2000	1.1945		0.2920	0.733				127.6
2380	1.1926		0.2920	0.761				152
2500	1.1916		0.2920	0.771				160
3000	1.1871		0.2920	0.810				192
3500	1.1827		0.2920	0.847				224
4000	1.1784		0.2920	0.886				256

Compressibility at Temp.: 149 DF

Interval psig	psig	Co 10 <sup>-6</sup> * psi <sup>-1</sup>
790	1000	9.88
1000	1500	9.87
1500	2000	9.42
2000	2377	8.68
2377	3000	7.57
3000	4000	7.48

Remarks:  

$$\text{Above Pb: } B_o = \frac{B_{ob}}{1 + C_o(P - P_b)}$$

$$E = \text{Linear extrapolated}$$
 RFT-sample = 1 gallon segregated sample. First the 2 3/4 gallon chamber was filled.

TABLE 7

## RESERVOIR FLUID PROPERTIES

FIELD/COUNTRY	:	DRAUGEN/NORWAY
WELL	:	6407/9-1
Reference PVT Report nr./date	:	Corelab 19-12-1984: RFLN 840049
Sample cylinders	:	BHS nr 811513 sampled at 1536.8 m SS
"	:	"
"	:	"
Perforated Interval	m bdf =	1632-1638
Separator press/temp.	psig/DF :	150/60
Bobf	rb/stb :	1.202
Rsif	Mscf/stb :	0.291
Bobd	rb/stb :	1.298
Rsid	Mscf/stb :	0.395
Gravity tank oil	API/60 DF :	40.1
Gravity tank gas	air = 1 :	1.326
Gravity sep. gas	air = 1 :	0.736
Sep. gas/oil ratio	Mscf/stb :	0.156
Tank gas/oil	Mscf/stb :	0.135
BHT	DF :	155
Bubble point pressure	psig :	853

Press psig	Bo rb/stb	Bg rb/Mscf	Rs Mscf/stb	Uo cP 155 DF	Ug cP 155 DF	Z -	Oil.Dens. gr/cc 149 DF	E scf/rcf
112	1.095	23.8753	0.0799	0.823	0.0104	0.977	0.7710	7.46
200	1.116	13.9163	0.1160	0.777	0.0111	0.965	0.7645	12.80
300	1.133	9.3767	0.1475	0.725	0.0114	0.953	0.7588	18.99
400	1.147	7.0401	0.1762	0.686	0.0117	0.943	0.7539	25.30
500	1.161	5.6313	0.2021	0.662	0.0118	0.936	0.7493	31.63
600	1.172	4.6750	0.2271	0.630	0.0120	0.929	0.7455	38.10
700	1.184	4.0000	0.2530	0.618	0.0122	0.924	0.7421	44.52
853	1.202	3.2747	0.2910	0.597	0.0132		0.7363	54.39
1000	1.200	2.7891	0.2910	0.606	0.0140			63.86
1500	1.194	1.8536	0.2910	0.634	0.0180			96.09
2000	1.188	1.3881	0.2910	0.663	0.0234			128.31
2312	1.184	1.2000	0.2910	0.681	0.0269			148.42
2500	1.182	1.1094	0.2910	0.691	0.0289			160.54
3000	1.176	0.9240	0.2910	0.719	0.0338			192.76
3500	1.170	0.7916	0.2910	0.747	0.0381			224.99
4000	1.164	0.6925	0.2910	0.776	0.0418			257.21

Compressibility at Temp.: 155 DF

Interval psig	psig	Co 10 <sup>-6</sup> * psi <sup>-1</sup>
842	1000	10.89
1000	1200	10.40
1500	2000	9.64
2000	2312	8.91
2312	3500	8.57

Remarks:

Bob  
Above Pb:  $Bo = \frac{Bob}{1 + Co(P-Pb)}$   
E = Linear extrapolated  
BHS - sampling while flowing on 1/8" bear

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April 1986

RKER.86.080

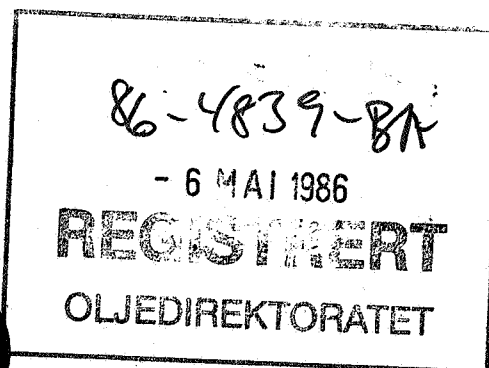
GEOCHEMICAL INVESTIGATION OF TWO GAS SAMPLES FROM  
WELLS 6407/9-1 AND 6407/9-4, NORWAY

by

J.M.A. Buiskool Toxopeus & P.J.R. Nederlof

Sponsor: Shell Risavika

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**KONINKLIJKE/SHELL EXPLORATIE EN PRODUKTIE LABORATORIUM**

**RIJSWIJK, THE NETHERLANDS**

(Shell Research B.V.)

GEOCHEMICAL INVESTIGATION OF TWO GAS SAMPLES FROM  
WELLS 6407/9-1 AND 6407/9-4, NORWAY

1. INTRODUCTION

Geochemical analyses have been carried out on two gas samples from wells 6407/9-1 (1632-1638 m) and 6407/9-4 (1662-1668 m), Norway.

2. RESULTS AND CONCLUSIONS

The composition of the gases (mole %, corrected for the presence of air) and the carbon isotope ratios of methane are as follows:

	6407/9-1 1632-1638 m bottle no. 1044	6407/9-4 1662-1668 m bottle no. 1031
Methane	46.27	71.96
Ethane	14.92	10.45
Propane	25.06	10.60
i-Butane	3.22	1.14
n-Butane	6.42	2.07
neo-pentane	0.05	0.02
i-pentane	0.99	0.40
n-Pentane	0.92	0.40
C <sub>6</sub> + Hydrocarbons	0.59	0.39
Hydrogen	ND	ND
Carbon dioxide	0.96	1.11
Nitrogen	0.56	1.48
Hydrogen sulphide	ND	ND
$\delta^{13}\text{C}^{\circ}/\text{oo}$	-45.0	*

ND = not detectable

\* = not sufficient gas available for analysis

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 Revision Number :

**Title**

GEOCHEMICAL DATA REPORT FOR WELL 6407/9-1

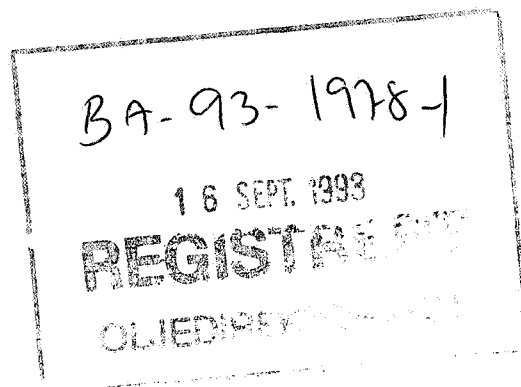
**Authors(s)**

VENCHE BJERKREIM PEDERSEN

**Abstract**

32 samples from the cored interval in well 6407/9-1 have been analysed by Iatroscan (TCL-FID).  
 4 samples were analysed by GC-FID and GC/MS.

NOT INCLUDED IN WELL TRADE.



**Key Words**

6407/9-1, geochemistry, Iatroscan, GC-FID, GC/MS

Classification:  Free  Saga and partners  Internal  Confidential  Strictly confidential

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## **1 Objectives**

The objective of this study was to characterise the extractable hydrocarbons in 32 core samples from well 6407/9-1.

## **2 General well information**

The well was drilled by Shell as operator of licence 093 from 26.6.84 to 9.7.84 and reached a total depth of 2500 mRKB. The KB of the rig was 25 metres and the water depth was 248 metres.

## **3 Samples and analytical scheme**

32 samples were picked from the cored interval in the period 29th to 30th July 1991. All samples were analysed by Iatroscan (TLC-FID), and the saturated hydrocarbon fractions from 4 samples were analysed by GC-FID and GC/MS.

## **4 Vitrinite reflectance**

No samples were analysed.

## **5 TOC and Rock Eval**

No samples were analysed.

## **6 Iatroscan (TLC-FID)**

32 samples were analysed, and the results are tabulated in Table 1.

## **7 GC-FID**

The saturated hydrocarbon fractions from 4 samples were analysed by Saga Petroleum a.s.. The GC-FID chromatograms are shown in figure 1.

## **8 GC/MS**

The GC/MS analyses were performed by Saga Petroleum a.s. The saturated hydrocarbon fractions from the samples were analysed by GC/MS and the mass chromatograms for m/z 191, 177, 217 and 218 are shown in figure 2. Selected biological marker parameters manually measured by Saga are given in table 2.

## **9 Stable carbon isotopes**

No samples were analysed.

**Table 1.**

SAGLAB RESULTS MANAGEMENT : EXTRACTION ANALYSIS RESULTS in mg/g Rock

Data for Well 6407/9-1

Page 1

Type	St.Depth	En.Depth	Weight (g)	EOM mg/g Rock	EOM mg/g TOC	Sat (mg/g)	Aro (mg/g)	NSO (mg/g)	Asph (mg/g)	Polars (mg/g)	TOC (%)	M/I
CCP	1631.00	1631.00	2.65	2.98		1.95	0.66			0.37		I
CCP	1632.00	1632.00	3.04	7.58		4.36	1.73			1.48		I
CCP	1633.50	1633.50	3.20	13.01		7.53	3.94			1.54		I
CCP	1635.00	1635.00	3.20	11.06		5.97	2.33			2.76		I
CCP	1637.00	1637.00	3.45	8.38		4.62	1.78			1.98		I
CCP	1638.00	1638.00	3.39	10.60		5.61	2.68			2.30		I
CCP	1640.00	1640.00	3.18	7.73		4.45	2.15			1.13		I
CCP	1642.00	1642.00	3.44	9.89		5.53	2.57			1.79		I
CCP	1643.20	1643.20	2.53	8.22		4.80	1.98			1.44		I
CCP	1645.50	1645.50	2.96	6.33		3.53	1.82			0.99		I
CCP	1647.00	1647.00	2.36	9.02		4.78	1.94			2.31		I
CCP	1649.00	1649.00	2.88	10.20		5.31	2.57			2.32		I
CCP	1651.00	1651.00	2.97	13.53		7.12	4.15			2.26		I
CCP	1652.00	1652.00	2.83	9.93		5.62	2.58			1.74		I
CCP	1653.50	1653.50	2.81	5.14		2.73	1.26			1.15		I

32 RESULT(s) selected ..., from the following search criteria:

Company: SAG, Nat: NOR, Well:

6407/9-1, Type: CCP, Depth between:

0.000 and 99999.990 m, MPLC: I

SAGLAB RESULTS MANAGEMENT : EXTRACTION ANALYSIS RESULTS in mg/g Rock

Data for Well 6407/9-1

Page 2

Type	St.Depth	En.Depth	Weight (g)	EOM mg/g Rock	EOM mg/g TOC	Sat (mg/g)	Aro (mg/g)	NSO (mg/g)	Asph (mg/g)	Polars (mg/g)	TOC (%)	M/I
CCP	1655.50	1655.50	2.97	8.69		4.40	2.15			2.14		I
CCP	1656.60	1656.60	2.55	6.56		3.53	1.74			1.28		I
CCP	1657.00	1657.00	2.91	5.72		2.94	1.25			1.52		I
CCP	1659.00	1659.00	2.53	4.18		2.16	0.66			1.35		I
CCP	1660.00	1660.00	3.24	6.06		3.04	1.08			1.94		I
CCP	1661.00	1661.00	3.29	4.36		2.10	0.63			1.63		I
CCP	1663.00	1663.00	2.66	0.78		0.15	0.19			0.45		I
CCP	1665.00	1665.00	2.71	0.33		0.12	0.09			0.13		I
CCP	1668.00	1668.00	2.10	0.40		0.05	0.00			0.35		I
CCP	1671.00	1671.00	2.37	0.74		0.16	0.00			0.58		I
CCP	1673.00	1673.00	2.15	2.18		0.13	0.11			1.94		I
CCP	1673.90	1673.90	2.16	3.69		0.27	0.13			3.29		I
CCP	1675.00	1675.00	2.12	5.49		0.22	0.16			5.11		I
CCP	1676.00	1676.00	2.64	0.31		0.00	0.00			0.31		I
CCP	1678.00	1678.00	2.21	0.57		0.10	0.04			0.44		I

32 RESULT(s) selected ..., from the following search criteria:

Company: SAG, Nat: NOR, Well:

6407/9-1, Type: CCP, Depth between:

0.000 and 99999.990 m, MPLC: I

SAGLAB RESULTS MANAGEMENT : EXTRACTION ANALYSIS RESULTS in mg/g Rock

Data for Well 6407/9-1

Page 3

Type	St.Depth	En.Depth	Weight (g)	EOM mg/g Rock	EOM mg/g TOC	Sat (mg/g)	Aro (mg/g)	NSO (mg/g)	Asph (mg/g)	Polars (mg/g)	TOC (%)	M/I
CCP	1680.00	1680.00	3.23	0.06		0.04	0.00			0.02		I
CCP	1682.00	1682.00	3.11	0.12		0.04	0.05			0.03		I
Averages this Well:				5.74	0.00	2.92	1.33	0.00	0.00	1.50	0.00	
Averages all Wells:				5.74	0.00	2.92	1.33	0.00	0.00	1.50	0.00	

32 RESULT(s) selected ..., from the following search criteria:

Company: SAG, Nat: NOR, Well:

6407/9-1, Type: CCP, Depth between:

0.000 and 99999.990 m, MPLC: I

**Table 2.**

0 well	1	2 nat	3 formation	4	5 upper depth	6 lower depth	7 sample type	8 Ts/Tm
1 6407/9-1	6407/9-1	nor		saga_sept92	1633.50	1633.5	ccp	1.035714
2 6407/9-1	6407/9-1	nor		saga_sept92	1642.00	1642.0	ccp	1.071429
3 6407/9-1	6407/9-1	nor		saga_sept92	1651.00	1651.0	ccp	1.071429
4 6407/9-1	6407/9-1	nor		saga_sept92	1673.00	1673.0	ccp	0.692308

0 well	9 Z/C	10 Z/Z+E	11 X/E	12 X/X+D	13 E/E+F	14 22S	15 a/a+j	16 20S
1 6407/9-1	0.527778	0.170149	0.158273	0.698413	0.891026	56.800000	0.777409	0.587629
2 6407/9-1	0.504673	0.162651	0.151079	0.677419	0.893891	57.723577	0.772414	0.595960
3 6407/9-1	0.545455	0.178571	0.166667	0.696970	0.890323	57.600000	0.771812	0.581152
4 6407/9-1	0.290909	0.116788	0.090909	0.323529	0.812081	43.119266	0.575130	0.335664

0 well	17 20bb 217	18 %C27 abbs	19 %C28 abbs	20 %C29 abbs
1 6407/9-1	0.568889	29.069767	31.686047	39.244186
2 6407/9-1	0.558036	27.761628	33.284884	38.953488
3 6407/9-1	0.560920	28.613569	32.448378	38.938053
4 6407/9-1	0.482821	29.080119	34.124629	36.795252