

Denne rapport
tilhører

 **STATOIL**

UND DOK.SENTER

L.NR. 30287290038

KODE Well 31/2-5 nr. 49

Returneres etter bruk



WELL TEST REPORT

PL 054

WELL NO. 31/2-5

Den norske stats oljeselskap a.s



statoil
Den norske stats
oljeselskap a.s

Gradering _____

Avdeling for petroleumsteknologi
Seksjon for RESERVOAREVALUERING

Oppdragsgiver _____

PE/FELT

Undertittel _____

Test analysis of oil test on 31/2-5

Tittel _____

WELL TEST REPORT

PL 054

WELL NO. 31/2-5

Utarbeidet

4.12.81

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INTRODUCTION

A 23m thick oil zone was discovered in the well 31/2-5. The oil zone was overlain by a gas cap and underlain by a water zone. The GOC was located at 1578 mRKB with the WOC at 1601 mRKB. The formation consisted of very loose sand and few measurements on rock properties was performed in the interval of interest.

The well was opened up for flow the 30.6.81 and flowed till 13.7.81. During this period there were a short shut down the 7.7.81. The duration of this shut down was 9.2 hrs. When the production was increased the 10.7.81 the GOR increased from the solution gas oil ratio of 360 SCF/STB til around 1400 SCF/STB. The well was choked down the last day of the test and a decline in the produced GOR was observed.

As was pointed out in ref 1 a transient test on the oil zone in this well would be difficult to analyse by a traditional pressure respons analysis technique. It was therefore decided to use a numerical radial simulator to match the GOR and WOR performance observed during the test.

1 MODEL AND DATA DESCRIPTION

1.1 MODEL USED

The base for the model used in this study was the model described in ref.1. The reservoir was divided into two zones, the upper one at 1530-1564 mRKB and the lower one at 1564-1616 mRKB. Zone 1 had a permeability of 2500 md while the permeability for zone 2 was used as one of the matching parameters together with the vertical permeability and the relative permeability. The GOC was located at 1578 mRKB and the OWC at 1601 mRKB.

The dimensions used in the model were:

$\Delta z(\text{ft})$:

95.1, 29.5, 10.1, 6.14, 3x12.0, 9.8, 3x9.8, 6.3, 10.1,
32.8

$\Delta r(\text{ft})$:

4.6, 8., 14., 25., 43., 75., 130., 400., 700., 1225.,
2140.

Layer 1-4 : Gas zone
Layer 5-11 : Oil zone
Layer 12-14: Water zone
Layer 8 : Producing interval

The normalized relative permeability curves that were used are given in Figs. 4 and 5 in ref.1.

1.2 PVT DATA

The PVT data used were based upon measurements performed on a RFT ⁽²⁾ sample from 31/2-5. This PVT report was not available at the time the study given in ref. 1 was performed. Such that this study used the new set of PVT data. The main difference

between the fluid properties obtained by correlations and the measured results was the oil viscosity. ($\mu_0 = 1.32$ cp was measured on the oil sample compared to 2.17 cp from correlations).

The following equations were used to calculate the PVT properties used in the model. The results are given in Table 1.

$$R_s = R_{sf} - (R_{spb} - R_{sp}) \frac{B_{of}}{B_{odb}} \quad 1$$

$$B_o = B_{odp} \frac{B_{of}}{B_{od}} \quad 2$$

$$B_g = .0283 \frac{ZT}{P} \quad 3$$

R_{sf} : Gas oil ratio by flashing bubble point oil through a given set of separators (SCF/STB)

R_s : Gas in solution at pressure p (SCF/STB)

R_{spb} : Gas in solution at the bubble point pressure (SCF/STB)

R_{sp} : Gas in solution at pressure p (SCF/STB)

B_{of} : Flash formation volume factor

B_{od} : Differential formation volume factor at the bubble point pressure

B_{odp} : Differential formation volume factor at pressure p

In addition to the data given in Table 1 the following data were used:

Reservoir temperature	160 °F
Bubble point pressure	2280 psia
Initial pressure (at GOC)	2280 psia
Water viscosity	.45 cp
Water density	1.045 g/cc
Gas gravity	.635 (air=1.0)
Stock tank oil density	.850 g/cc

Table 1 PVT Properties Used

OIL PROPERTIES				
PRESS	SOL GAS	VISCOSITY	VOL FAC	
PSTA	SCF/STB	CP	RB /STB	RP
700.00	76.0	2.1600	1.0900	
1000.00	134.0	1.9400	1.1080	
1300.00	191.0	1.7400	1.1250	
1600.00	245.0	1.5600	1.1440	
1900.00	297.0	1.4400	1.1600	
2200.00	347.0	1.3400	1.1750	
2280.00	360.0	1.3200	1.1800	
2500.00	400.0	1.2800	1.1870	
GIL COMPRESSIBILITY IS 0.000027 1/PSI				
VISCOSITY SLOPE IS 0.0001900 1/PSI				

GAS PROPERTIES			
PRESS	VOL FAC	VISCOSITY	
PSTA	RB /MCF	CP	
700.00	4.0600	0.0135	
1000.00	2.7900	0.0141	
1300.00	2.1100	0.0148	
1600.00	1.6900	0.0156	
1900.00	1.4100	0.0164	
2200.00	1.2200	0.0173	
2280.00	1.1700	0.0175	
2500.00	1.0600	0.0181	

1.3 RATE DATA.

Fig. 1 gives the separator flash formation volume factor and separator GOR as a function of separator pressure. (These data are from one stage separations and are given in the RFT⁽²⁾ fluid analysis report). Oil rate was given as separator barrels per day and the gas rates were given as SCF per separator barrel. These rates were corrected to STB/day and SCF/STB by using Fig. 1, i.e. for a given separator pressure the Bo_{sep} and GOR_{sep} were estimated and

$$Q_o(\text{STB/day}) = Q_o(\text{SEPBBL/day}) / Bo_{sep}$$

$$GOR(\text{SCF/STB}) = GOR(\text{SCF/SEPBBL}) * Bo_{sep} + GOR(\text{SCF/STB})_{sep}$$

Oil rates that were measured are given in Fig. 2 and the corrected values used are given in Table 2 and plotted vs time in Fig 3. These values were average values over a time interval, i.e 730 STB/day was the average value between 0-3 hrs, 2300 STB/day was the average production from 3 to 6 hrs. and so on.

Table 2. Oil Rates Used in the Model

Δt hrs	Oil Rate STB/day
0	730
3	2300
6	5250
20	5490
70	5700
174.5	5590
175	0
183.8	5800
252	6564
267	7415
299	6045
319	5410

2. TESTMATCHING

2.1 TEST MATCHING PROCEDURE

2.1.1 First approximation.

A preliminary test match was performed prior to this study. At the time of that test match the RFT ⁽²⁾ report was not available and the PVT properties was calculated by correlation techniques. Based upon those results and the new PVT data a horizontal permeability of 15000 md was estimated with $k_v/k_H=0.6$ and $k_{rw}(S_{Or}) = 0.20$. This gave the background for the first series of simulation runs performed. These are given in Table 3 with the main results.

Table 3. Simulation Runs Performed during the 1. Step

		k _H (D)		
		12	15	18
.1	k _v / k _H	K _{rw} (S _{Or}) = .1 a)	K _{rw} (S _{Or}) = .2 b)	K _{rw} (S _{Or}) = .5 c)
		GOR: 363	GOR: 362	GOR: 362
		WOR: 0	WOR: 0	WOR: .007
.6	k _v / k _H	K _{rw} (S _{Or}) = .5 d)	K _{rw} (S _{Or}) = .1 e)	K _{rw} (S _{Or}) = .2 f)
		GOR: 1180	GOR: 430	GOR: 362
		WOR: .222	WOR: .009	WOR: .027
1.	k _v / k _H	K _{rw} (S _{Or}) = .2 g)	K _{rw} (S _{Or}) = .5 h)	K _{rw} (S _{Or}) = .1 i)
		GOR: 2222	GOR: 925	GOR: 362
		WOR: .084	WOR: .23	WOR: .014

The GOR and WOR given in Table 3 were max values observed during the simulation runs. The results obtained for each case as a function of time are given in the appendix. Table 3 shows that for $k_v/k_H=.1$ for $k_H \in [12, 18]$ there were no gas break through or water break through, except for case c which had a

slight increase in produced WOR. For $k_H = 18D$ and $k_v/k_H \in [.1, 1]$ an increase in produced WOR was observed but with no increase in the produced gas oil ratio. Cases c, d and h had a value of .5 for the $k_{rw}(S_{or})$. These cases except Case c, gave a water production that was far too high even when the produced GORs were too low. Case c had a measurable max WOR but with no production of gas from the gas cap. Even when the vertical permeability was increased to $k_v/k_H=1$. for $k_H=18 D$ there was no increase in produced GOR.

From the results obtained during the first step in the test match procedure the following values were excluded.

$$k_v/k_H = .1$$

$$k_{rw}(S_{or}) = .5$$

$$k_H = 18D$$

2.1.2 Second approximation.

From the results in chapter 2.1.1 6 new cases were runned. These are described in Table 4 together with Cases e and g from Table 3.

Table 4. Simulation Runs Performed during the 2. step

		$k_H = 15 D$		$k_H = 12 D$	
		$k_{rw}(S_{or})$		$k_{rw}(S_{or})$	
		.1	.2	.1	.2
k_v	k_H	e)	m)	j)	l)
.6	.6	GOR: 430 WOR: .009	GOR: 421 WOR: .033	GOR: 1087 WOR: .014	GOR: 1149 WOR: .049
1.	1.	n)	o)	k)	g)
		GOR: 601 WOR: .018	GOR: 644 WOR: .055	GOR: 2065 WOR: .029	GOR: 2223 WOR: .084

Table 4 shows that the max GORs were too low when $k_H = 15 D$ for $k_v/k_H \in [.6, 1]$, $k_{rw}(S_{or}) \in [.1, .2]$ and relative permeability Case a in ref.1. When $k_H = 12D$ for $k_{rw}(S_{or}) \in [.1, .2]$ and $k_v/k_H = 1$. the produced GORs were too high and for

$k_{rw}(S_{or}) = .2$ for $k_H \in [12, 15D]$ and $k_v/k_H \in [.6, 1]$ the produced WOR seemed to be high. It was therefore decided to use interpolation in Table 4 to specify the values used in the next step.

2.1.3 Final Results.

By interpolating in Table 4 two new cases were runned. These cases used the following values:

Case p: $k_H = 13D$ $k_v/k_H = 1.0$ $k_{rw}(S_{or}) = .13$

Case Q: $k_H = 12D$ $k_v/k_H = .75$ $k_{rw}(S_{or}) = .13$

The relative permeability for Cases p and Q are described in ref 1 as Case a but with a change in $k_{rw}(S_{or})$. The two cases gave the following results:

Case	Gor _{max}	WOR _{max}
P	1498	.039
Q	1535	.031

These results are close to the max GOR and WOR recorded during the test. The lowest horizontal permeability used in this study so far was 12 D. Since case Q gave a relative close match with $k_H = 12D$ it was decided to use lower horizontal permeabilities and Cases R and S were runned.

Case R $k_H = 10D$ $k_v/k_H = .6$ $k_{rw}(S_{or}) = 0.13$

Case S $k_H = 10D$ $k_v/k_H = .4$ $k_{rw}(S_{or}) = 0.20$

These two cases gave the following results:

Case	GOR _{max}	WOR _{max}
R	1951	.030
S	1268	.035

Case R gave a too high value for max GOR produced while case S gave a result close to the test values.

Case Q and R were rerun with a small change in properties. These Cases, T and U were given as:

Case T $k_H=12.5D$ $k_V/k_H=.75$ $k_{rw}(S_{or})=.15$
 Case U $k_H=11.5D$ $k_V/k_H=.60$ $k_{rw}(S_{or})=.17$

And the following results were obtained

Case	GOR_{max}	WOR_{max}
T	1332	.036
U	1428	.039

2.2 DISCUSSION

The four Cases P,T,U and S are summarized in Table 5.

Table 5 Summary of Results

Case	k_H Darcy	k_V/k_H	$k_{rw}(S_{or})$	GOR_{max} SCF/STB	WOR_{max}
P	13	1.0	.13	1498	0.039
T	12.5	.75	.15	1332	0.036
U	11.5	.60	.17	1428	0.039
S	10	.40	.20	1268	0.035

The results for the four cases given in Table 5 are plotted in Figs 4-11 as a function of time. Case P had a k_V/k_H value of 1. and Fig. 4 shows that the calculated GOR decline more rapidly than the test GOR after the reduction in flow rate (see Fig.3) This was interpreted as a result of a too high vertical permeability since the flow was controlled partially by the vertical conductivity and partially by the pressure drop in the oil zone. And the pressure drop in the oil zone was again mainly a function of the horizontal permeability. Thus for Case T the vertical permeability ratio was decreased to reduce the rate of decline of the GOR. But to get the same max produced GOR the horizontal permeability had to be decreased to create the necessary pressure drop in the formation. At the same time

the end point of the water relative permeability curve had to be increased to adjust the produced WOR for the decrease in the vertical conductivity. This adjustment on the water relative permeability curve was necessary because gas had a much higher mobility ratio than water and the ratio between gas rate and water rate should be the same as for the previous case. The rate of gas flow was adjusted by the change in the permeabilities. But this change was not large enough to get the same water rate as for the previous case and an additional adjustment had to increase the water mobility ratio and the $k_{rw}(S_{or})$ was increased.

The same adjustments as described above was performed for Case U. Case U had a vertical permeability ratio $k_v/k_H=.6$. In this case it can be observed that the rate of decline of produced GOR was about the same for the test and simulator results. (See Fig.8) Case S had a vertical permeability $k_v/k_H=0.4$ and the results in Fig.10 indicate that the simulator GOR had a lower rate of decline than the test results. The max GOR was somewhat lower in this case than the previous cases.

3. CONCLUSION.

Case U seems to give the best match and the data used were:

$$\begin{aligned}k_H &= 11.5D \\k_v/k_H &= 0.6 \\k_{rw}(S_{or}) &= .17 \\ \text{Rel. Perm: Case a ref.1}\end{aligned}$$

There was a high degree of uncertainty in the measured WOR results. But the $k_{rw}(S_{or})$ should not be far off since the results were very sensitiv to $k_{rw}(S_{or})$. A small change in $k_{rw}(S_{or})$ gave a considerable change in produced WOR.

A K_H value of 11.5 D is somewhat higher than the average core permeabilities from zone 2 in 31/2-5 and similar formations in the other 31/2 wells. But the representativeness of the core permeabilities is questionable since the formation was unconsolidated and few measurements were performed.

The k_v/k_H value of 0.6 is in good agreement with values reported in Table 1 ref. 1

REFERENCES

1. One Well Study on 31/2-5, august 81, Lars Rosslund.
2. Reservoir Fluid Study for A/S Norske Shell Exploration and Production, Well 31/2-5, Corelab 17 march 1981.

APPENDIX

**GOR AND B_o FROM SEPARATOR TESTS OF
RESERVOIR FLUID SAMPLE, RFT 31/2-5**

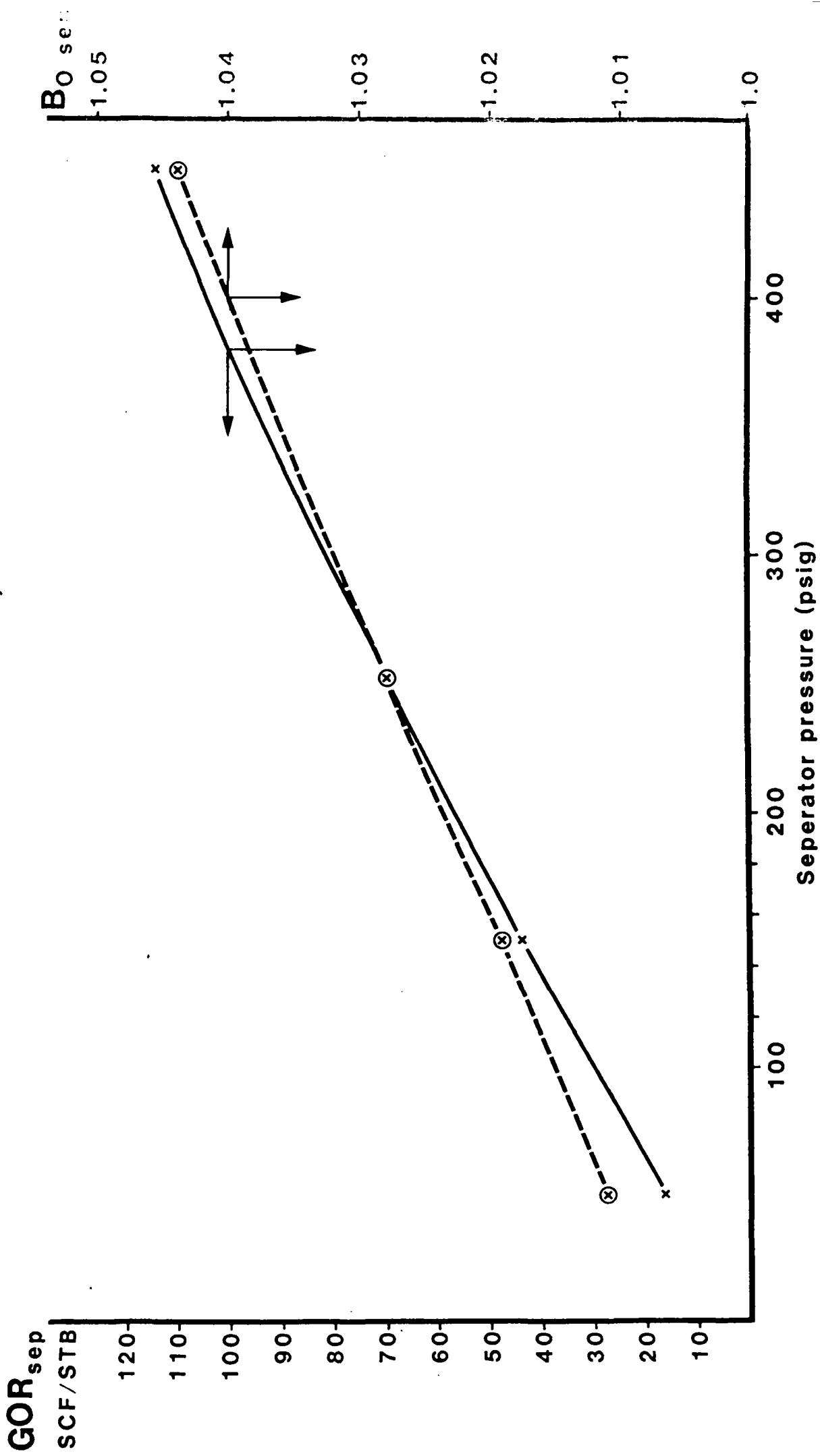


Fig. 1 GOR and B_o for separator tests vs separator pressure

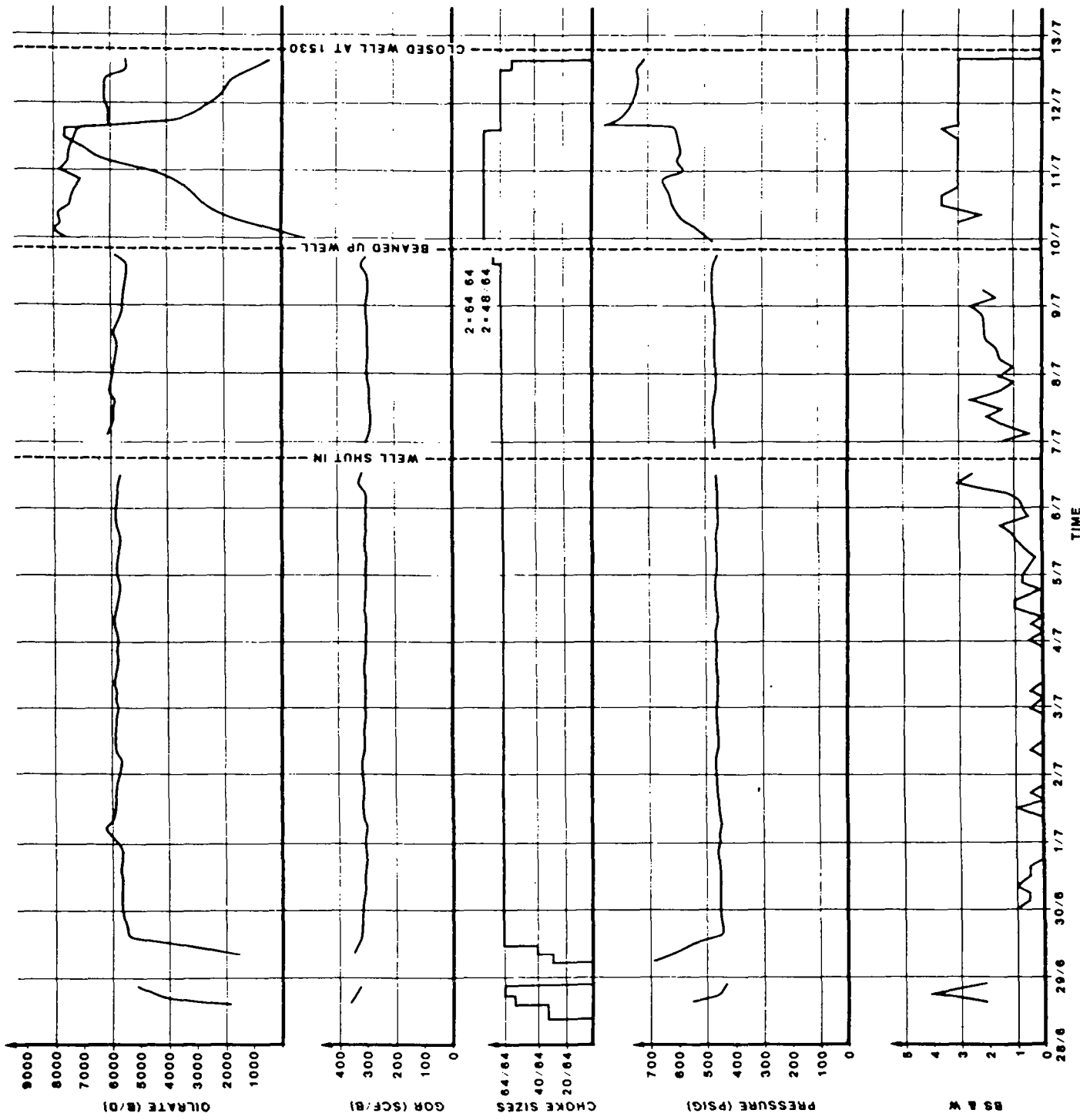
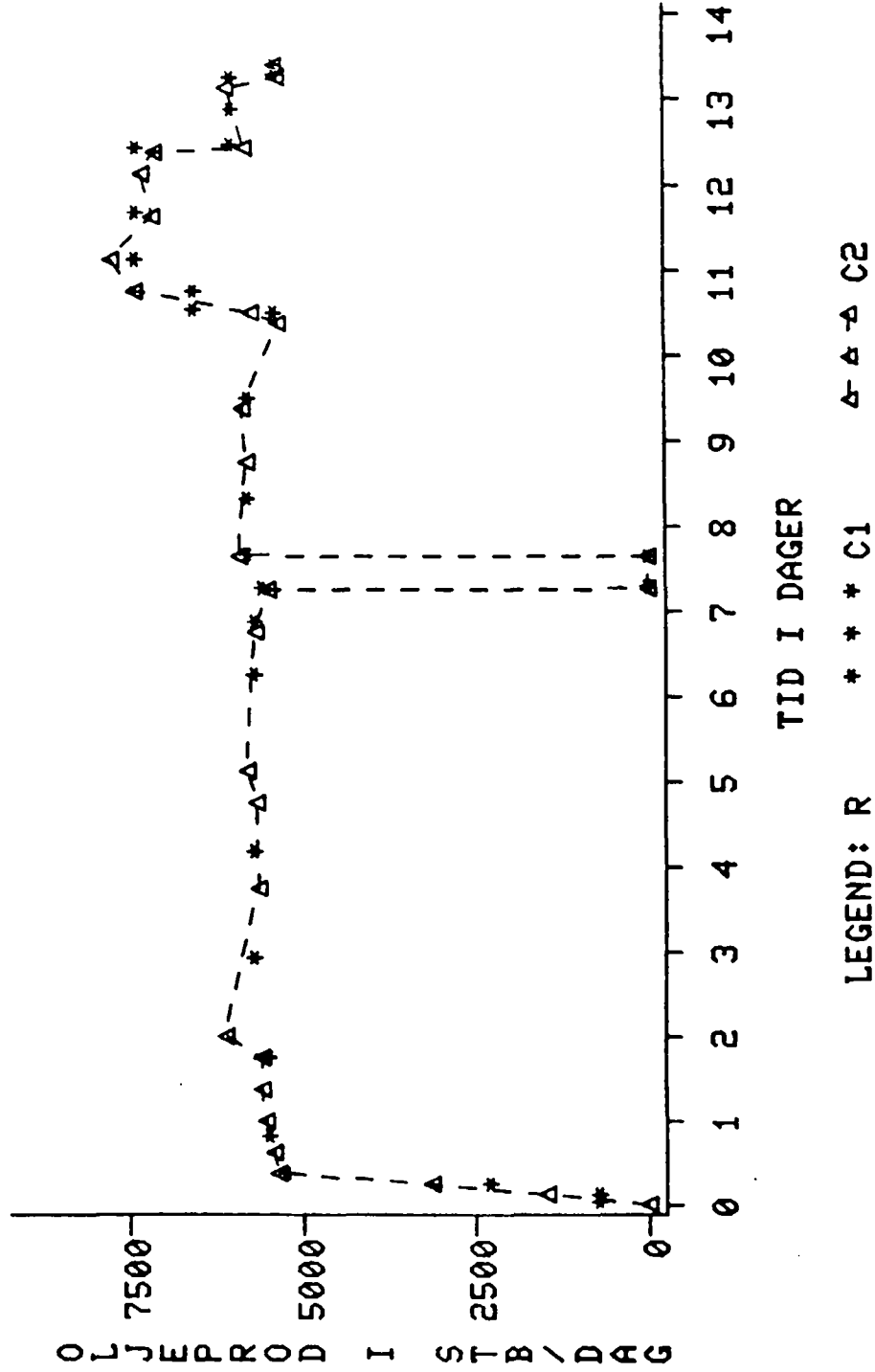


Fig. 2 FLOW DATA

31/2 TESTMATCH



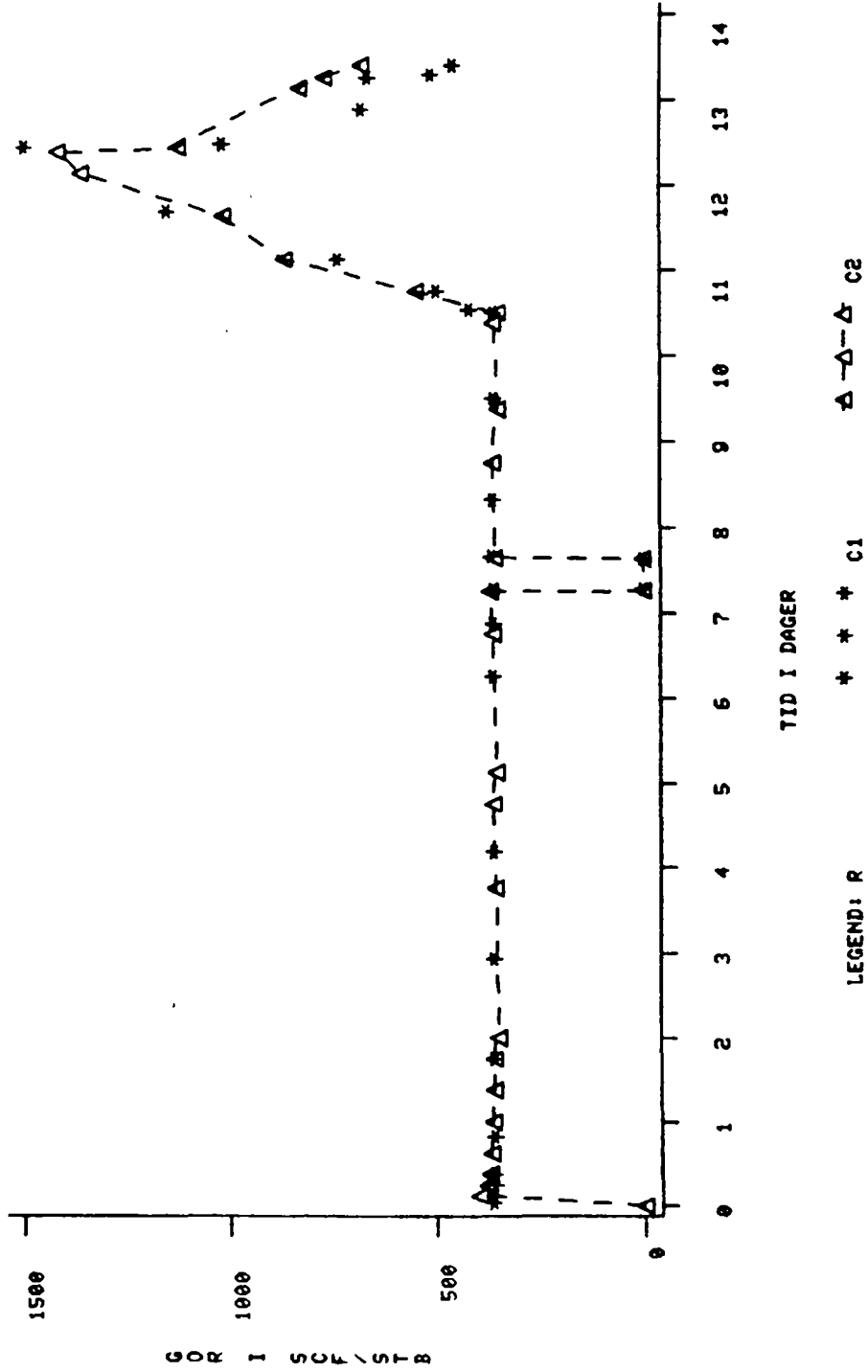
C1 = SIMULATORRESULTAT C2 = TESTRESULTAT

Fig. 3 Oil Production vs Time

31/2 TESTMATCH

CASE P

KH=13D KV/KH=1. KRW(SOR)=.13 (A)



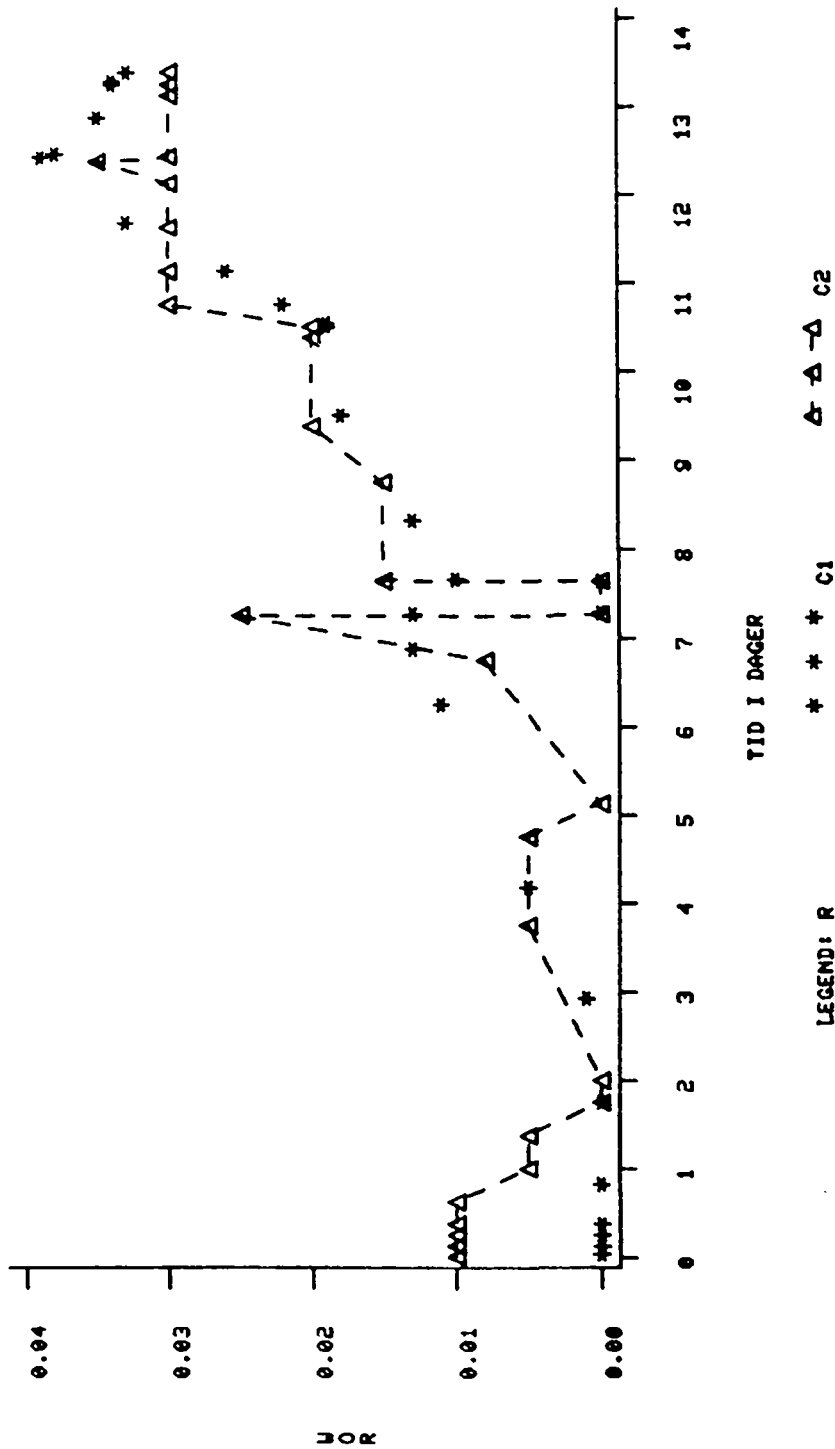
C1-SIMULATORRESULTAT C2-TESTRESULTAT

Fig. 4. GOR vs Time for Case P

31/2 TESTMATCH

CASE P

KH=13D KV/KH=1. KRW(SOR)=.13 (A)



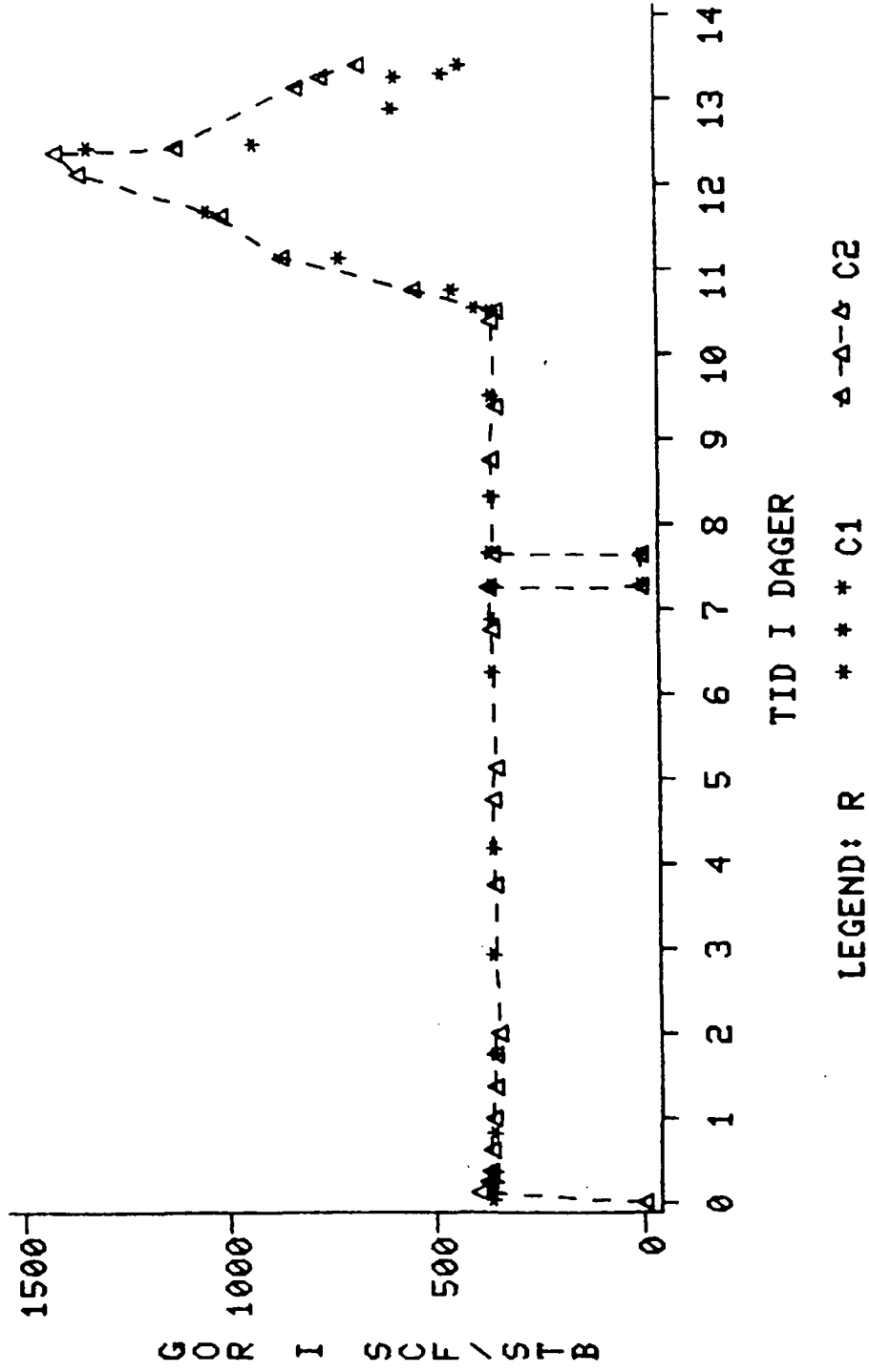
C1-SIMULATORRESULTAT C2-TESTRESULTAT

Fig. 5. WOR vs Time for Case P

31/2 TESTMATCH

CASE T

KH=12.5D KV/KH=.75 KRW(SOR)=.15 (A)



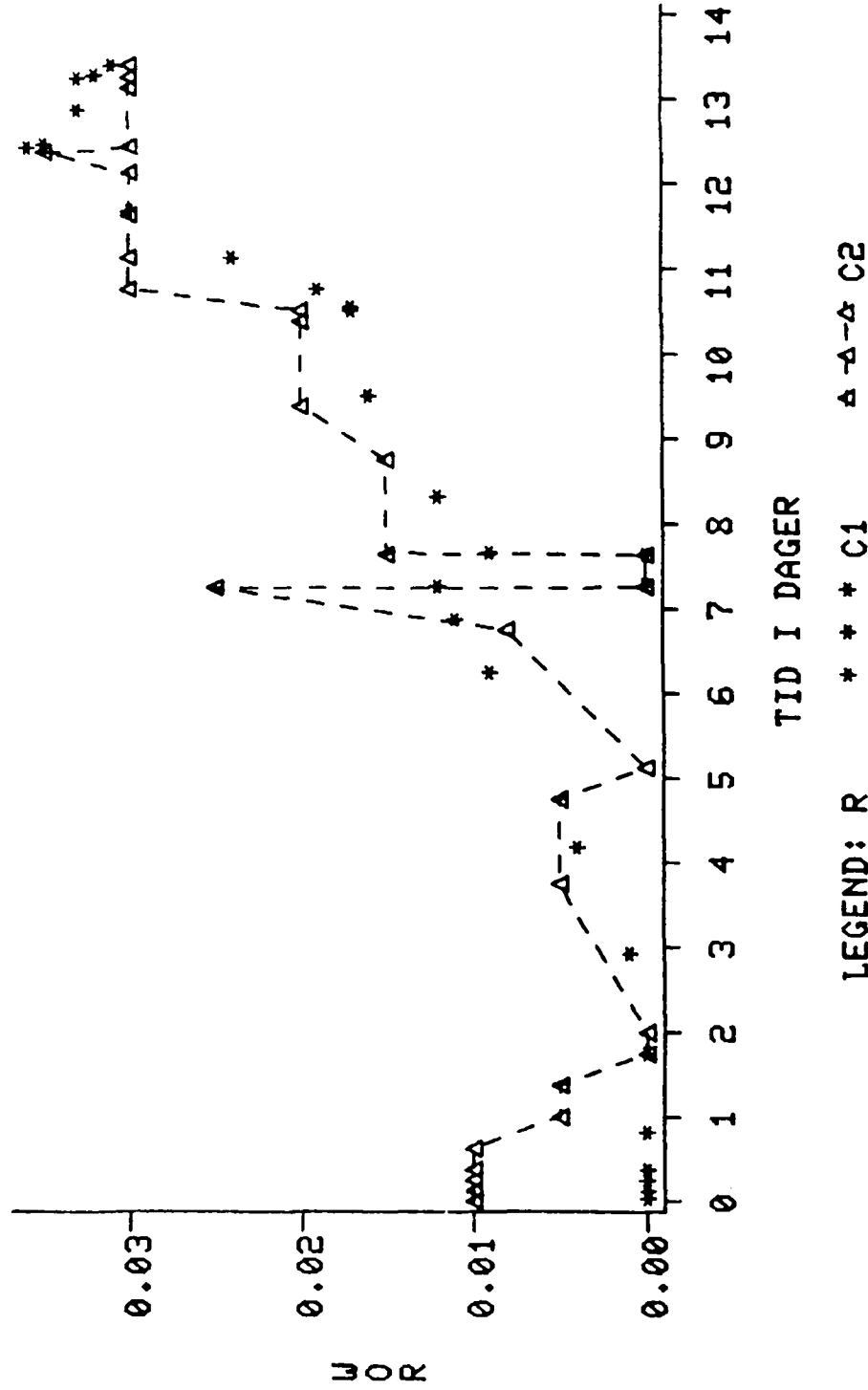
C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 6. GOR vs Time for Case T

31/2 TESTMATCH

CASE T

KH=12.5D KV/KH=.75 KRW(SOR)=.15 (A)



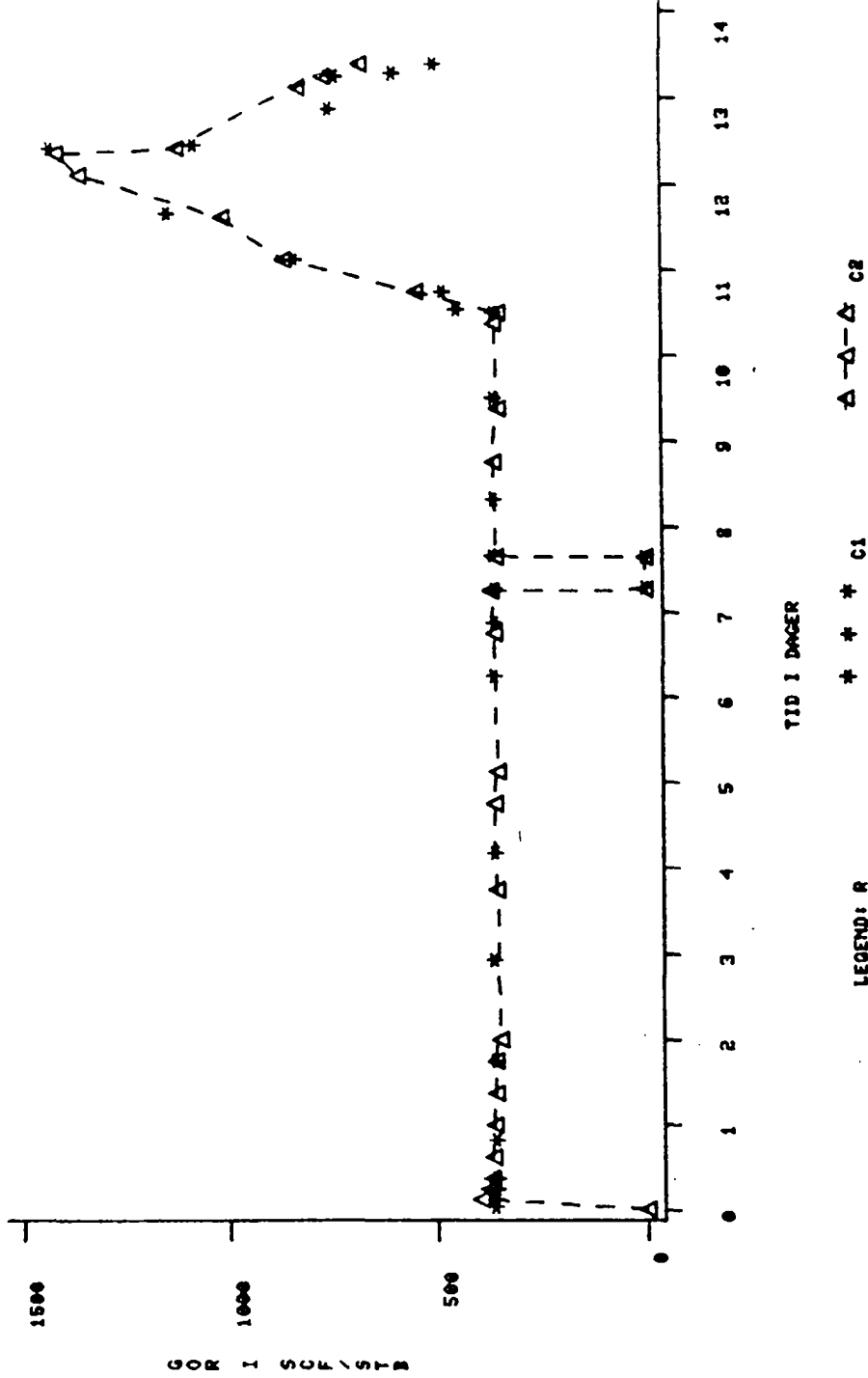
C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 7. WOR vs Time for Case T

31/2 TESTMATCH

CASE U

KH=11.5D KV/KH=.60 KRW(SOR)=.17 (A)



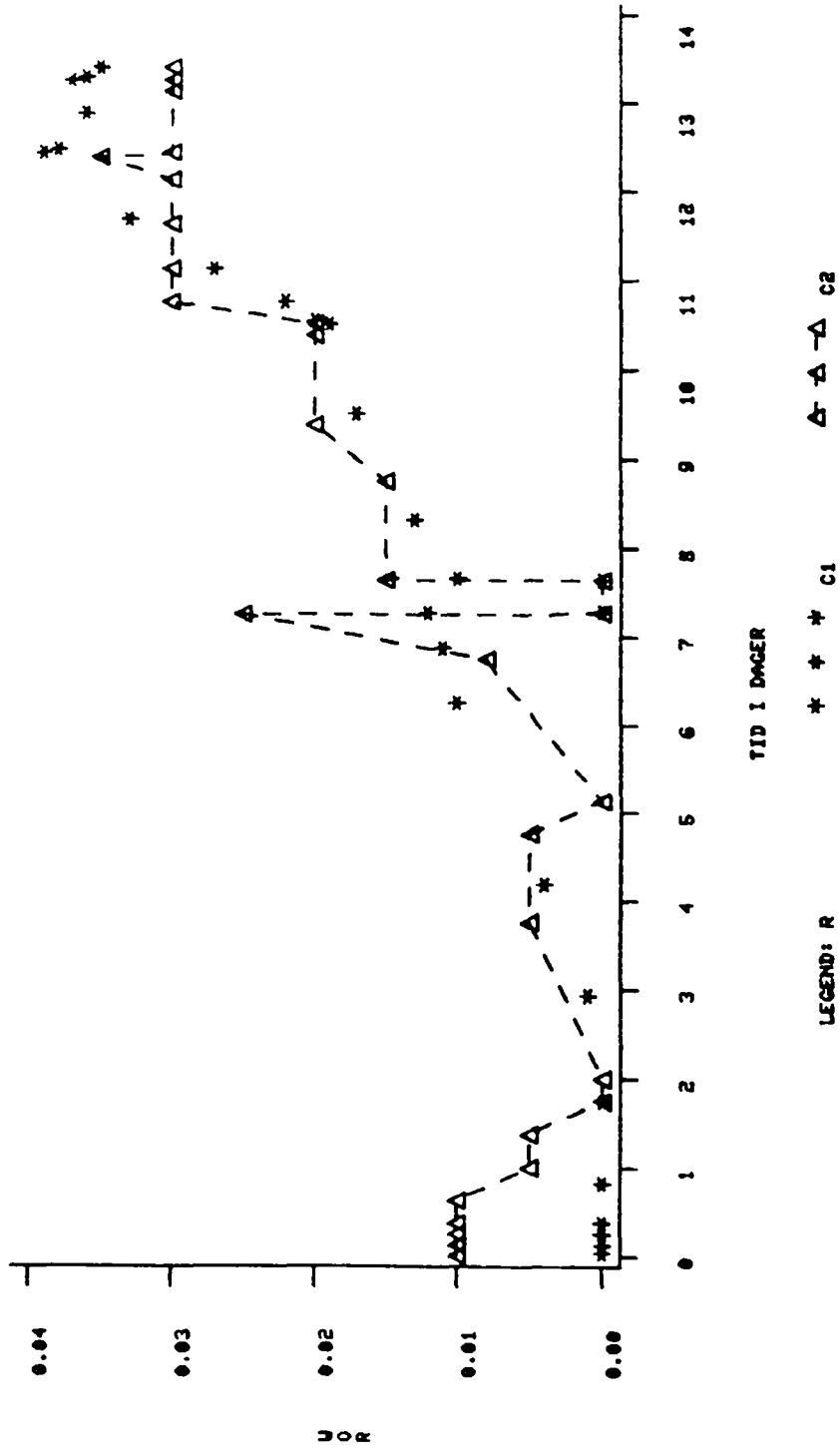
C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 8 GOR vs Time for Case U

31/2 TESTMATCH

CASE U

KH=11.50 KV/KH=.60 KRW(SOR)=.17 (A)



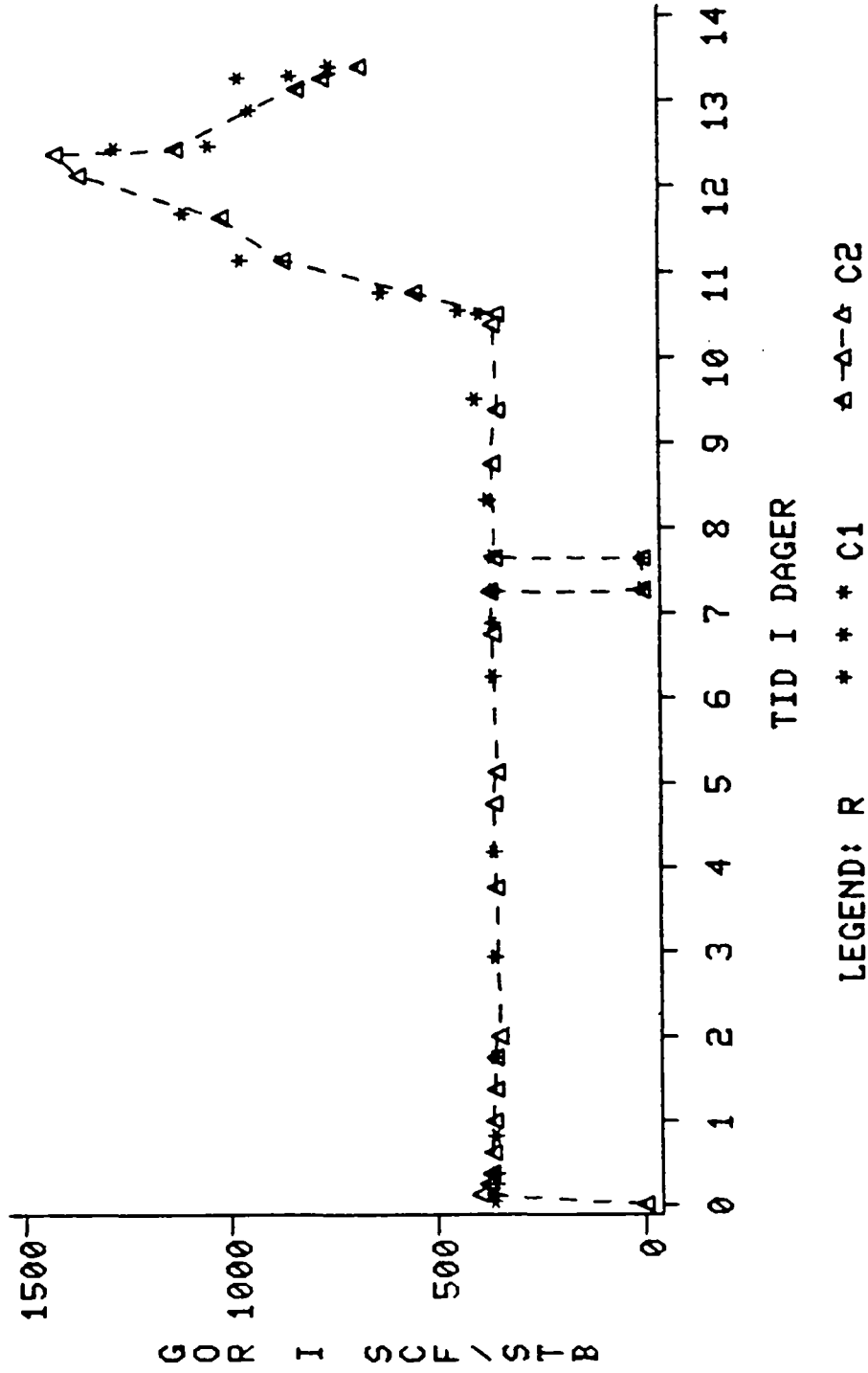
C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 9. WOR vs Time for Case U

31/2 TESTMATCH

CASE S

KH=100 KV/KH=.4 KRW(SOR)=.20 (A)



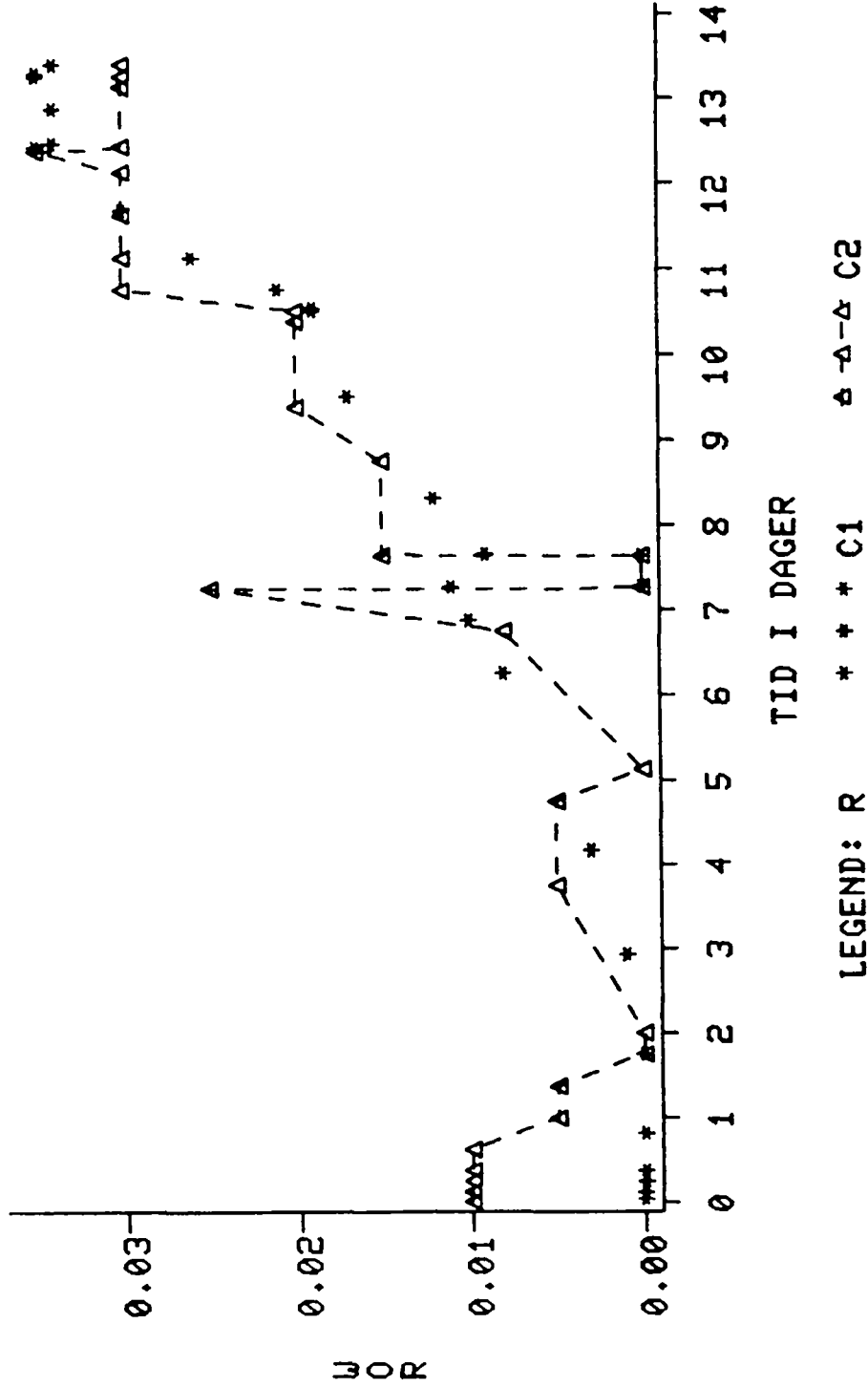
C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 10 GOR vs Time for Case S

31/2 TESTMATCH

CASE S

KH=10D KV/KH=.4 KRW(SOR)=.20 (A)



C1=SIMULATORRESULTAT C2=TESTRESULTAT

Fig. 11 WOR vs Time for Case S

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	829.	361.	0.000	0.000
0.38	5250.	0.	1881.	358.	0.000	0.000
0.83	5490.	0.	1975.	360.	0.000	0.000
1.75	5490.	0.	1975.	360.	0.000	0.000
2.92	5700.	0.	2057.	361.	0.000	0.000
4.17	5700.	0.	2056.	361.	0.000	0.000
6.25	5700.	0.	2056.	361.	0.000	0.000
6.88	5700.	0.	2056.	361.	0.000	0.000
7.27	5590.	0.	2016.	361.	0.000	0.000
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5800.	0.	2092.	361.	0.000	0.000
9.50	5800.	0.	2092.	361.	0.000	0.000
10.50	5425.	0.	1960.	361.	0.000	0.000
10.54	6564.	0.	2380.	363.	0.000	0.000
10.75	6564.	0.	2371.	361.	0.000	0.000
11.13	7750.	0.	2798.	361.	0.000	0.000
11.67	7750.	0.	2798.	361.	0.000	0.000
12.42	7750.	0.	2798.	361.	0.000	0.000
12.46	6045.	0.	2179.	361.	0.000	0.000
12.88	6045.	0.	2183.	361.	0.000	0.000
13.25	6045.	0.	2183.	361.	0.000	0.000
13.29	5410.	0.	1950.	360.	0.000	0.000
13.40	5410.	0.	1955.	361.	0.000	0.000

*** CASE B ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	830.	361.	0.000	0.000
0.38	5250.	0.	1885.	359.	0.000	0.000
0.83	5490.	0.	1978.	360.	0.000	0.000
1.75	5490.	0.	1978.	360.	0.000	0.000
2.92	5700.	0.	2058.	361.	0.000	0.000
4.17	5700.	0.	2058.	361.	0.000	0.000
6.25	5700.	0.	2058.	361.	0.000	0.000
6.88	5700.	0.	2058.	361.	0.000	0.000
7.27	5590.	0.	2018.	361.	0.000	0.000
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5800.	0.	2094.	361.	0.000	0.000
9.50	5800.	0.	2094.	361.	0.000	0.000
10.50	5425.	0.	1959.	361.	0.000	0.000
10.54	6564.	0.	2372.	361.	0.000	0.000
10.75	6564.	0.	2368.	361.	0.000	0.000
11.13	7750.	0.	2794.	361.	0.000	0.000
11.67	7750.	1.	2809.	362.	0.000	0.000
12.42	7749.	3.	2799.	361.	0.000	0.000
12.46	6045.	2.	2182.	361.	0.000	0.000
12.88	6045.	3.	2185.	361.	0.000	0.000
13.25	6045.	3.	2184.	361.	0.000	0.000
13.29	5410.	3.	1952.	361.	0.000	0.000
13.40	5410.	3.	1955.	361.	0.000	0.000

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1888.	360.	0.000	0.000
0.83	5490.	0.	1980.	361.	0.000	0.000
1.75	5490.	0.	1979.	361.	0.000	0.000
2.92	5700.	0.	2059.	361.	0.000	0.000
4.17	5700.	0.	2059.	361.	0.000	0.000
6.25	5700.	0.	2059.	361.	0.000	0.000
6.88	5700.	0.	2059.	361.	0.000	0.000
7.27	5590.	0.	2019.	361.	0.000	0.000
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5800.	1.	2095.	361.	0.000	0.000
9.50	5800.	2.	2095.	361.	0.000	0.000
10.50	5424.	3.	1959.	361.	0.001	0.001
10.54	6564.	4.	2373.	362.	0.001	0.001
10.75	6563.	6.	2369.	361.	0.001	0.001
11.13	7749.	16.	2796.	361.	0.002	0.002
11.67	7745.	30.	2794.	361.	0.004	0.004
12.42	7739.	52.	2792.	361.	0.007	0.007
12.46	6046.	38.	2178.	360.	0.006	0.006
12.88	6046.	34.	2186.	361.	0.006	0.006
13.25	6045.	35.	2185.	361.	0.006	0.006
13.29	5411.	30.	1953.	361.	0.006	0.006
13.40	5410.	29.	1956.	362.	0.005	0.005

*** CASE D ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1888.	360.	0.000	0.000
0.83	5489.	1.	1982.	361.	0.000	0.000
1.75	5484.	39.	1979.	361.	0.007	0.007
2.92	5681.	142.	2054.	362.	0.025	0.024
4.17	5674.	252.	2050.	361.	0.044	0.042
6.25	5682.	432.	2052.	361.	0.076	0.071
6.88	5683.	473.	2052.	361.	0.083	0.077
7.27	5573.	482.	2012.	361.	0.087	0.080
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5786.	479.	2089.	361.	0.083	0.076
9.50	5780.	625.	2234.	387.	0.108	0.098
10.50	5399.	620.	1983.	367.	0.115	0.103
10.54	6540.	786.	2860.	437.	0.120	0.107
10.75	6525.	886.	2999.	460.	0.136	0.120
11.13	7714.	1376.	6862.	890.	0.178	0.151
11.67	7688.	1521.	7832.	1019.	0.198	0.165
12.42	7684.	1706.	9066.	1180.	0.222	0.182
12.46	6051.	1290.	5437.	899.	0.213	0.176
12.88	6047.	1239.	4946.	818.	0.205	0.170
13.25	6040.	1244.	4893.	810.	0.206	0.171
13.29	5415.	1096.	3751.	693.	0.202	0.168
13.40	5417.	1067.	3375.	623.	0.197	0.165

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1890.	360.	0.000	0.000
0.83	5490.	0.	1983.	361.	0.000	0.000
1.75	5490.	0.	1983.	361.	0.000	0.000
2.92	5700.	0.	2058.	361.	0.000	0.000
4.17	5700.	0.	2061.	362.	0.000	0.000
6.25	5699.	5.	2060.	361.	0.001	0.001
6.88	5699.	7.	2060.	361.	0.001	0.001
7.27	5588.	9.	2020.	361.	0.002	0.002
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5799.	11.	2096.	361.	0.002	0.002
9.50	5799.	18.	2095.	361.	0.003	0.003
10.50	5424.	19.	1960.	361.	0.004	0.004
10.54	6563.	24.	2374.	362.	0.004	0.004
10.75	6563.	27.	2371.	361.	0.004	0.004
11.13	7749.	43.	2798.	361.	0.006	0.005
11.67	7746.	55.	2958.	382.	0.007	0.007
12.42	7745.	70.	3329.	430.	0.009	0.009
12.46	6045.	52.	2166.	358.	0.009	0.009
12.88	6045.	50.	2183.	361.	0.008	0.008
13.25	6045.	50.	2183.	361.	0.008	0.008
13.29	5410.	44.	1953.	361.	0.008	0.008
13.40	5410.	43.	1955.	361.	0.008	0.008

*** CASE F ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	832.	362.	0.000	0.000
0.38	5250.	0.	1892.	360.	0.000	0.000
0.83	5490.	0.	1984.	361.	0.000	0.000
1.75	5490.	0.	1984.	361.	0.000	0.000
2.92	5700.	1.	2059.	361.	0.000	0.000
4.17	5699.	5.	2064.	362.	0.001	0.001
6.25	5695.	27.	2059.	362.	0.005	0.005
6.88	5693.	33.	2058.	362.	0.006	0.006
7.27	5588.	34.	2020.	362.	0.006	0.006
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5797.	35.	2096.	362.	0.006	0.006
9.50	5794.	56.	2095.	361.	0.010	0.010
10.50	5423.	56.	1960.	361.	0.010	0.010
10.54	6560.	72.	2373.	362.	0.011	0.011
10.75	6555.	87.	2369.	361.	0.013	0.013
11.13	7746.	143.	2798.	361.	0.018	0.018
11.67	7741.	175.	2796.	361.	0.023	0.022
12.42	7742.	210.	2796.	361.	0.027	0.026
12.46	6049.	156.	2182.	361.	0.026	0.025
12.88	6045.	138.	2184.	361.	0.023	0.022
13.25	6046.	135.	2184.	361.	0.022	0.022
13.29	5413.	117.	1955.	361.	0.022	0.021
13.40	5411.	112.	1955.	361.	0.021	0.020

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1889.	360.	0.000	0.000
0.83	5490.	0.	1983.	361.	0.000	0.000
1.75	5489.	6.	1982.	361.	0.001	0.001
2.92	5490.	47.	2054.	361.	0.008	0.008
4.17	5696.	90.	2058.	361.	0.016	0.016
6.25	5697.	159.	2058.	361.	0.028	0.027
6.88	5695.	178.	2057.	361.	0.031	0.030
7.27	5587.	183.	2018.	361.	0.033	0.032
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5796.	186.	2208.	381.	0.032	0.031
9.50	5788.	236.	2673.	462.	0.041	0.039
10.50	5418.	229.	2270.	419.	0.042	0.041
10.54	6558.	288.	3864.	589.	0.044	0.042
10.75	6559.	315.	4364.	665.	0.048	0.046
11.13	7743.	494.	12262.	1584.	0.064	0.060
11.67	7738.	583.	15390.	1989.	0.075	0.070
12.42	7740.	650.	17196.	2222.	0.084	0.077
12.46	6046.	483.	9082.	1502.	0.080	0.074
12.88	6051.	442.	6723.	1111.	0.073	0.068
13.25	6050.	436.	6482.	1071.	0.072	0.067
13.29	5412.	383.	4570.	844.	0.071	0.066
13.40	5413.	367.	3895.	720.	0.068	0.063

*** CASE H ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	362.	0.000	0.000
0.38	5250.	0.	1892.	360.	0.000	0.000
0.83	5490.	2.	1984.	361.	0.000	0.000
1.75	5483.	56.	1981.	361.	0.010	0.010
2.92	5687.	194.	2054.	361.	0.034	0.033
4.17	5670.	313.	2047.	361.	0.055	0.052
6.25	5684.	457.	2054.	361.	0.080	0.074
6.88	5688.	488.	2055.	361.	0.086	0.079
7.27	5583.	484.	2017.	361.	0.087	0.080
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5780.	458.	2088.	361.	0.079	0.073
9.50	5780.	605.	2088.	361.	0.105	0.095
10.50	5418.	576.	1957.	361.	0.106	0.096
10.54	6552.	742.	2366.	361.	0.113	0.102
10.75	6549.	853.	2448.	374.	0.130	0.115
11.13	7712.	1310.	4133.	536.	0.170	0.145
11.67	7693.	1572.	5884.	765.	0.204	0.170
12.42	7682.	1767.	7109.	925.	0.230	0.187
12.46	6065.	1316.	3656.	603.	0.217	0.178
12.88	6054.	1170.	2821.	466.	0.193	0.162
13.25	6056.	1136.	2729.	451.	0.188	0.158
13.29	5423.	988.	2039.	376.	0.182	0.154
13.40	5417.	979.	1998.	369.	0.181	0.153

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	832.	362.	0.000	0.000
0.38	5250.	0.	1893.	361.	0.000	0.000
0.83	5490.	0.	1985.	362.	0.000	0.000
1.75	5490.	0.	1984.	361.	0.000	0.000
2.92	5700.	0.	2060.	361.	0.000	0.000
4.17	5700.	2.	2059.	361.	0.000	0.000
6.25	5700.	10.	2061.	362.	0.002	0.002
6.88	5697.	15.	2059.	362.	0.003	0.003
7.27	5588.	16.	2020.	361.	0.003	0.003
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
8.33	5799.	17.	2096.	361.	0.003	0.003
9.50	5798.	27.	2096.	361.	0.005	0.005
10.50	5424.	26.	1960.	361.	0.005	0.005
10.54	6563.	33.	2373.	362.	0.005	0.005
10.75	6560.	40.	2371.	361.	0.006	0.006
11.13	7748.	69.	2799.	361.	0.009	0.009
11.67	7746.	87.	2798.	361.	0.011	0.011
12.42	7742.	106.	2796.	361.	0.014	0.014
12.46	6047.	78.	2182.	361.	0.013	0.013
12.88	6045.	67.	2184.	361.	0.011	0.011
13.25	6045.	64.	2184.	361.	0.011	0.011
13.29	5411.	56.	1954.	361.	0.010	0.010
13.40	5410.	54.	1955.	361.	0.010	0.010

*** CASE J ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1887.	360.	0.000	0.000
0.83	5490.	0.	1982.	361.	0.000	0.000
1.75	5490.	0.	1981.	361.	0.000	0.000
2.92	5700.	0.	2062.	362.	0.000	0.000
4.17	5699.	2.	2059.	361.	0.000	0.000
6.25	5698.	12.	2058.	361.	0.002	0.002
6.88	5699.	15.	2059.	361.	0.003	0.003
7.27	5588.	17.	2019.	361.	0.003	0.003
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	16.	2098.	362.	0.003	0.003
8.33	5799.	20.	2095.	361.	0.003	0.003
9.50	5798.	30.	2094.	361.	0.005	0.005
10.50	5423.	33.	1959.	361.	0.006	0.006
10.54	6563.	40.	2372.	361.	0.006	0.006
10.75	6563.	44.	2665.	406.	0.007	0.007
11.13	7414.	61.	4487.	605.	0.008	0.008
11.67	7409.	79.	6308.	851.	0.011	0.011
12.42	7409.	101.	8054.	1087.	0.014	0.013
12.46	6045.	80.	4674.	773.	0.013	0.013
12.88	6045.	78.	3088.	511.	0.013	0.013
13.25	6045.	79.	3075.	509.	0.013	0.013
13.29	5410.	70.	2265.	419.	0.013	0.013
13.40	5410.	69.	2115.	391.	0.013	0.013

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1889.	360.	0.000	0.000
0.83	5490.	0.	1983.	361.	0.000	0.000
1.75	5490.	0.	1982.	361.	0.000	0.000
2.92	5699.	3.	2057.	361.	0.001	0.001
4.17	5699.	14.	2059.	361.	0.002	0.002
6.25	5698.	40.	2058.	361.	0.007	0.007
6.88	5696.	49.	2057.	361.	0.009	0.008
7.27	5586.	51.	2017.	361.	0.009	0.009
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	42.	2101.	362.	0.007	0.007
8.33	5798.	53.	2094.	361.	0.009	0.009
9.50	5795.	73.	2327.	401.	0.013	0.012
10.50	5424.	73.	1947.	359.	0.013	0.013
10.54	6563.	93.	3756.	572.	0.014	0.014
10.75	6564.	100.	4187.	638.	0.015	0.015
11.13	7414.	141.	9103.	1228.	0.019	0.019
11.67	7409.	175.	12494.	1686.	0.024	0.023
12.42	7408.	214.	15294.	2065.	0.029	0.028
12.46	6045.	169.	8752.	1448.	0.028	0.027
12.88	6045.	160.	5887.	974.	0.027	0.026
13.25	6044.	161.	5713.	945.	0.027	0.026
13.29	5411.	142.	4225.	781.	0.026	0.026
13.40	5411.	137.	3609.	667.	0.025	0.025

*** CASE L ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1888.	360.	0.000	0.000
0.83	5490.	0.	1982.	361.	0.000	0.000
1.75	5490.	0.	1981.	361.	0.000	0.000
2.92	5696.	12.	2059.	362.	0.002	0.002
4.17	5692.	36.	2057.	361.	0.006	0.006
6.25	5699.	73.	2058.	361.	0.013	0.013
6.88	5698.	85.	2058.	361.	0.015	0.015
7.27	5586.	90.	2018.	361.	0.016	0.016
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	71.	2098.	362.	0.012	0.012
8.33	5797.	96.	2093.	361.	0.017	0.016
9.50	5791.	131.	2091.	361.	0.023	0.022
10.50	5420.	135.	1957.	361.	0.025	0.024
10.54	6562.	168.	2704.	412.	0.026	0.025
10.75	6558.	185.	2893.	441.	0.028	0.027
11.13	7411.	259.	5305.	716.	0.035	0.034
11.67	7405.	315.	7029.	949.	0.043	0.041
12.42	7409.	365.	8511.	1149.	0.049	0.047
12.46	6046.	291.	5149.	852.	0.048	0.046
12.88	6048.	271.	3643.	602.	0.045	0.043
13.25	6045.	271.	3488.	577.	0.045	0.043
13.29	5412.	238.	2654.	490.	0.044	0.042

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1890.	360.	0.000	0.000
0.83	5490.	0.	1983.	361.	0.000	0.000
1.75	5490.	0.	1983.	361.	0.000	0.000
2.92	5700.	3.	2058.	361.	0.001	0.001
4.17	5696.	18.	2059.	361.	0.003	0.003
6.25	5697.	48.	2059.	361.	0.008	0.008
6.88	5691.	58.	2057.	361.	0.010	0.010
7.27	5586.	59.	2019.	361.	0.011	0.010
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	44.	2105.	363.	0.008	0.008
8.33	5797.	60.	2095.	361.	0.010	0.010
9.50	5792.	84.	2093.	361.	0.014	0.014
10.50	5422.	82.	1959.	361.	0.015	0.015
10.54	6560.	104.	2372.	362.	0.016	0.016
10.75	6563.	118.	2371.	361.	0.018	0.018
11.13	7411.	170.	2675.	361.	0.023	0.022
11.67	7412.	205.	2848.	384.	0.028	0.027
12.42	7409.	243.	3120.	421.	0.033	0.032
12.46	6047.	191.	2166.	358.	0.032	0.031
12.88	6046.	184.	2183.	361.	0.031	0.030
13.25	6045.	182.	2183.	361.	0.030	0.029
13.29	5412.	160.	1953.	361.	0.030	0.029
13.40	5412.	156.	1955.	361.	0.029	0.028

*** CASE N ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1892.	360.	0.000	0.000
0.83	5490.	0.	1984.	361.	0.000	0.000
1.75	5490.	0.	1984.	361.	0.000	0.000
2.92	5700.	1.	2059.	361.	0.000	0.000
4.17	5699.	6.	2058.	361.	0.001	0.001
6.25	5699.	25.	2060.	361.	0.004	0.004
6.88	5696.	31.	2058.	361.	0.005	0.005
7.27	5587.	32.	2019.	361.	0.006	0.006
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	25.	2103.	363.	0.004	0.004
8.33	5797.	33.	2095.	361.	0.006	0.006
9.50	5795.	47.	2094.	361.	0.008	0.008
10.50	5423.	47.	1959.	361.	0.009	0.009
10.54	6564.	58.	2371.	361.	0.009	0.009
10.75	6563.	66.	2370.	361.	0.010	0.010
11.13	7412.	96.	3204.	432.	0.013	0.013
11.67	7411.	114.	3786.	511.	0.015	0.015
12.42	7407.	135.	4450.	601.	0.018	0.018
12.46	6045.	107.	2299.	380.	0.018	0.017
12.88	6045.	99.	2183.	361.	0.016	0.016
13.25	6045.	100.	2183.	361.	0.016	0.016
13.29	5411.	88.	1953.	361.	0.016	0.016

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1892.	360.	0.000	0.000
0.83	5490.	0.	1984.	361.	0.000	0.000
1.75	5490.	1.	1984.	361.	0.000	0.000
2.92	5699.	20.	2058.	361.	0.004	0.004
4.17	5690.	60.	2055.	361.	0.011	0.010
6.25	5695.	106.	2058.	361.	0.019	0.018
6.88	5695.	119.	2058.	361.	0.021	0.020
7.27	5583.	122.	2017.	361.	0.022	0.021
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	73.	2100.	362.	0.013	0.012
8.33	5793.	119.	2093.	361.	0.021	0.020
9.50	5799.	154.	2095.	361.	0.027	0.026
10.50	5424.	146.	1959.	361.	0.027	0.026
10.54	6563.	186.	2371.	361.	0.028	0.028
10.75	6560.	214.	2369.	361.	0.033	0.032
11.13	7405.	301.	3475.	469.	0.041	0.039
11.67	7396.	350.	4077.	551.	0.047	0.045
12.42	7400.	405.	4762.	644.	0.055	0.052
12.46	6050.	315.	2664.	440.	0.052	0.049
12.88	6047.	289.	2184.	361.	0.048	0.046
13.25	6050.	279.	2185.	361.	0.046	0.044
13.29	5414.	244.	1954.	361.	0.045	0.043
13.40	5411.	236.	1954.	361.	0.044	0.042

*** CASE P ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1890.	360.	0.000	0.000
0.83	5490.	0.	1983.	361.	0.000	0.000
1.75	5490.	0.	1983.	361.	0.000	0.000
2.92	5698.	8.	2057.	361.	0.001	0.001
4.17	5696.	29.	2059.	361.	0.005	0.005
6.25	5697.	62.	2058.	361.	0.011	0.011
6.88	5698.	72.	2059.	361.	0.013	0.012
7.27	5586.	75.	2018.	361.	0.013	0.013
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	57.	2102.	362.	0.010	0.010
8.33	5799.	76.	2095.	361.	0.013	0.013
9.50	5795.	102.	2093.	361.	0.018	0.017
10.50	5422.	101.	1958.	361.	0.019	0.018
10.54	6564.	127.	2740.	417.	0.019	0.019
10.75	6561.	143.	3251.	495.	0.022	0.021
11.13	7410.	194.	5455.	736.	0.026	0.026
11.67	7404.	241.	8498.	1148.	0.033	0.032
12.42	7407.	287.	11093.	1498.	0.039	0.037
12.46	6045.	227.	6143.	1016.	0.038	0.036
12.88	6046.	210.	4100.	678.	0.035	0.034
13.25	6046.	207.	4013.	664.	0.034	0.033

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1880.	360.	0.000	0.000
0.83	5490.	0.	1982.	361.	0.000	0.000
1.75	5490.	0.	1982.	361.	0.000	0.000
2.92	5700.	4.	2057.	361.	0.001	0.001
4.17	5698.	16.	2059.	361.	0.003	0.003
6.25	5699.	42.	2059.	361.	0.007	0.007
6.88	5698.	51.	2058.	361.	0.009	0.009
7.27	5588.	54.	2019.	361.	0.010	0.010
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	45.	2099.	362.	0.008	0.008
8.33	5799.	57.	2094.	361.	0.010	0.010
9.50	5798.	77.	2094.	361.	0.013	0.013
10.50	5421.	79.	1958.	361.	0.015	0.014
10.54	6564.	97.	2981.	454.	0.015	0.015
10.75	6561.	107.	3284.	501.	0.016	0.016
11.13	7414.	150.	6548.	883.	0.020	0.020
11.67	7410.	187.	9199.	1241.	0.025	0.025
12.42	7401.	230.	11358.	1535.	0.031	0.030
12.46	6045.	181.	6768.	1120.	0.030	0.029
12.88	6045.	173.	4385.	725.	0.029	0.028
13.25	6045.	173.	4161.	688.	0.029	0.028
13.29	5411.	152.	3080.	569.	0.028	0.027
13.40	5411.	149.	2736.	506.	0.028	0.027

*** CASE R ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	830.	361.	0.000	0.000
0.38	5250.	0.	1885.	359.	0.000	0.000
0.83	5490.	0.	1980.	361.	0.000	0.000
1.75	5490.	0.	1980.	361.	0.000	0.000
2.92	5700.	3.	2059.	361.	0.001	0.001
4.17	5699.	12.	2058.	361.	0.002	0.002
6.25	5696.	38.	2159.	379.	0.007	0.007
6.88	5695.	46.	2324.	408.	0.008	0.008
7.27	5589.	49.	2295.	411.	0.009	0.009
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	44.	2101.	362.	0.008	0.008
8.33	5799.	54.	2370.	409.	0.009	0.009
9.50	5794.	77.	2869.	495.	0.013	0.013
10.50	5424.	82.	2656.	490.	0.015	0.015
10.54	6563.	101.	3531.	538.	0.015	0.015
10.75	6560.	114.	6458.	984.	0.017	0.017
11.13	7407.	158.	11211.	1514.	0.021	0.021
11.67	7412.	186.	12754.	1721.	0.025	0.024
12.42	7400.	222.	14436.	1951.	0.030	0.029
12.46	6045.	174.	9631.	1593.	0.029	0.028
12.88	6044.	175.	8825.	1460.	0.029	0.028
13.25	6044.	179.	9017.	1492.	0.030	0.029
13.29	5410.	159.	7038.	1301.	0.029	0.029

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	830.	361.	0.000	0.000
0.38	5250.	0.	1883.	359.	0.000	0.000
0.83	5490.	0.	1979.	360.	0.000	0.000
1.75	5490.	0.	1978.	360.	0.000	0.000
2.92	5699.	4.	2058.	361.	0.001	0.001
4.17	5698.	15.	2058.	361.	0.003	0.003
6.25	5697.	44.	2057.	361.	0.008	0.008
6.88	5697.	55.	2057.	361.	0.010	0.010
7.27	5587.	60.	2017.	361.	0.011	0.011
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	54.	2093.	361.	0.009	0.009
8.33	5798.	69.	2150.	371.	0.012	0.012
9.50	5791.	98.	2332.	403.	0.017	0.017
10.50	5417.	105.	2115.	390.	0.019	0.019
10.54	6562.	127.	2877.	438.	0.019	0.019
10.75	6558.	141.	4099.	625.	0.021	0.021
11.13	7410.	191.	7154.	966.	0.026	0.025
11.67	7405.	224.	8150.	1101.	0.030	0.029
12.42	7398.	261.	9380.	1268.	0.035	0.034
12.46	6045.	207.	6305.	1043.	0.034	0.033
12.88	6044.	207.	5711.	945.	0.034	0.033
13.25	6044.	212.	5866.	971.	0.035	0.034
13.29	5410.	188.	4579.	846.	0.035	0.034
13.40	5410.	185.	4052.	749.	0.034	0.033

*** CASE T ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	831.	361.	0.000	0.000
0.38	5250.	0.	1889.	360.	0.000	0.000
0.83	5490.	0.	1982.	361.	0.000	0.000
1.75	5490.	0.	1982.	361.	0.000	0.000
2.92	5700.	5.	2057.	361.	0.001	0.001
4.17	5696.	22.	2058.	361.	0.004	0.004
6.25	5699.	52.	2059.	361.	0.009	0.009
6.88	5699.	61.	2059.	361.	0.011	0.011
7.27	5586.	65.	2018.	361.	0.012	0.012
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	52.	2099.	362.	0.009	0.009
8.33	5797.	68.	2094.	361.	0.012	0.012
9.50	5797.	91.	2093.	361.	0.016	0.015
10.50	5422.	91.	1958.	361.	0.017	0.017
10.54	6564.	113.	2622.	399.	0.017	0.017
10.75	6561.	126.	2946.	449.	0.019	0.019
11.13	7411.	177.	5348.	722.	0.024	0.023
11.67	7403.	222.	7726.	1044.	0.030	0.029
12.42	7408.	265.	9867.	1332.	0.036	0.035
12.46	6045.	211.	5629.	931.	0.035	0.034
12.88	6046.	198.	3605.	596.	0.033	0.032
13.25	6045.	197.	3549.	587.	0.033	0.032
13.29	5411.	173.	2556.	472.	0.032	0.031

*** CASE U ***

TIME	OIL PROD RATE	WATER PROD RATE	GAS PROD RATE	GAS-OIL RATIO	WATER-OIL RATIO	WATER CUT
DAYS	STB/DAY	STB/DAY	MCF/DAY	SCF/STB	FRAC	FRAC
0.04	730.	0.	264.	362.	0.000	0.000
0.13	730.	0.	264.	362.	0.000	0.000
0.25	2300.	0.	830.	361.	0.000	0.000
0.38	5250.	0.	1887.	359.	0.000	0.000
0.83	5490.	0.	1981.	361.	0.000	0.000
1.75	5490.	0.	1981.	361.	0.000	0.000
2.92	5697.	8.	2061.	362.	0.001	0.001
4.17	5694.	28.	2057.	361.	0.005	0.005
6.25	5699.	62.	2058.	361.	0.011	0.011
6.88	5699.	72.	2058.	361.	0.013	0.012
7.27	5586.	77.	2017.	361.	0.014	0.014
7.29	0.	0.	0.	0.	0.0	0.0
7.65	0.	0.	0.	0.	0.0	0.0
7.66	5800.	63.	2097.	362.	0.011	0.011
8.33	5798.	82.	2094.	361.	0.014	0.014
9.50	5796.	112.	2093.	361.	0.019	0.019
10.50	5420.	117.	1957.	361.	0.022	0.021
10.54	6564.	145.	2958.	451.	0.022	0.022
10.75	6559.	159.	3188.	486.	0.024	0.024
11.13	7413.	221.	6314.	852.	0.030	0.029
11.67	7406.	271.	8583.	1159.	0.037	0.035
12.42	7405.	319.	10672.	1441.	0.043	0.041
12.46	6045.	254.	6593.	1091.	0.042	0.040
12.88	6047.	240.	4625.	765.	0.040	0.038
13.25	6044.	241.	4520.	748.	0.040	0.038
13.29	5411.	212.	3269.	604.	0.039	0.038
13.40	5411.	206.	2725.	504.	0.038	0.037