PRODUCTION TEST REPORT

WELL 31/3-2

Norsk Hydro

PRODUCTION TEST REPORT

WELL 31/3-2

HØVIK, NOVEMBER 1984

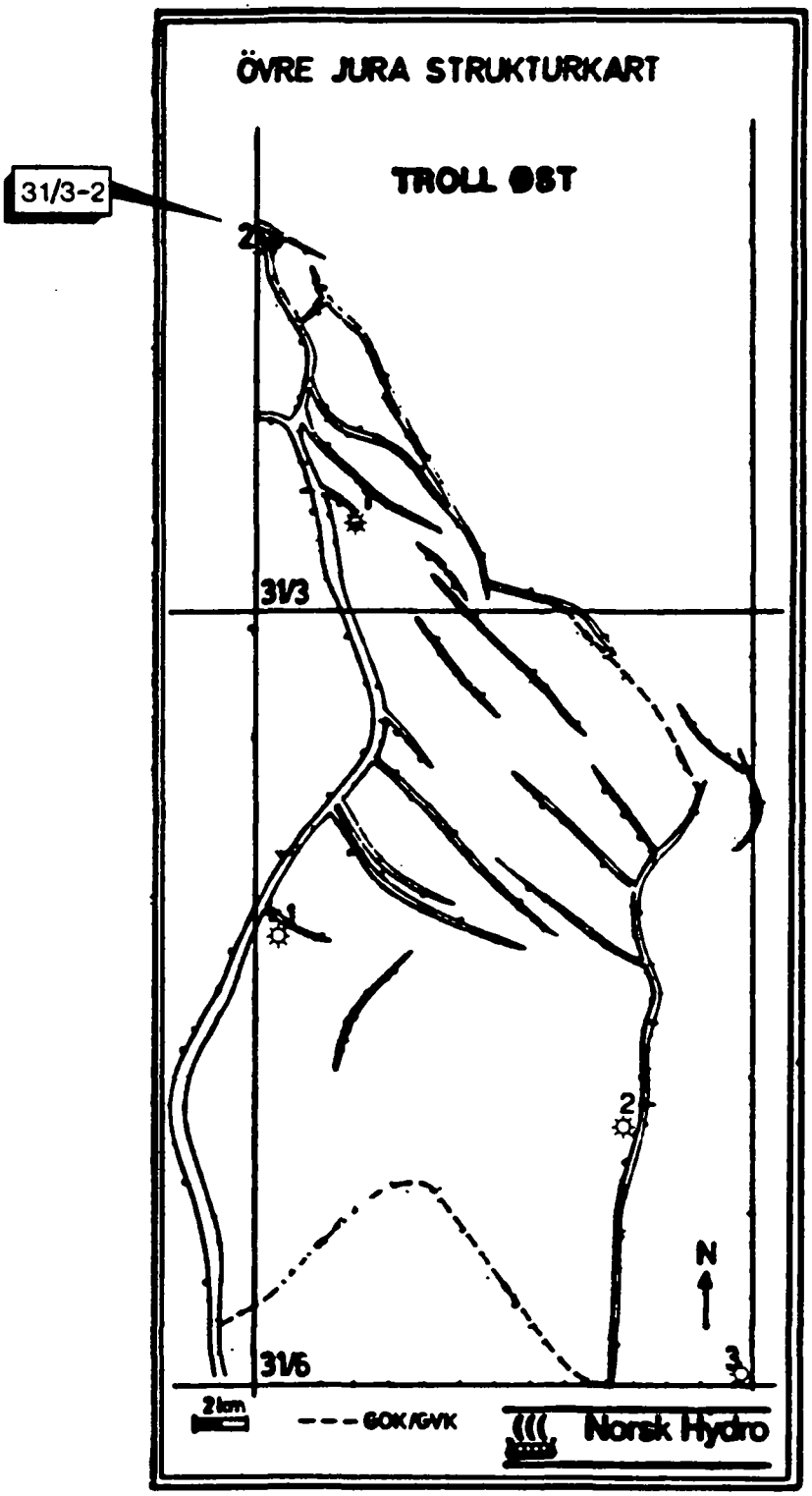
INDEX

Main report

Appendix

GENERAL WELL DATA

Licence/well:	085/31/3-2, Norwegian North Sea
Owners:	Norsk Hydro/Statoil/Saga
Operator:	Norsk Hydro/Statoil/Saga
Field:	Troll East
Well drilled by:	Norsk Hydro
Classification:	Exploration
Rig:	Treasure Seeker
Elevation depth:	25 m RKB - MSL
Water depth:	340 m MSL
Date spudded:	05.03.84
Date completed:	30.04.84
Status:	Plugged and abandonded
Total depth:	2088.0 m RKB



COORDINATES: $60^{0}52'$ 11,41" N
$03^{0}40'$ 41,79" E

WELL LOCATION

TEST OBJECTIVES

- Evaluate possible level of gas - oil contact
- Evaluate the consequences of possible water - production and/or coning.
- Evaluate reservoir properties and possible boundary effects
- Fluid sampling
- Gain experience with gravel pack completions

PRODUCTION TEST RESULTS WELL 31/3-2

TEST NO:	Post gravel 1
TEST INTERVAL (meters RKB):	1577 - 1567
WELL FLUID:	oil
GRAVEL PACK:	yes
MAIN FLOW (hours):	13.2
CHOKE SIZE (inch):	160/64
OIL RATE (bopd):	8000 (max 10000)
GAS RATE (mscfd):	20000
GAS OIL RATIO:	2500
SEPARATOR FLUID SAMPLES:	7 oil/ 4 gas
OIL GRAVITY (API):	27.5
GAS GRAVITY (SG 60):	0.62
RESERVOIR PRESSURE (psia):	2293.8
BOTTOM HOLE TEMPERATURE (°C):	69.5
SENSOR DEPTH (m RKB):	1564.16
WELL HEAD PRESSURE (psig):	880
B S & W (%):	0
COMMENTS:	Test data were non-interpretable

COMMENTS TO MAIN RESULTS AND ANALYSIS

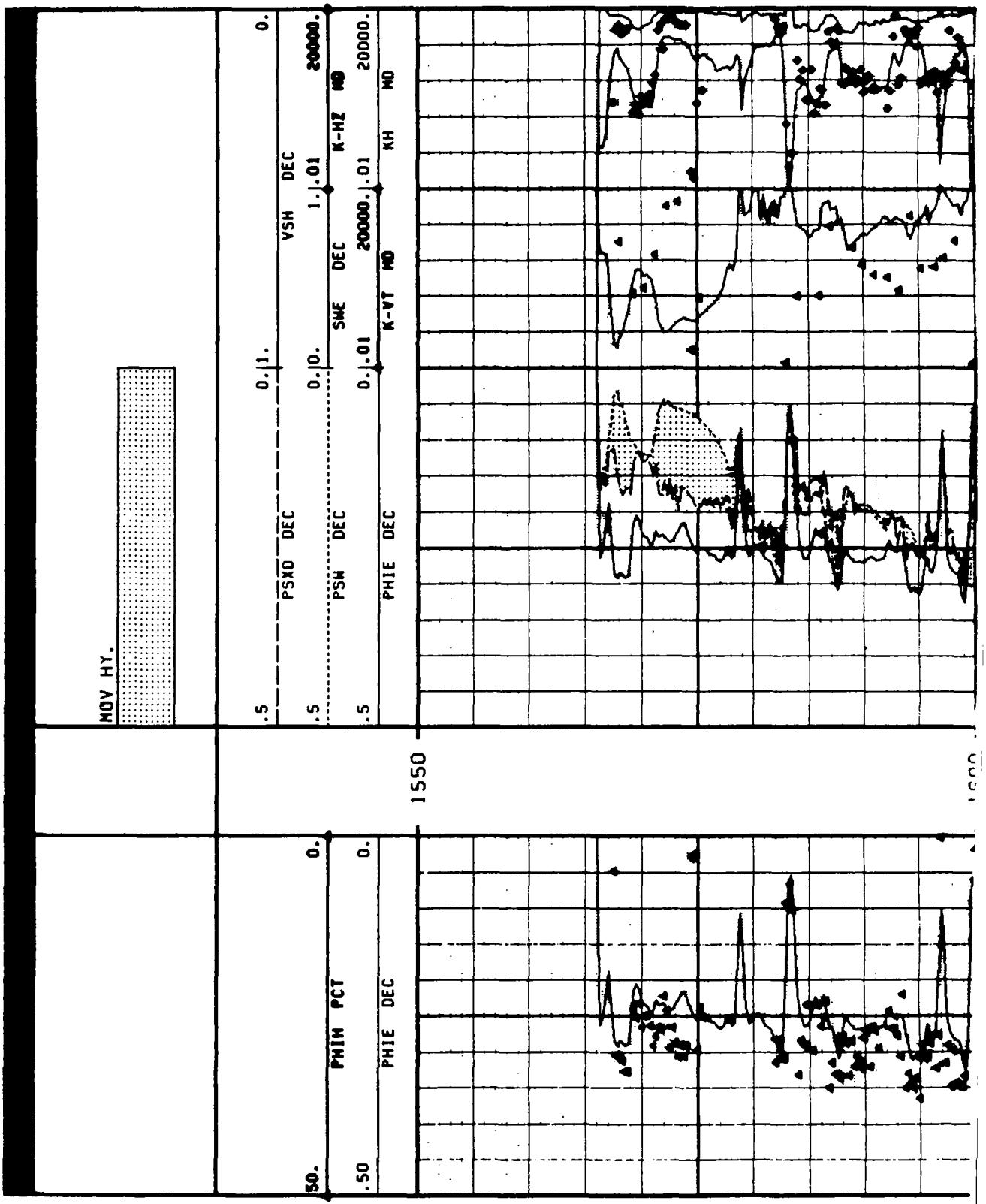
Based on informations from logs and RFT the formation was tested as an oil producer. The objective was to be able to increase GOR and be able to fix a gas-oil contact. However the gas-oil ratios from the pre gravel pack test gave very high GOR's. A well simulator was run to match the observed GOR's, but no definite match was obtai

Producing the well after the gravel pack was set looked better. It w not till after the high rates had started that the increase in gasproduction was significant. The well was choked back to allow the GOR to stabilize back to normal. This was not fully achieved before the final shut-in. The main reason for this was that the separator mechanical control system failed and uncertainties excists on the last flowmeasurements.

The main problem in the tested formation was the uncertainty of the contact and a possible dip. These factors resulted in a very sudden unexpected gas breakthrough. As a result of this no pressure transient analysis could be performed in the tested interval.

A P P E N D I X

WELL 31/3-2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REPORT REFERENCES

Report	Report no.
Flopetrol "BHP - report"	ELS 84.29 A
Flopetrol "BHP - report"	ELS 84.29 B
Flopetrol "BHP - report"	ELS 84.29 C
Flopetrol "BHP - report"	ELS 84.29 D
Flopetrol "BHP - report"	ELS 84.29 E
Sperry Sun "WHP - report"	
Baker Production "Well test report"	
Oil Plus " Well completion fluid monitoring"	CN 6659 B
Stavanger Oilfield Services " RFT fluid sampling report"	
Geco "Grain size distribution analysis"	

P R E G R A V E L P A C K T E S T N O. 1

Test operations and equipment

PRE GRAVEL PACK TEST

Test operations and equipment

Operations summary:

The well was drilled to T.D., logged, casing set and cemented. Three runs cement bond-logs were made.
Two runs were with the ordinary CBL-tool, one run under pressure and one without. The third run was with the new CET-tool. All three showed reason good cement across the perforated interval.

After the initial test preparations were made, bit and scraper were run a the top of the cement (T.D.) were dressed off. The well was then displace to seawater through same.

The 5" TAC-1 and the 3.5" PH-6 tubing strings were made up in stands, anc sub sea test tree was made up. The 3.5" PH-6 tubing was then run back wit perforated joint (4 holes) as a tailpipe for the casing cleaning. For e stand that was made up, the string was reciprocated two times while circu seawater. While on bottom, seawater was circulated and monitored until th cleanliness of the returns was at an acceptable level. During this circul two 2000 galls. acid pills were pumped to help cleaning out the casing. According to the monitoring of the returns, the effect of these pills car be discussed.

The well was then displaced to 1.12 R.D. calcium-chloride brine, and the was circulated, filtered and monitored until an acceptable level of clear was obtained. The last measurements showed:

Turbidity into the well : 3.4 NTU
Turbidity out from the well : 4.3 NTU

Particle distribution of brine out of the well:

2 - 3 u m	73.22 %
3 - 5 u m	21.78 %
5 - 10 u m	4.54 %
10 - 15 u m	0.41 %
greater than 15 u m	0.05 %

A high density pill (1.30 R.D.) was spotted from below the planned perforation interval to T.D., and the casing cleaning string was pulled

After making up the surface test tree, Schlumberger was rigged up to run sump packer, which was set at 1528.8 M RKB. To be able to detect any san from the pre gravelpack test, a GR/CCL - log was run to define the exac

The perforation string was then run in hole and positioned by means of a radioactive marker in both the test string and casing. The packer had to be reset once, and final setting gave the perforation depth to be approx 0.3 meters too deep.

After having Schlumberger rigged down, the tubing was pressured up to 5000 psi from the cement unit to trigger the perforating guns. This pressure was bled back to the cement unit to create the desired underbalance. The guns fired six minutes after being activated, and the well was immediately back-flowed with approx. 25 Bbls.

After having the well shut in at the choke manifold, two downhole recorders were run in on wireline, and the well was opened up for flow again. The flow was finally stabilized on a 24/64" fixed choke. Average stabilized flow rate was approx. 1030 Bbl/D / 164 M3/D. A short build up was held after the flow period. The downhole recorders were then pulled by wireline to confirm the data before the kill operation was initiated.

To kill the well, the tubing contents were bullheaded back into the formation, followed by a calcium carbonate pill, all chased by clean brine. No fluid losses were registered during or after the killing operation.

When the perforation string was out of the hole, a GR/CNL/CCL - log was run by Schlumberger to serve as a reference log for the gravelpack. Toghether with the logging tools, a sandbailer was run. The T.D. was tagged and no measurable sandfill was registered. However, the sandbailer contained some very fine sand among perforation debris etc.

31/3-2 PRODUCTION TEST

SEQUENCE OF EVENTS

Date	Time	Event
080484		Run bit and scraper. Displace well to seawater.
090484		Make up 5" and 3.5" tubing strings.
100484		Make up SSTT, RIH with CSG. Cleaning string. Wash 2 times for each stand.
110484		Circulate seawater and acid cleaning pills.
120484		Continue circulating seawater.
130484	01:00	Displace well to CaCO3 brine (1.12 RD). Continue to circulate and filter brine.
	12:00	Finish circulating brine. Spot 1.30 R.D. high dens. pill
	12:30	Start POOH. with washstring
	15:15	OOH. with washstring. Make up S.T.T. Rig up Schlumberger
	18:30	RIH with sump packer
	20:00	Sump packer set at 1582.8 M RKB
	22:00	Finished GR/CCL - log to determine exact T.D.
	23:00	Start to RIH with perforating string (3.5" PH - 6)
140484		Continue to RIH with perf. string. Press. test equipment..
150484	07:00	Set packer. Rig up Schlumberger for correlation log
	08:20	Packer found to be off. Reset same with Schlumberger still in the hole.
	09:20	Packer depth accepted. 0.3 m too deep.
	10:12	Pressure up tubing to activate perforating guns
	10:15	Required press. reached. Start to bleed off excess press. to create correct underbalance.
	10:21	Guns fire. Backsurge well through choke manifold
	10:37	Shutin choke manifold after 24.5 Bbls flowed. Rig up slick-line to run downhole gauges.
	15:45	Rig down wireline
	16:07	Open well on 8/64" adj. choke
	16:36	Change choke to 12/64" adj.
	17:12	Change choke to 16/64" adj.
	17:27	Change choke to 24/64" adj.
	17:38	Change choke to 16/64" adj.
	17:56	Change choke to 16/64" fix.
	19:38	Change choke to 24/64" adj.
	19:46	Change choke to 24/64" fix.
ca	20:10	Flow diverted through separator
	23:04	Shut in well at PCT-valve and choke manifold
160484	01:30	Rig up wireline to pull gauges
ca	04:20	Gauges OOH and OK. Start killing procedure
	21:10	OOH with perf.string. Rig up Schlumberger for GR/CNL/CCL - log plus sandbailer

FINAL RUNNING LIST

PERFORATING STRING, WELL 31/3-2

No.	Item	OD (inch)	ID (inch)	Length (m)	Top of item (m)
1	STT with swivel		2.500		
2	X-over		2.500		
3	5" TAC-1 tubing	5.00	4.276	23.08	-3.31
4	X-over 4.5" TAC-1 B x 4.5" ACME P		3.000	0.33	19.77
5	Lubricator valve		3.000	1.75	20.10
6	X-over 4.5" ACME B x TAC-1 P		3.000	0.39	21.85
7	5" TAC-1 tubing	5.00	4.276	334.88	22.24
8	X-over TAC-1 B x 3.75" ACME P	7.00	2.500	0.35	357.12
9	SSTT + slick jt. + donut	17.75	2.500	6.84	357.47
10	X-over 3.75" ACME P x PH-6 P	5.50	2.500	0.38	364.31
11	3.5" PH-6 tubing	3.50	2.750	989.71	364.69
12	X-over PH-6 B x 3.5" IF P	5.00	2.250	0.30	1354.40
13	3 slip joints	5.00	2.250	22.83	1354.70
14	X-over 3.5" IF B x 4.0" IF P	6.50	2.250	0.29	1377.53
15	6.5" drill collars 4 stands	6.50	2.813	108.99	1377.82
16	X-over 4.0" IF B x 3.5" IF P	6.50	2.250	0.36	1486.81
17	Sub with radioactive marker	5.00	2.250	0.46	1487.17
18	M.I.R.V.	5.00	2.250	2.92	1487.63
19	X-over 3.5" IF B x 4.0" IF P	6.50	2.250	0.32	1490.55
20	6.5" drill collars 1 stand	6.50	2.813	27.08	1490.87
21	X-over 4.0" IF B x 3.5" IF P	6.50	2.250	0.32	1517.95
22	S.S.A.R.V.	5.00	2.250	2.58	1518.27
23	P.C.T.	5.00	2.250	6.99	1520.85
24	H.R.T.	5.00	2.250	1.61	1527.84
25	Jar	5.00	2.250	1.98	1529.45
26	Safety joint	5.00	2.750	0.51	1531.43
27	X-over 3.5" IF B x 3.5" EU P	5.00	2.250	0.50	1531.94
28	Positrieve Packer	8.31	3.000	2.58	1532.44
29	X-over 3.5" EU B x 3.5" IF P	5.00	2.250	0.40	1535.02
30	Perforated anchor	4.75	2.250	3.40	1535.42
31	X-over 3.5" IF B x 2 3/8" EU P	4.50	1.920	0.35	1538.82
32	F-nipple	3.05	1.810	0.28	1539.17
33	2 3/8" EU tubing	2.375	1.920	10.15	1539.45
34	X-over 2 7/8" EU P x 2 3/8" EU B	3.465	2.000	0.14	1549.60
35	Ported equalizing sub, 2 7/8" P x B	3.75	2.400	0.46	1549.74
36	X-over 2 7/8" EU B x 2 3/8" EU P	3.48	1.920	0.11	1550.20
37	2 3/8" EUE pup joint	2.375	1.920	3.03	1550.31
38	X-over 2 3/8" EU B x 2 7/8" EU P	3.12	1.920	0.11	1553.34
39	Mechanical tubing release	3.37	1.880	0.40	1553.45
40	X-over 2 3/8" EU B x 3.5" IF P	4.75	2.000	0.24	1553.85
41	X-over 3.5" IF B x 3.5" EUE P	4.75	2.750	0.42	1554.09
42	Drag block	5.87	2.250	1.60	1554.51
43	X-over 3.5" EUE B x 2 3/8" EU P	5.00	2.750	0.35	1556.11
44	2 3/8" EU tubing	2.375	1.920	9.13	1556.46

No.	Item	OD (inch)	ID (inch)	Length (m)	Top of item (m)
45	Extended firing head	3.37		1.70	1565.59
46	Perforating guns	6.00		10.00	1567.29
47	Perforating gun blank section	6.00		0.34	1577.29
48	Pressure activated firing head	3.36		0.71	1577.63
49	X-over 3 3/8" P x 2 3/8" EU B	3.36	1.680	0.05	1578.34
50	Ported sub	3.00	2.280	0.21	1578.39
51	X-over 2 3/8" EU B x 2 7/8" P	3.00	1.920	0.10	1578.60
52	X-over 2 7/8" B x 4.0" EUE P	3.00	2.400	0.32	1578.70
53	X-over 4.0" EUE B x 5.5" LTC P	4.20		0.22	1579.02
54	Locator assembly	6.40		1.34	1579.24
55	Indicating point with 0.5" muleshoe	6.00		1.38	1580.58
56	Tail				1581.96

POST GRAVEL PACK TEST

Perforations: 1577 - 1567 MRKB

POST GRAVEL PACK TEST

Test operations and equipment

POST GRAVEL PACK TEST

TEST OPERATIONS AND EQUIPMENT

Operations summary:

The gravelpack job was performed according to the test program. Based on three sieve-analysis from cores taken in the perforation interval, 12/20 gravel size was found to be most appropriate, regarding gravel sizes available and the qualities of same. Due to short notice, both 12 gauge and 16 gauge screens had to be used in the gravelpack assembly. No special problems were encountered during the job.

After the gravelpack job, a GR/CNL/CCL - log was run to determine the height of gravel in the pack. The log showed two levels of gravel. The upper probably less compacted than the lower level, this perhaps because the gravel was still segregating some, about the time of logging. Final gravel height should therefore be somewhere in between 1557 and 1546 M RKB.

After completing the production string in the hole, the well was opened up for flow in order to get clean formation fluids into the production string and gravelpack assembly, prior to commence the acid treatment. This treatment consisted of 2500 galls. of 15 % hydrochloric acid with a 10 Bbl viscous diverter pill ahead, all of it chased by diesel. The acid was left to soak the formation and the pack for 60 minutes. After the soaking, the well was flowed to remove the acid and get clean formation fluids back into the production string again, before running downhole recorders on wireline. A total of four recorders were run.

The test program was now split into two parts; a constant flow rate/build-up part and a multirate flow part. As the controlsystem of the separator suffered from severe mechanical problems, the flow periods was at times extended quite much. Defoaming agent or de-emulsifier was injected into the wellstream to get better control of the flowrates. Unfortunately, because of the extended flow periods, the downhole recorders with data reduction algoritms, stopped recording before the last flow period was over. No downhole data are therefore available from the last eleven hours of flow. The downhole recorders were pulled by wireline to confirm the data before killing the well.

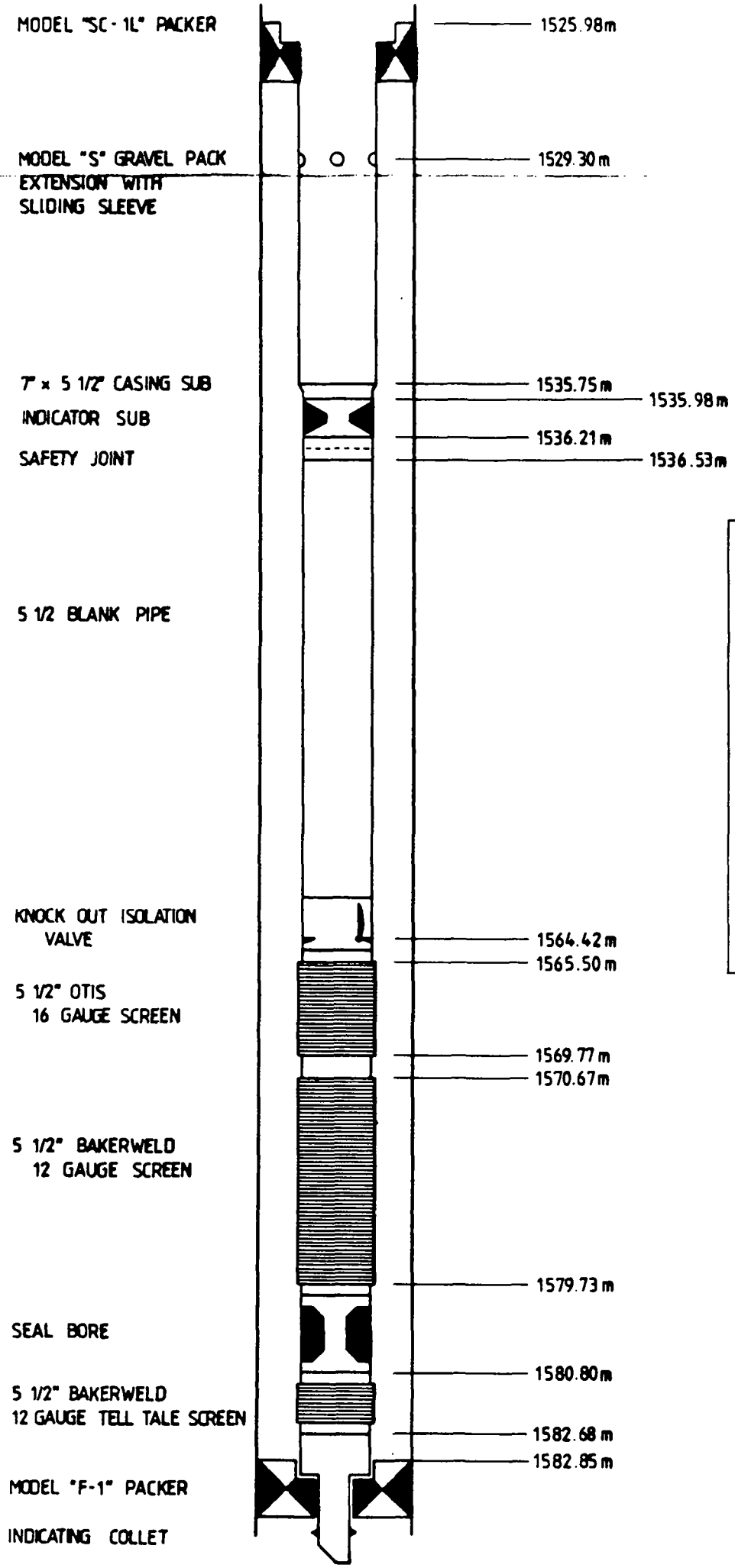
The well was killed with ordinary drilling mud. When the production string was pulled, a GR/CNL/CCL - log was run to detect any changes in gravel height in the pack. Unfortunately, now the CNL - log did not give any information at all about the gravel in the pack.

31/3-2 PRODUCTION TEST

SEQUENCE OF EVENTS

Date	Time	Event
170484	01:15	Rig down Schlumberger
ca	02:15	Start to RIH with gravelpack assembly
	15:57	Set hydraulic gravelpack packer
	17:00	Gravelpack positions established. Rig up surface equipment
	19:15	Circulated well clean. Prepare pre gravelpack acid job
	19:50	Acid job done. Wait for 30 minutes. Commence gravelpacking
	24:00	Start to POOH with gravelpack string
180484	05:00	OOH with gravelpack string. Rig up Schlumberger for GR/CNL/CCL - log
	07:15	Rig down Schlumberger
	07:35	Start to RIH with production string
190484	12:35	String complete. Rig up surface equipment. Pressure test. Land string
	14:55	Continue to rig up surface equipment. Pressure test.
	18:45	Pressure up tubing to shear the seat in the AVA - tool
	19:05	Close middle pipe ram. Pressure test annulus. Found M.I.R.V. open. Rig up wireline to set test plug to close M.I.R.V.
200484	00:50	M.I.R.V. closed. Function the "Modified PCT - valve" back to normal service.
	02:35	Testplug OOH. Rig down wireline.
	02:40	Close PCT - valve to verify function.
	02:57	Open choke manifold to 24/64" adj. choke
	04:36	change choke to 32/64" adj.
	04:38	Change choke to 48/64" adj.
	04:41	Change choke to 64/64" adj.
	04:45	Shut in choke manifold. Rig up Dowell for acid job
	05:15	Start pumping
	07:19	Finish pumping. Let acid soak for one hour.
	08:48	Open well on 28/64" adj. choke
	09:43	Change choke to 32/64" adj.
	10:33	Shut in choke manifold to run downhole gauges
	15:20	Rig down wireline equipment
	15:36	Open up well on 24/64" fixed choke
	16:05	Divert flow through heater
	16:15	Divert flow through separator
210484	02:30	Start separator sampling
	06:40	Finish separator sampling. Bypass separator.
	06:45	Shut in PCT - valve and choke manifold
	10:42	Open PCT - valve
	10:43	Open choke manifold on 28/64" adj. choke
	10:53	Divert flow through separator and heater
	11:20	Change choke to 28/64" fix.
	17:10	Change choke to 36/64" adj.
	17:21	Change choke to 36/64" fix.
	21:06	Change choke to 44/64" adj.
	21:15	Change choke to 44/64" fix.

Date	Time	Event
220484	01:01	Bypass heater
	01:05	Change choke to 56/64" adj.
	01:13	Change choke to 56/64" fix.
	05:18	Change choke to 64/64" adj.
	05:26	Change choke to 64/64" fix.
	08:33	Bypass choke manifold. Eqv. to 2 9/16" choke
	21:45	Close bypass on choke manifold. Flow on 56/64" fix.
ca	23:00	Accidental closure of failsafe flow valve on STT.
	23:25	Well reopened on 56/64" adj. choke
	23:30	Change choke to 56/64" fix.
230484	03:31	Change choke to 24/64" adj. Impossible to get out last used fixed choke bean. Had to continue flow on adj.
	04:15	Divert flow through heater
	08:00	Bypass separator and heater
	08:06	Shut in PCT - valve and choke manifold
	11:55	Close lubricator valve, rig up wireline to pull gauges
	12:20	Open PCT - valve
	15:00	Gauges checked and found OK. Start to rig down.
	16:05	Start killing operations



SCHEMATIC
GRAVEL PACK ASSEMBLY
WELL 31/3 - 2

FINAL RUNNING LIST

PRODUCTION STRING, WELL 31/3-2

No	Item	OD (inch)	ID (inch)	Length (m)	Top of item (m)
1	STT with swivel		2.500		
2	X-over		2.500		
3	5" TAC-1 tubing	5.000	4.276	23.08	-4.81
4	X-over 5.0" TAC-1 B x 4.5" SA P	6.310	3.000	0.33	18.27
5	Lubricator valve	9.000	3.000	1.75	18.60
6	X-over 4.5" SA P x 5.0" TAC-1 P	6.310	3.000	0.39	20.35
7	5.0" TAC-1 tubing	5.000	4.276	334.88	20.74
8	X-over 5.0" TAC-1 B x 3.75" ACME P	7.000	2.500	0.35	355.62
9	S.S.T.T. + slick joint + donut	17.750	2.500	6.84	355.97
10	X-over 3.75" ACME P x 5.0" TAC-1 P	5.500	2.500	0.38	362.81
11	5.0" TAC-1 tubing	5.000	4.276	1116.24	363.19
12	X-over 5.0" TAC-1 B x 3.5" IF P	5.000	2.250	0.51	1479.43
13	M.I.R.V.	5.000	2.250	2.92	1479.94
14	X-over 3.5" IF B x 4.0" IF P	6.500	2.250	0.32	1482.86
15	1 stand 6.5" x 2 13/16" drill collars	6.500	2.813	27.08	1483.18
16	X-over 4.0" IF B x 3.5" IF P	6.500	2.250	0.32	1510.26
17	S.S.A.R.V.	5.000	2.250	2.58	1510.58
18	Modified P.C.T.	5.500	2.250	7.00	1513.16
19	Modified H.R.T.	5.000	2.250	1.61	1520.16
20	Hydraulic jar	5.000	2.250	1.98	1521.77
21	Safety joint	5.000	2.750	0.51	1523.75
22	Seal assembly locator	6.250	2.687	0.29	1524.26
23	Upper half of seal assembly	6.000	4.875	3.40	1524.55
24	Lower half of seal assembly	6.000	4.875	3.40	1527.95
25	X-over 2 7/8" CS B x 2 7/8" EUE P	2.875	2.441	0.26	1531.35
26	Otis R-N nipple		2.125	0.42	1531.61
27	2 7/8" EUE pup joint	2.875	2.441	1.21	1532.03
28	Special x-over with 5.5" LTC P	5.700	2.441	0.37	1533.24
29	2 7/8" EUE pup joint	2.875	2.441	3.05	1533.61
30	2 7/8" EUE joint	2.875	2.441	9.35	1536.66
31	A.V.A. pump open S.S.D.	4.320	2.441	0.62	1546.01
32	X-over 2 7/8" EUE B x 2 3/8" EUE P	2.875		0.15	1546.63
33	2 3/8" EUE pup joint	2.375	1.995	2.45	1546.78
34	Baker F-nipple	3.050	1.875	0.28	1549.23
35	2 3/8" EUE pup joint	2.375	1.995	0.66	1549.51
36	2 3/8" EUE joint	2.375	1.995	9.49	1550.17
37	Baker F-nipple	3.050	1.875	0.28	1559.66
38	2 3/8" EUE joint	2.375	1.995	9.59	1559.94
39	2 3/8" EUE pup jt. w/half mule shoe	2.375		1.26	1569.53
40	Tail	3.500			1570.79

POST GRAVEL PACK TEST

Test data aquisition

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984
PLOT OF CHOKE SIZES USED

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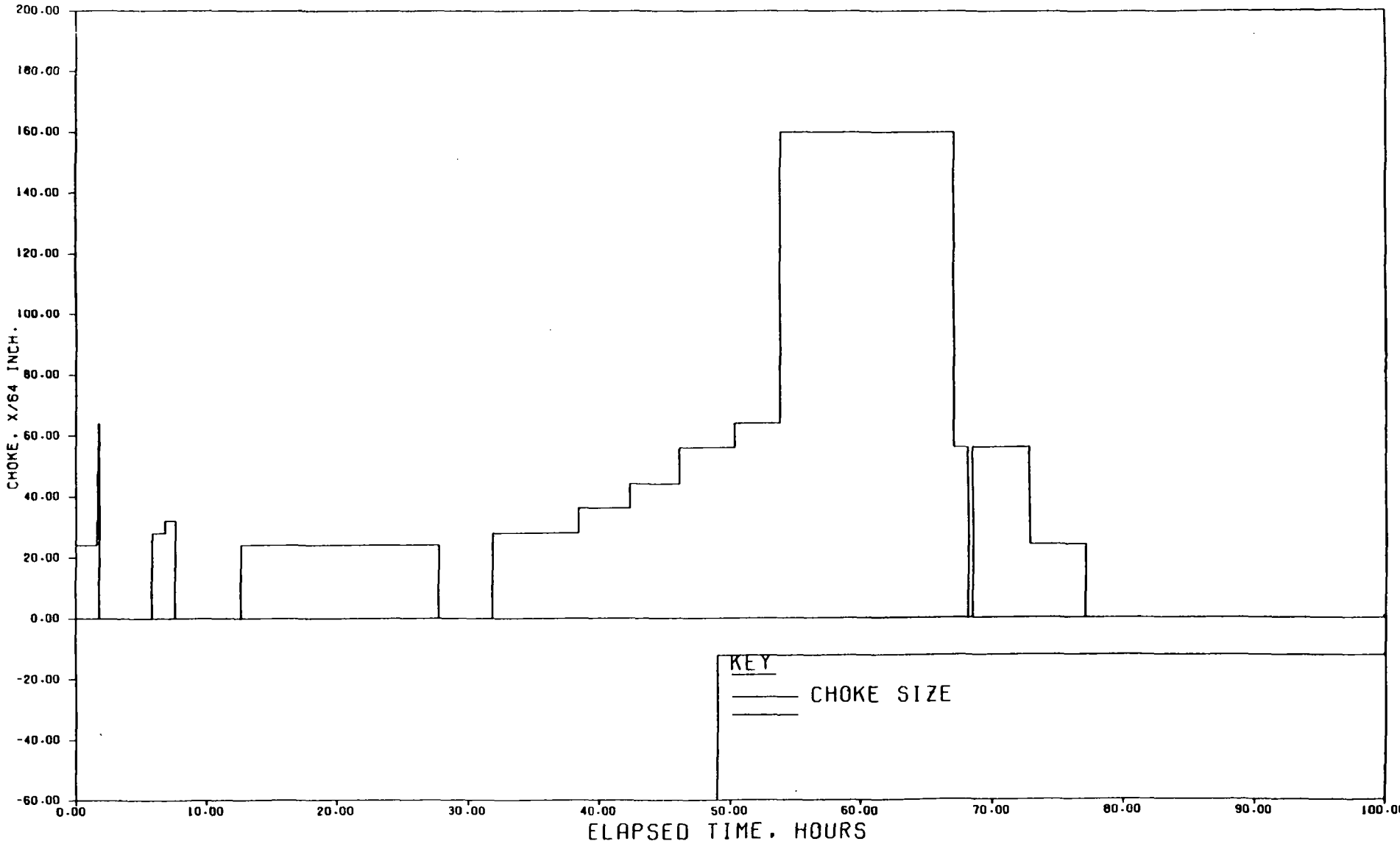
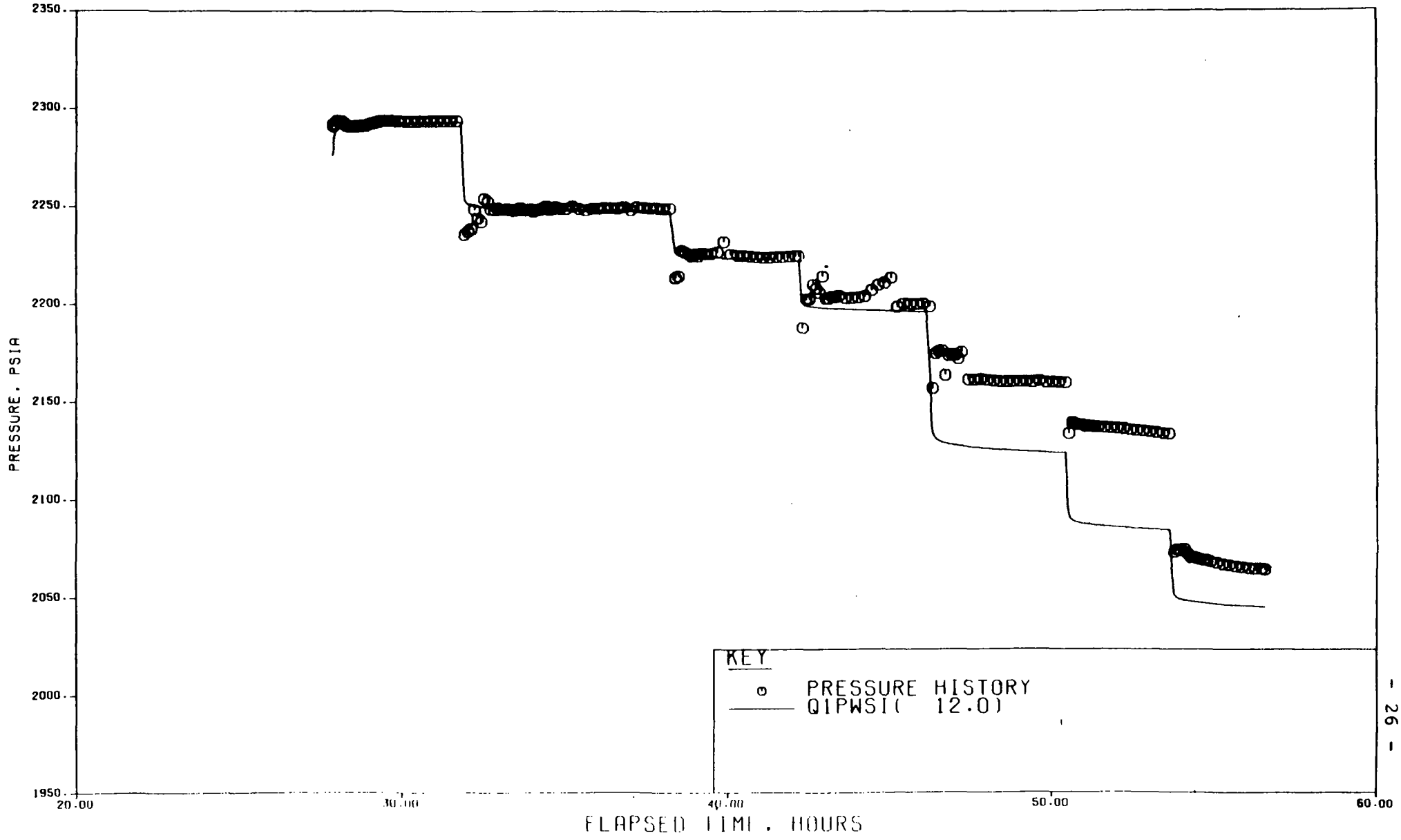
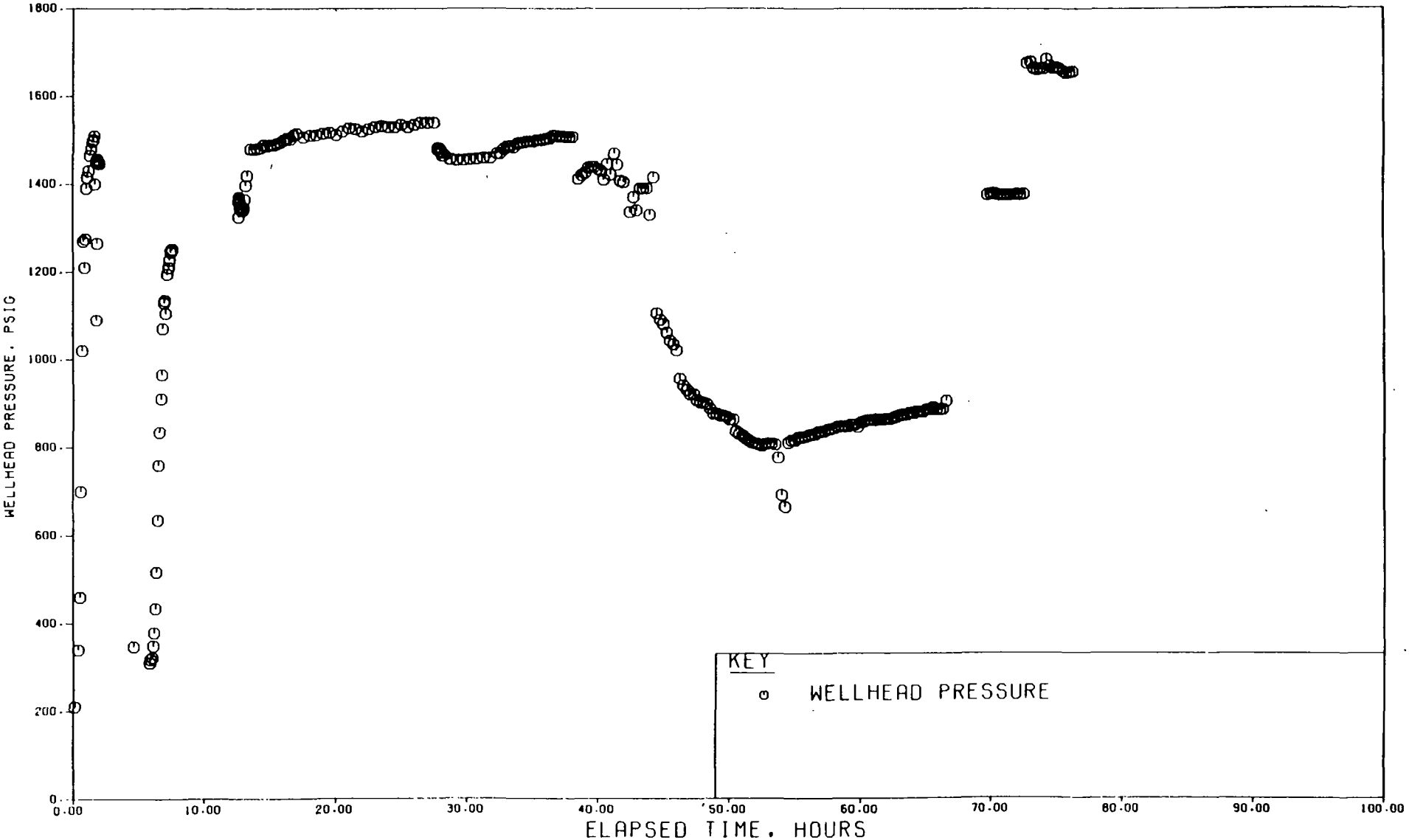


PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
DISK2:[SINTP.NH]JOURNALI.DAT;413



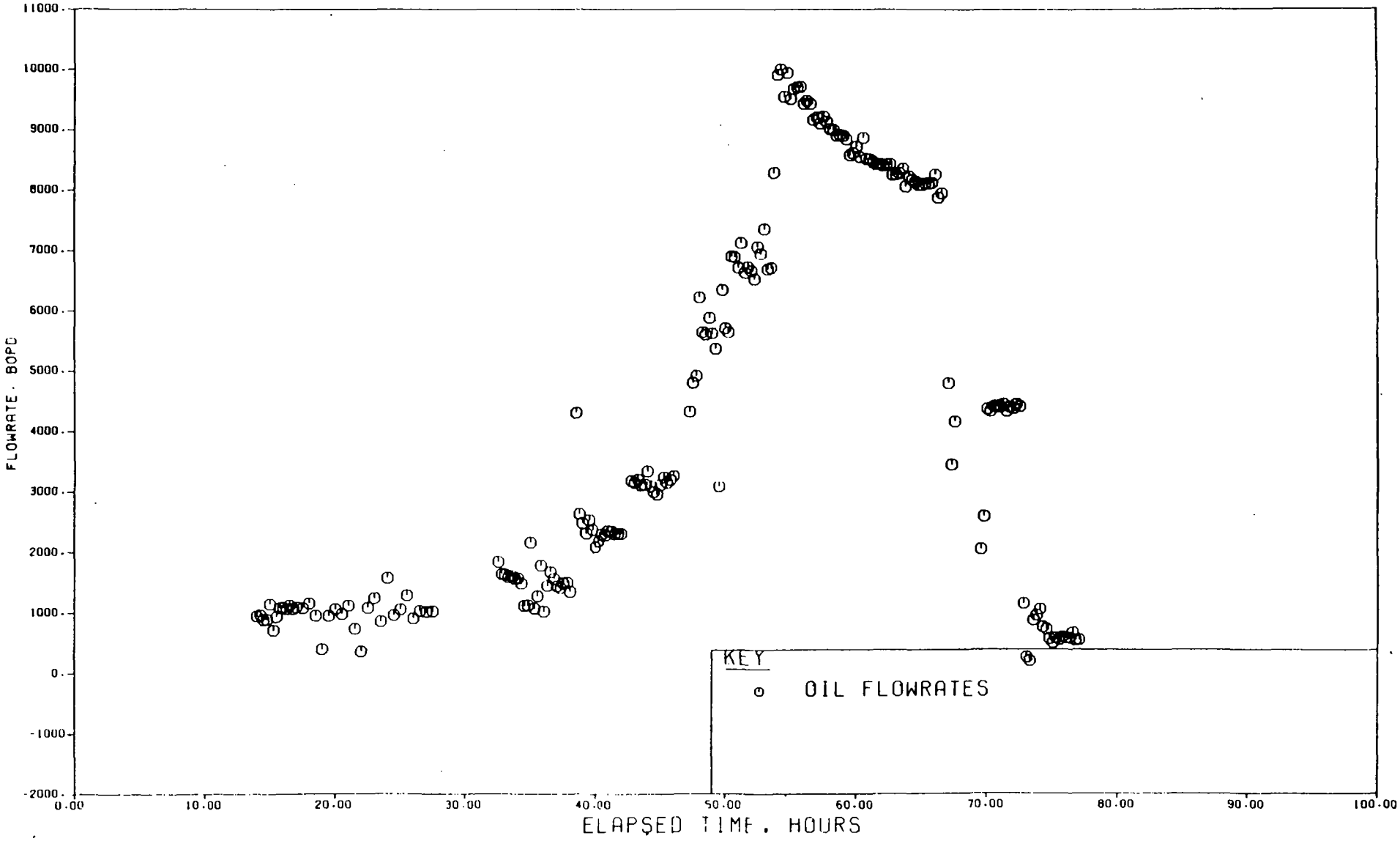
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984
PLOT OF WELLHEAD PRESSURES

DISK2:[SINTP.NHJOURNALI.DAT;484



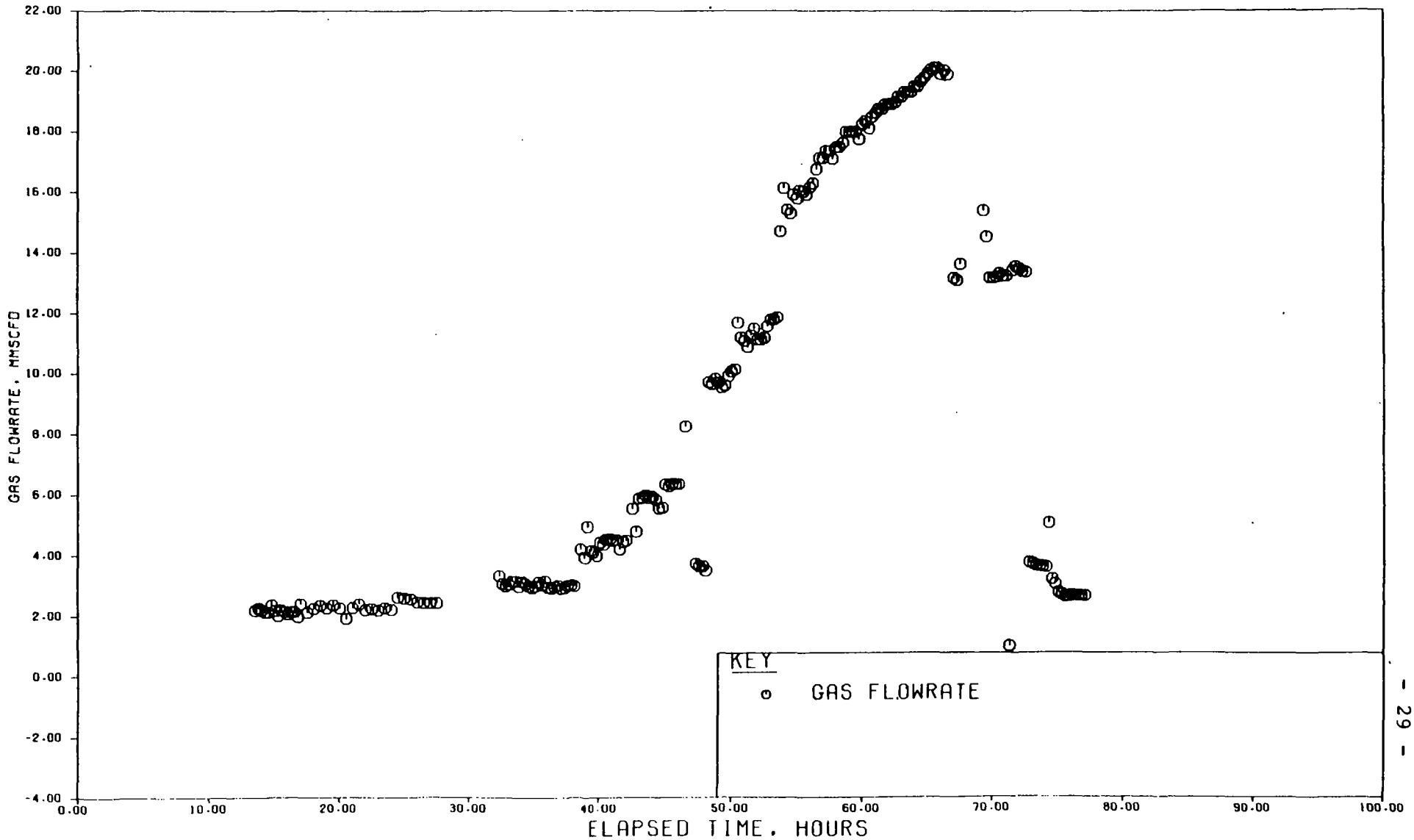
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984
PLOT OF OIL FLOWRATES

DISK2:[SINTP.NH]JOURNAL1.DAT;484



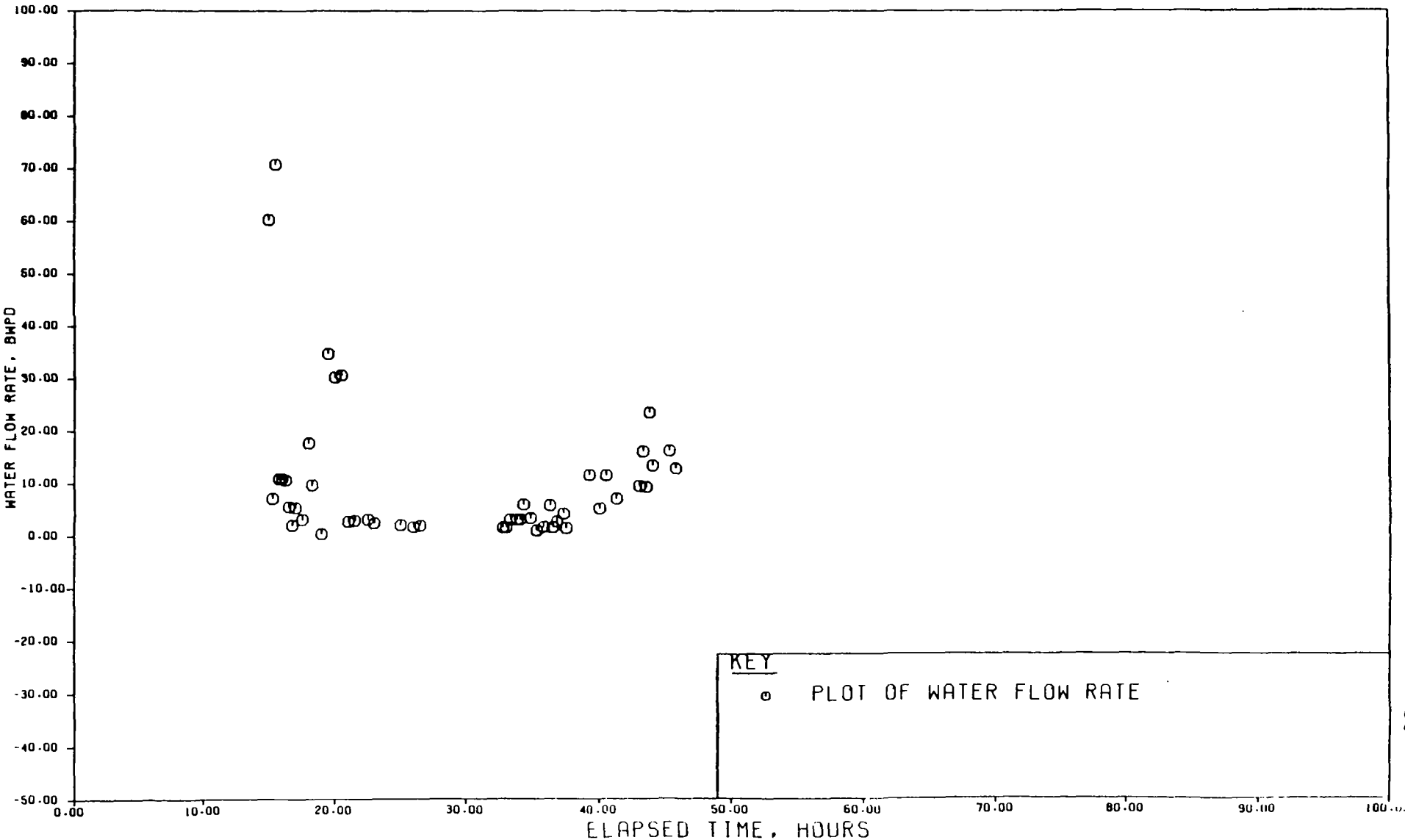
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984
PLOT OF GAS FLOWRATE HISTORY

DISK2:[SINTP.NH]JOURNALI.DAT;484



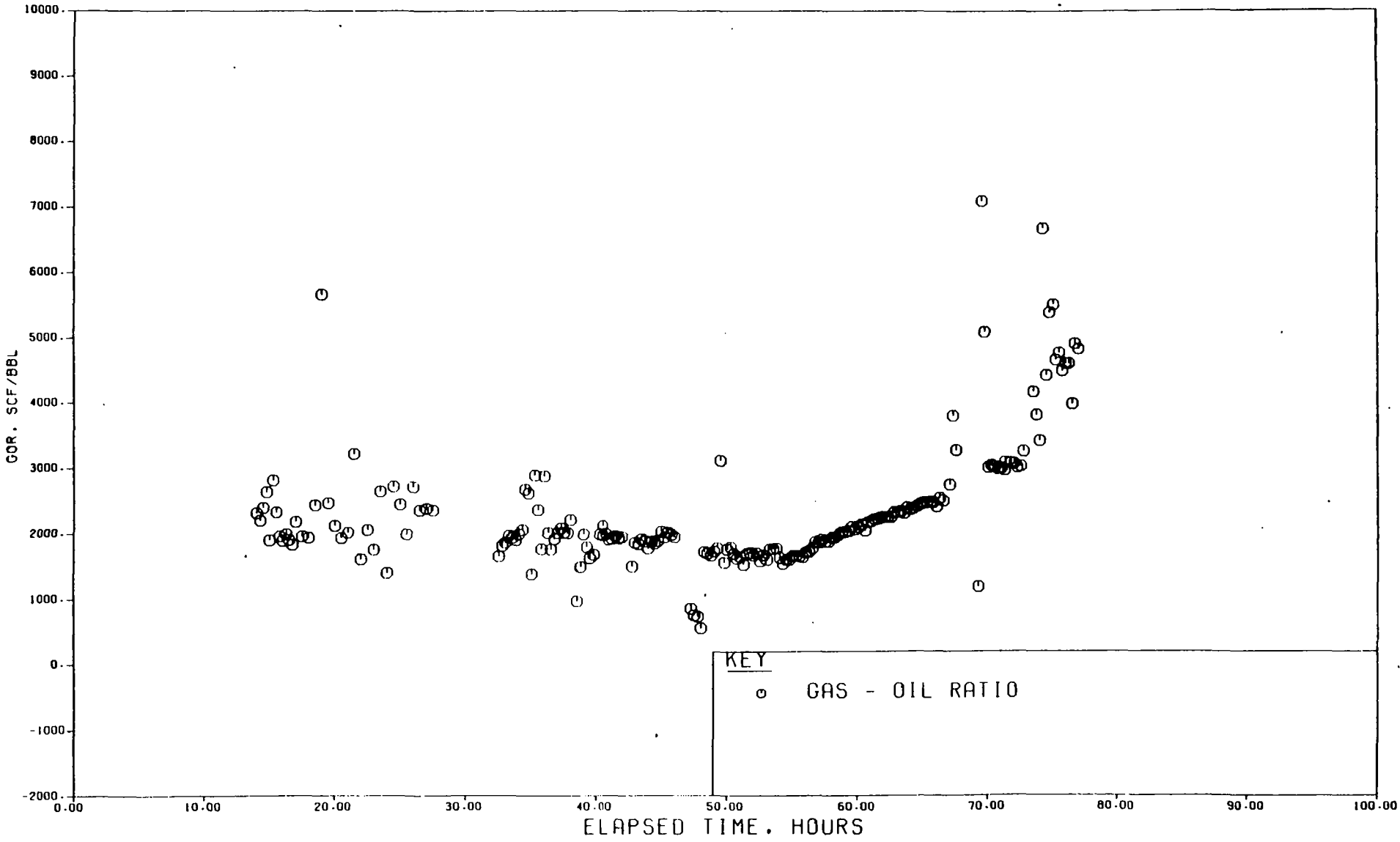
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH -23RD. 1984

DISK2:[SINTP.NH]JOURNALI.DAT;724



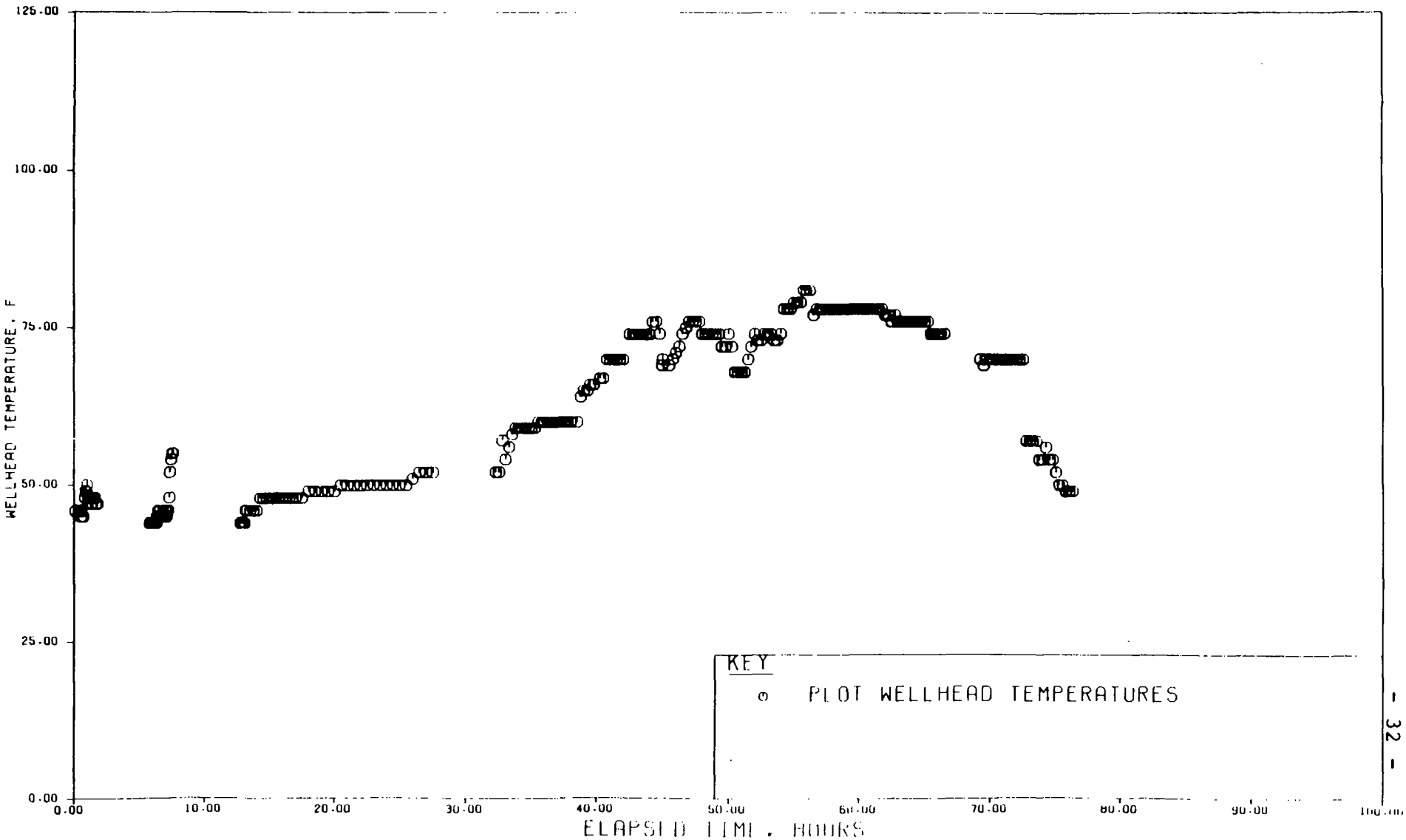
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984
PLOT OF MEASURED GAS-OIL RATIO

DISK2:[SINTP.NH]JOURNALI.DAT;484



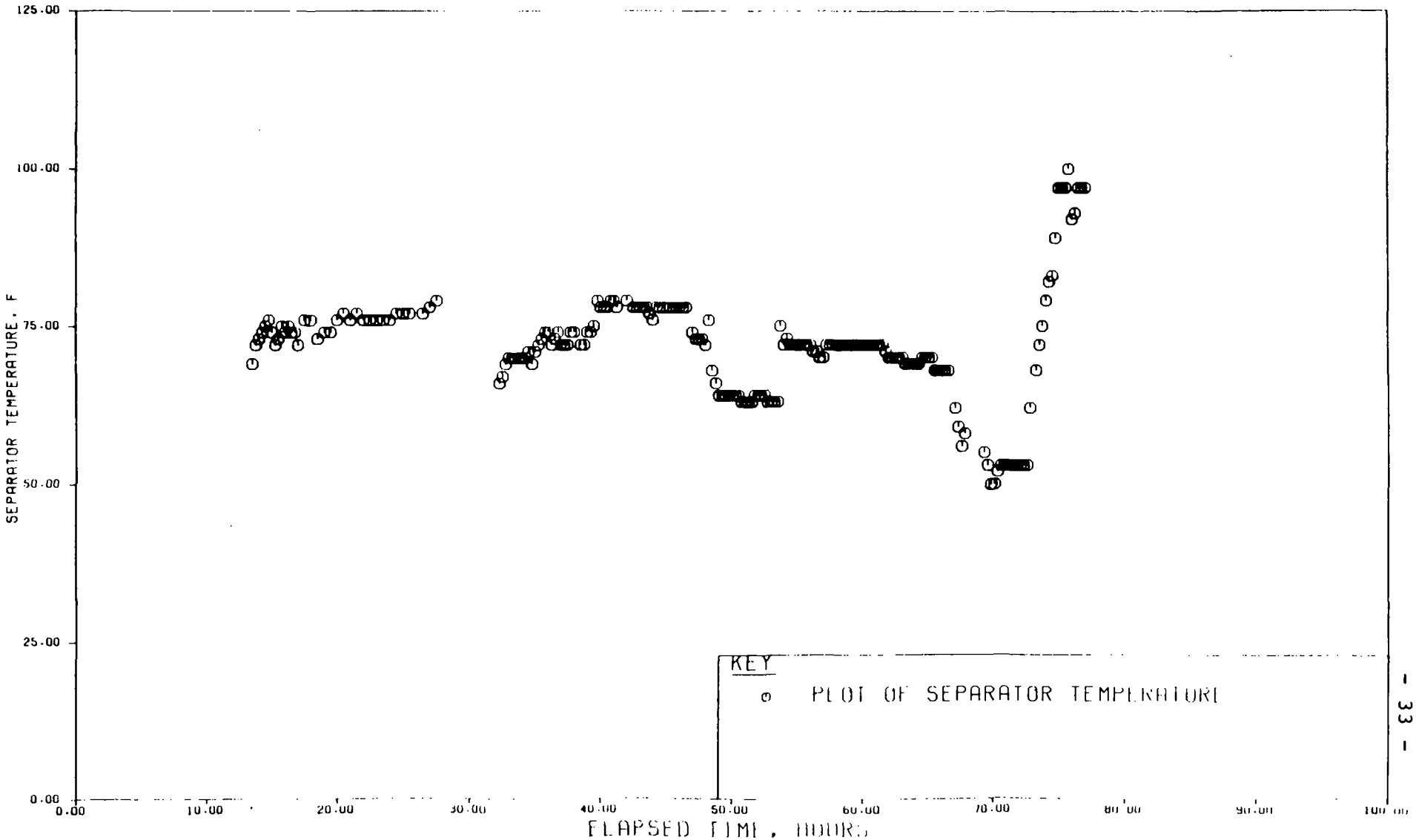
PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984

DISK2:[SINTP.NH]JOURNALI.DAT;724



PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984

DISK2:[SINTP.NH]JOURNAL1.DAT;724



PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984

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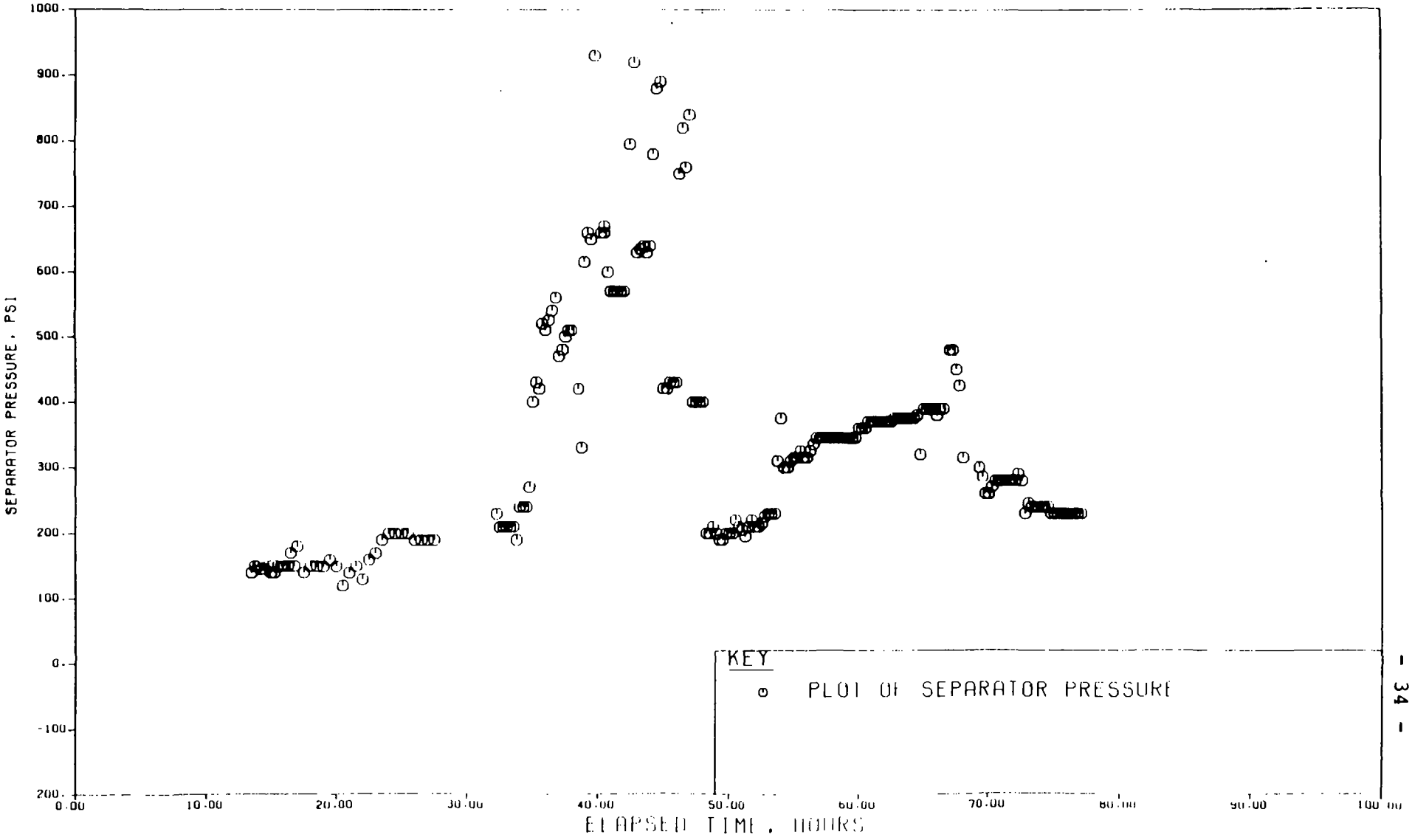

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984

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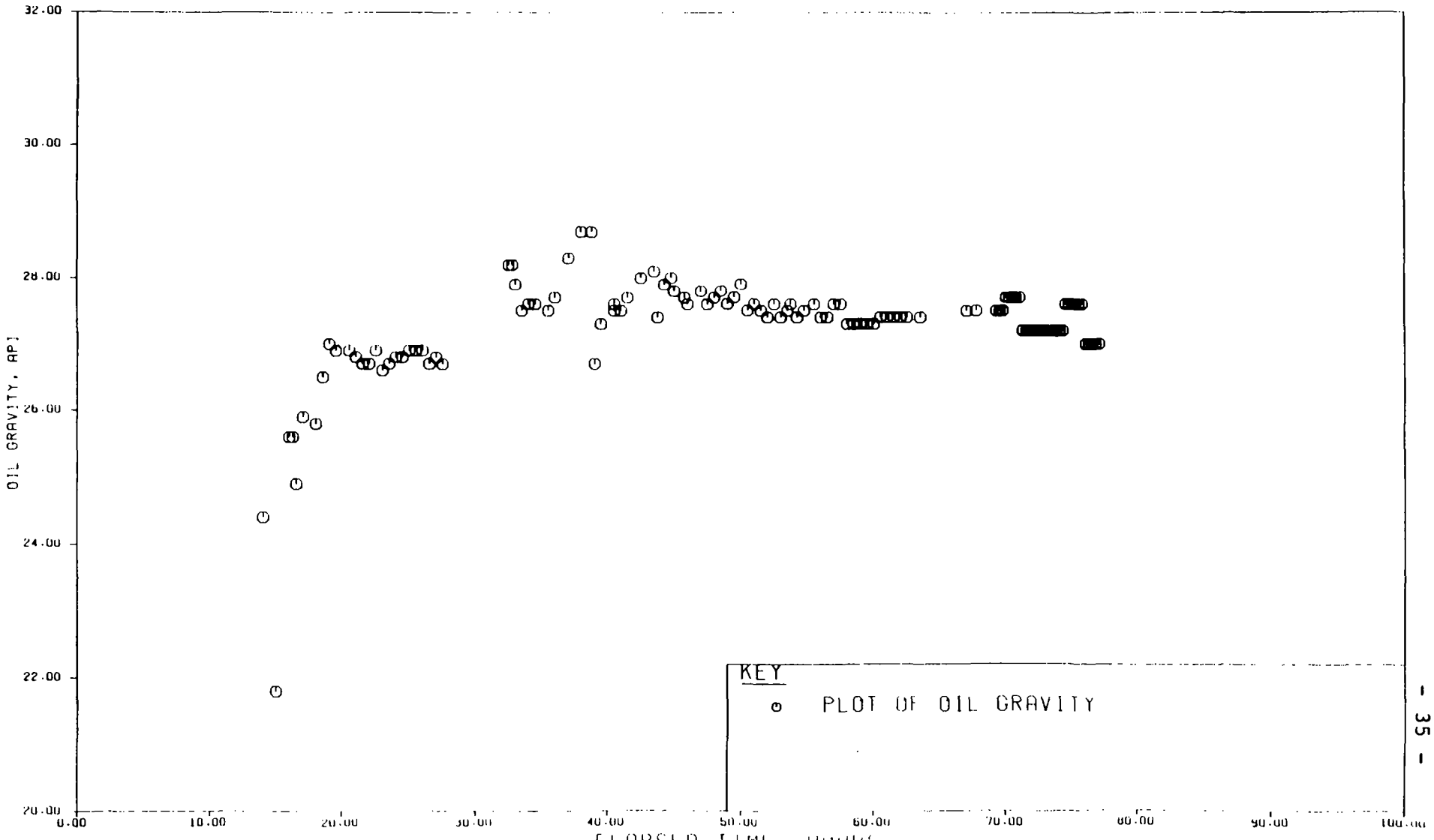

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984

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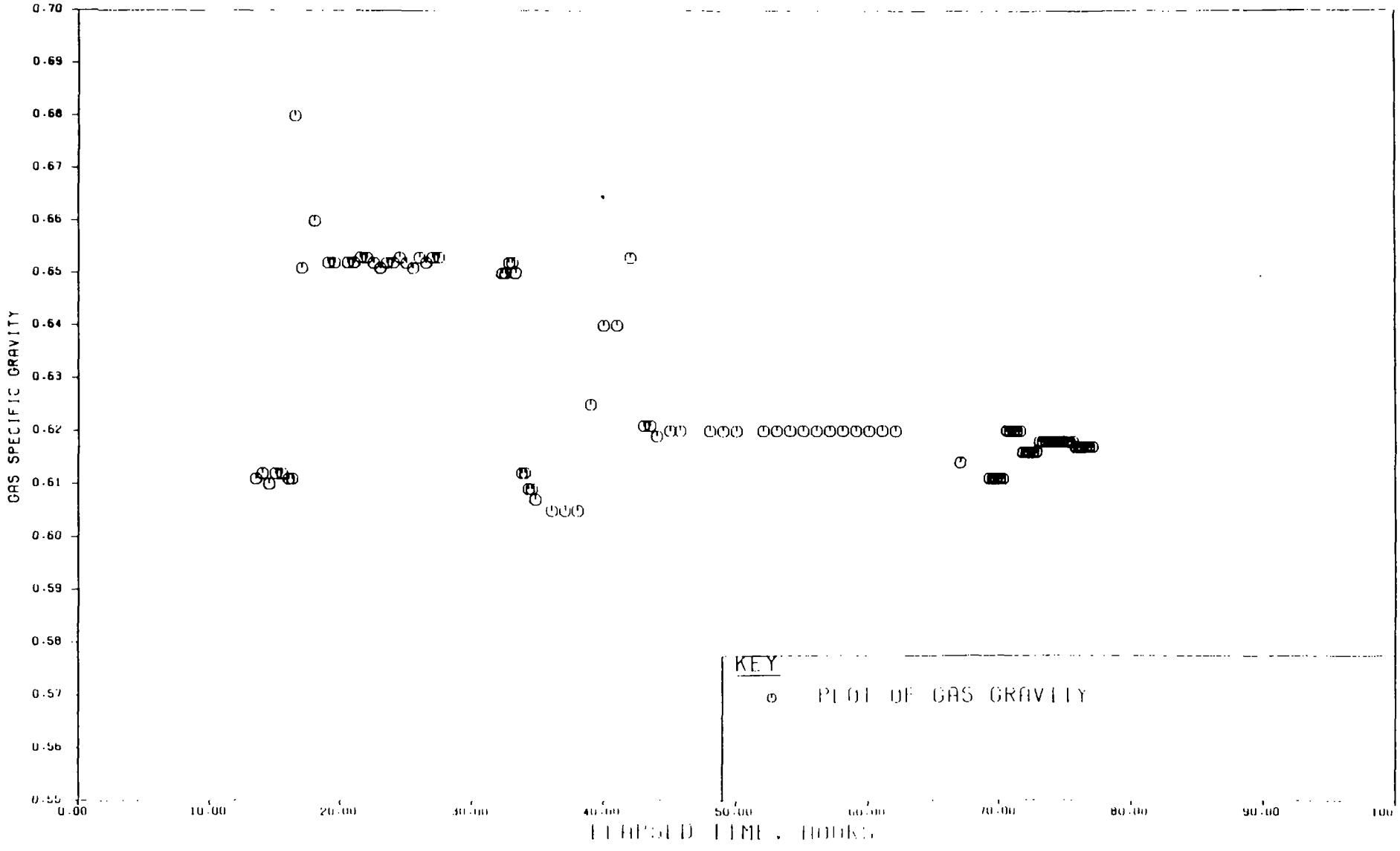

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD, 1984

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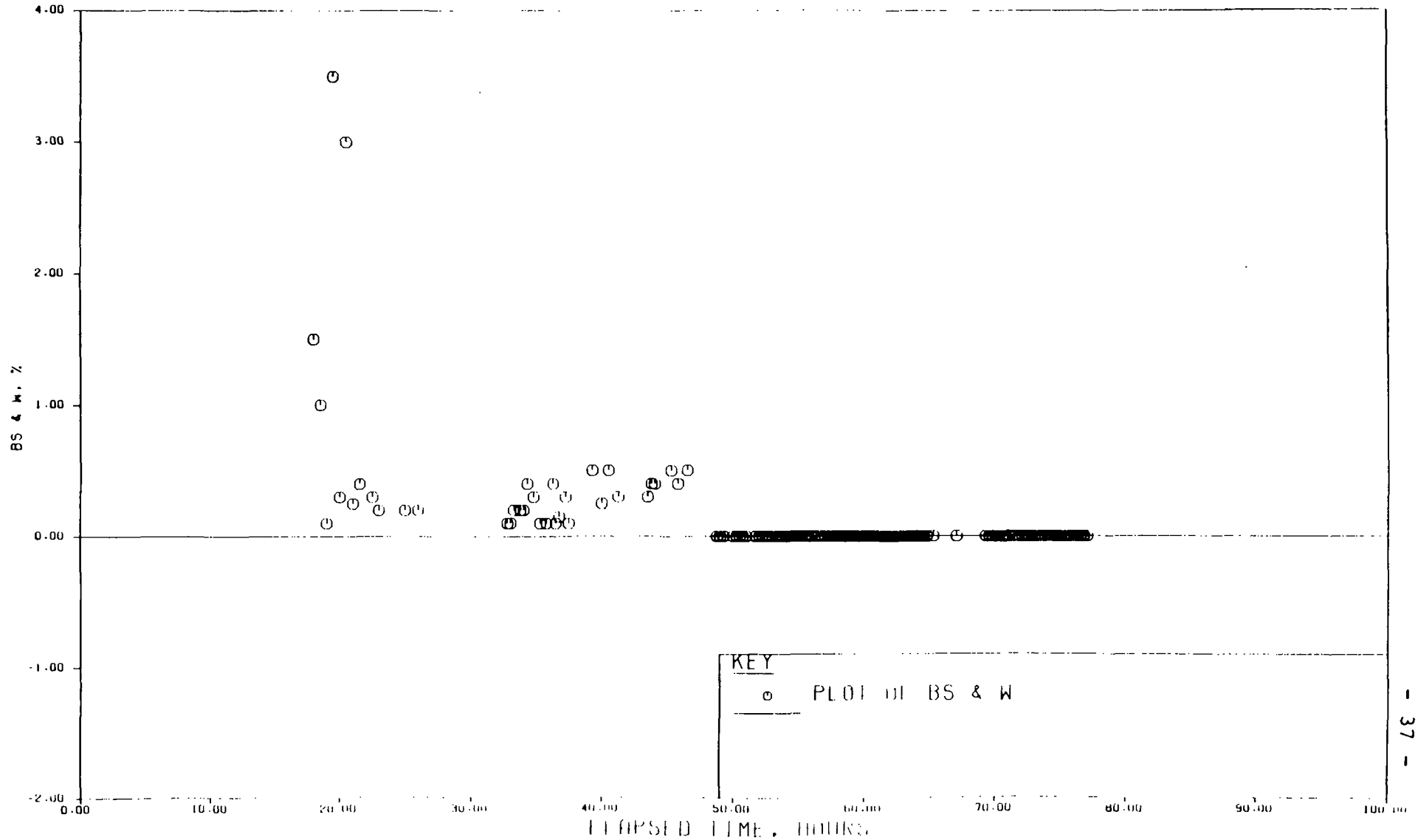


MULTIRATE ANALYSIS

COMMENTS TO THE MULTIRATE ANALYSIS

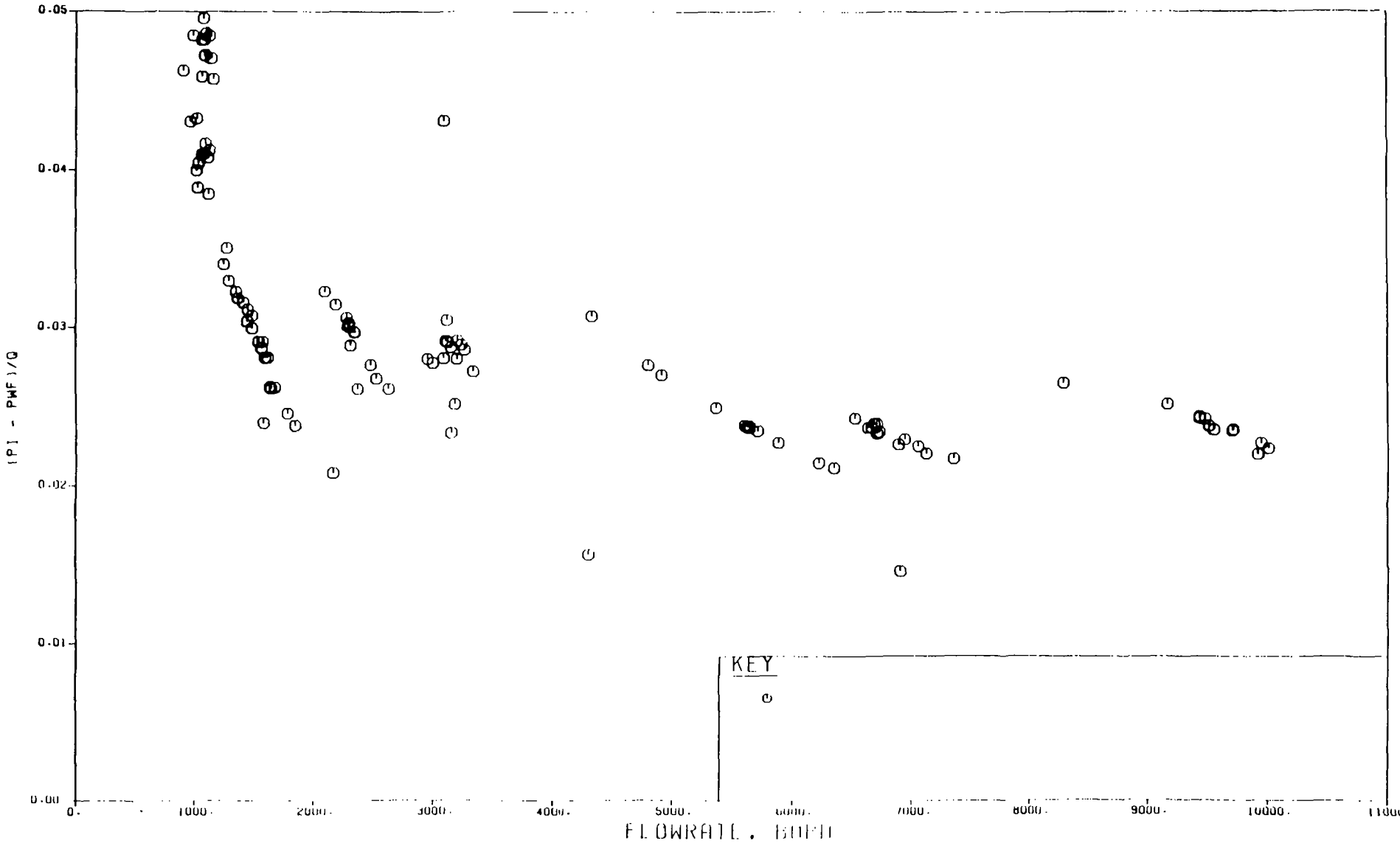
Based on the plot found on the next page no multirate analysis could be performed.

As can easily be seen no reliable straight line could be placed through these datapoints.

The reason for not having proper data is due to the unexpected gasbreakthrough experienced in this test.

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH - 23RD. 1984

DISK2:[SINTP.NH]JOURNAL1.DAT;724



POST GRAVEL PACK TEST

Transient analysis

TEST ANALYSIS PROCEDURE

For pressure transient analysis purposes the test on 31/3-2 was classified as an oil producer. Hence at the higher rates one was led to believe that this was a gas well. This situation made any transient analysis impossible.

In order to do a transient analysis first of all a plot of oil flowrates versus time was made. This clearly shows the difficulties in defining the proper stable flowrates.

In order to diagnose a suitable model for the test a log-log plot of pressure change versus elapsed time was made of various flowperiods. As can be seen from the log-log plots, no model could be diagnosed from the log-log plots.

A superposition plot was then made of all the various flowperiods taking into account all previous flowperiods. The various axis was shifted in order to plot on the same scale. As can be seen from the main superposition plot, none of the flowperiods were able to give a reliable straight line.

Several possible solutions were tried, however, but all of them failed when it came to match the simulated data with the measured test data.

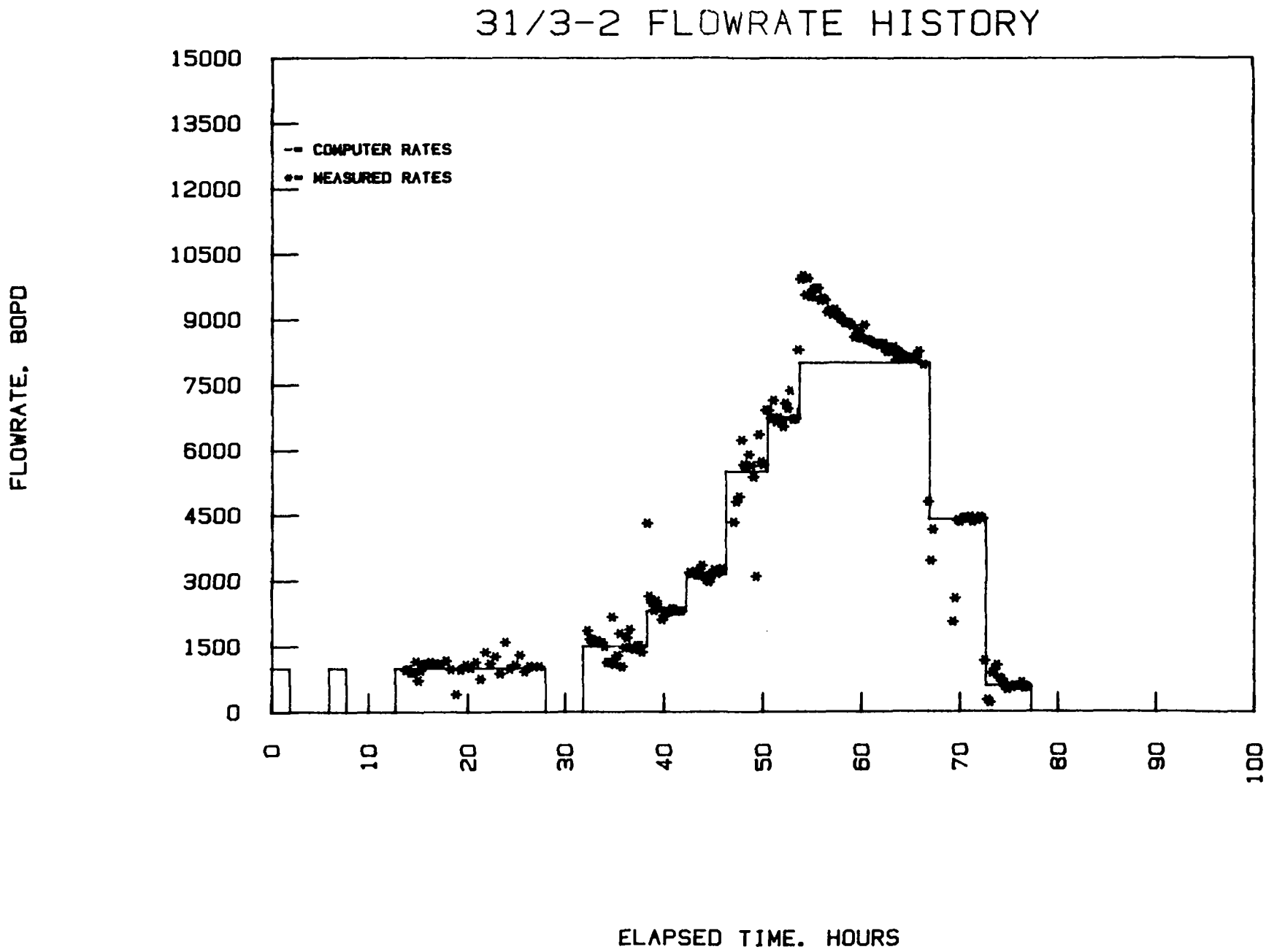
Based on the flowrate data (and GOR) a very early gas breakthrough was observed. This unexpected behaviour complicated the possibilities of having a pressure transient analysis. As none of the attempted solutions worked out, one can conclude that the test results from 31/3-2 are uninterpretable.

POST GRAVEL PACK TEST

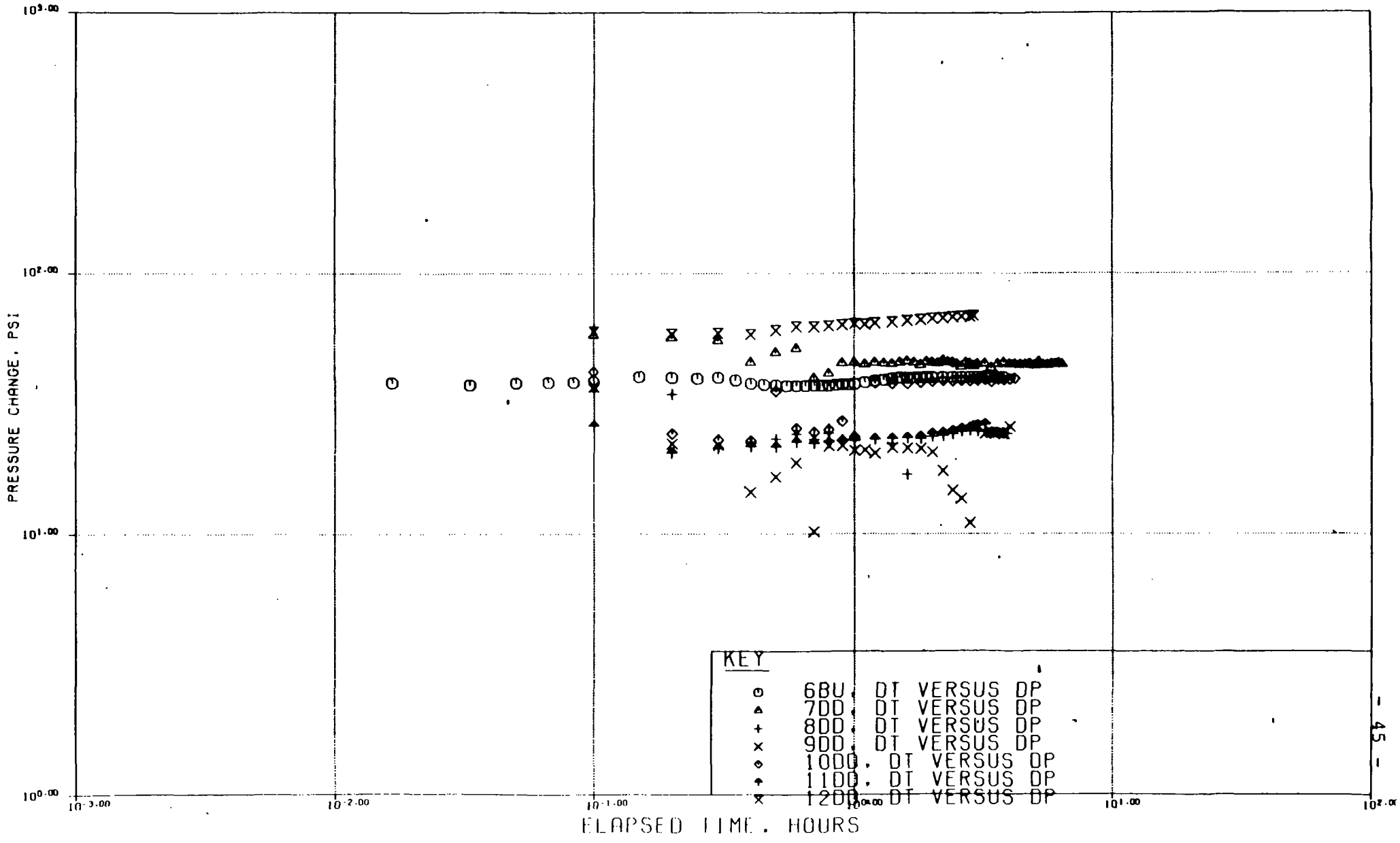
WELL: 31/3-2

Flowrates defined for analysis.

Flowperiod (DD/BU)	Start (date) (time)	Duration (hours)	Elapsed time (hours	Flowrate (BOPD)	Comments
	200484				
1DD	02:52	1.883	1.883	1000	Clean-up
2BU	04:45	4.050	5.933	0	Acid job
3DD	08:48	1.750	7.683	1000	
4DD	10:33	5.050	12.753	0	
5DD	15:36	15.150	27.883	1000	
	210484				
6BU	06:45	3.950	31.833	0	
7DD	10:42	6.467	38.300	1500	28/64" choke
8DD	17:10	3.933	42.233	2300	36/64" choke
9DD	21:06	3.983	46.216	3150	44/64" choke
	220484				
10DD	01:05	4.217	50.433	5500	56/64" choke
11DD	05:15	3.250	53.683	6750	64/64" choke
12DD	08:33	13.200	66.883	8000	Bypass (2 9/16")
13DD	21:45	5.767	72.650	4400	56/64" choke
	230484				
14DD	03:31	4.583	77.233	600	24/64" choke
15BU	08:06	5.000	82.233	0	


31/3-2 FLOWRATE HISTORY
15000
13500
12000
10500
9000
7500
6000
4500
3000
1500
0
-- COMPUTER RATES
** MEASURED RATES
FLOWRATE, BOPD
0
10
20
30
40
50
60
70
80
90
100
ELAPSED TIME, HOURS

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
DISK2:[SINTP.NH]JOURNALI.DAT;413



PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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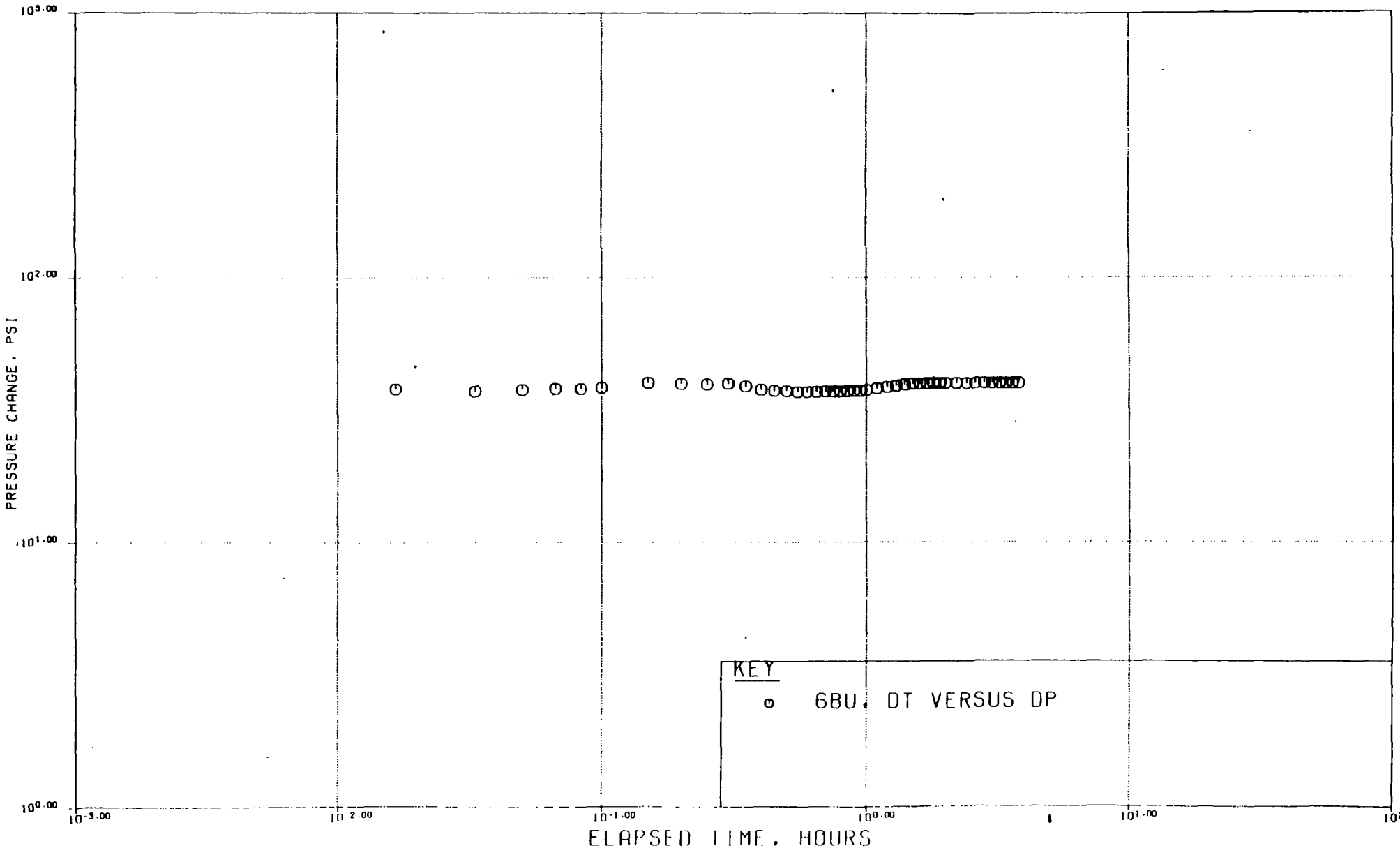

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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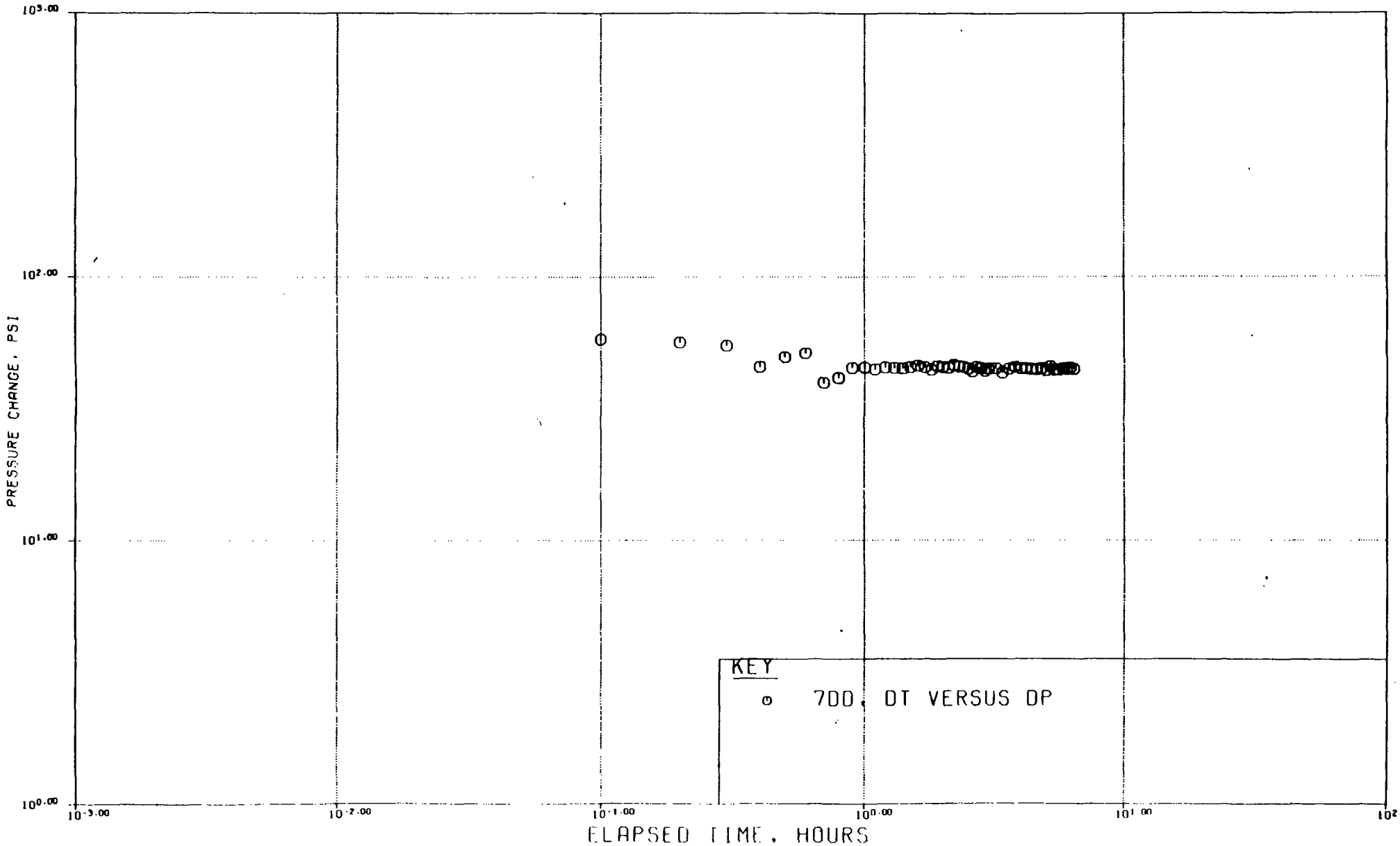

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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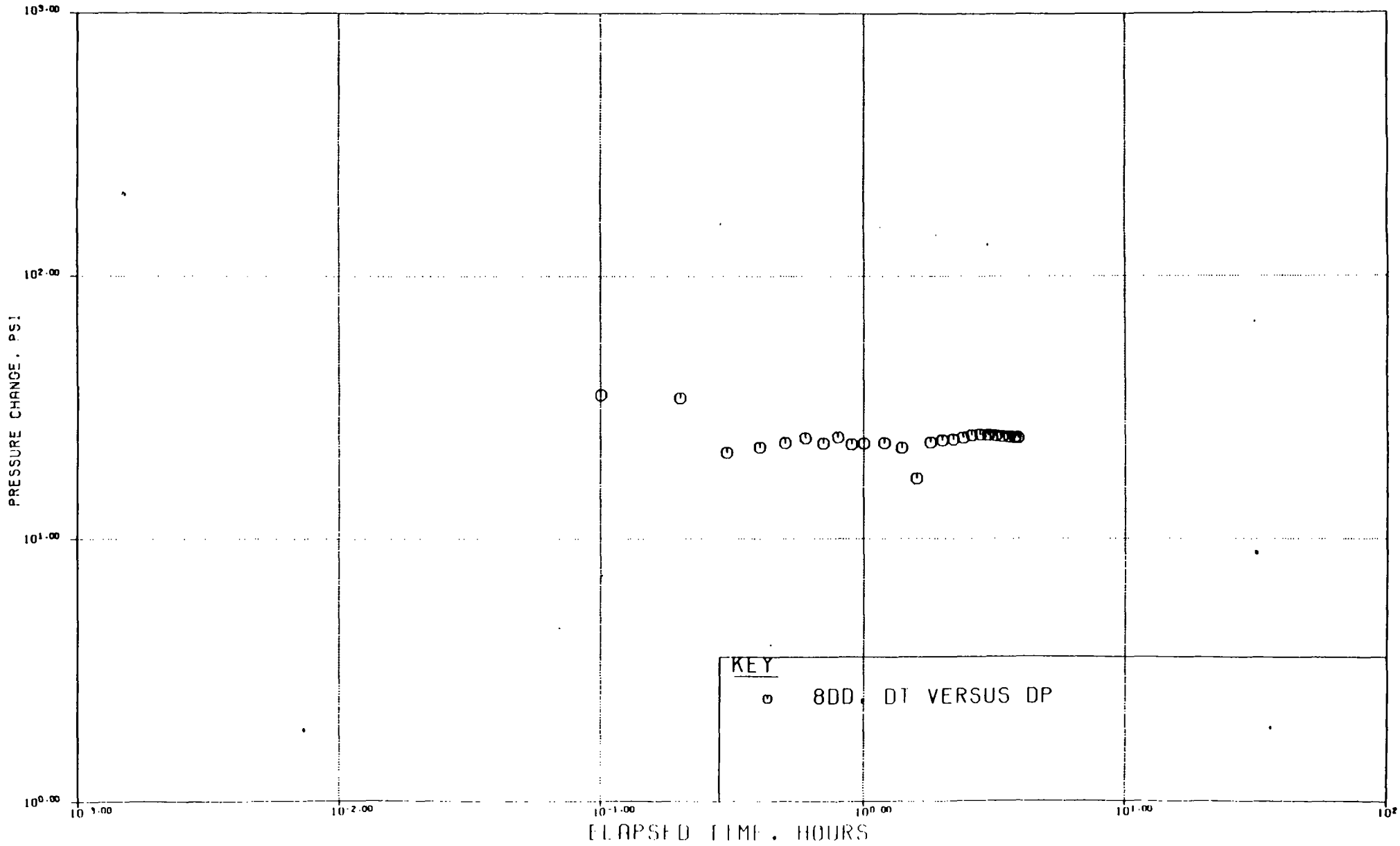

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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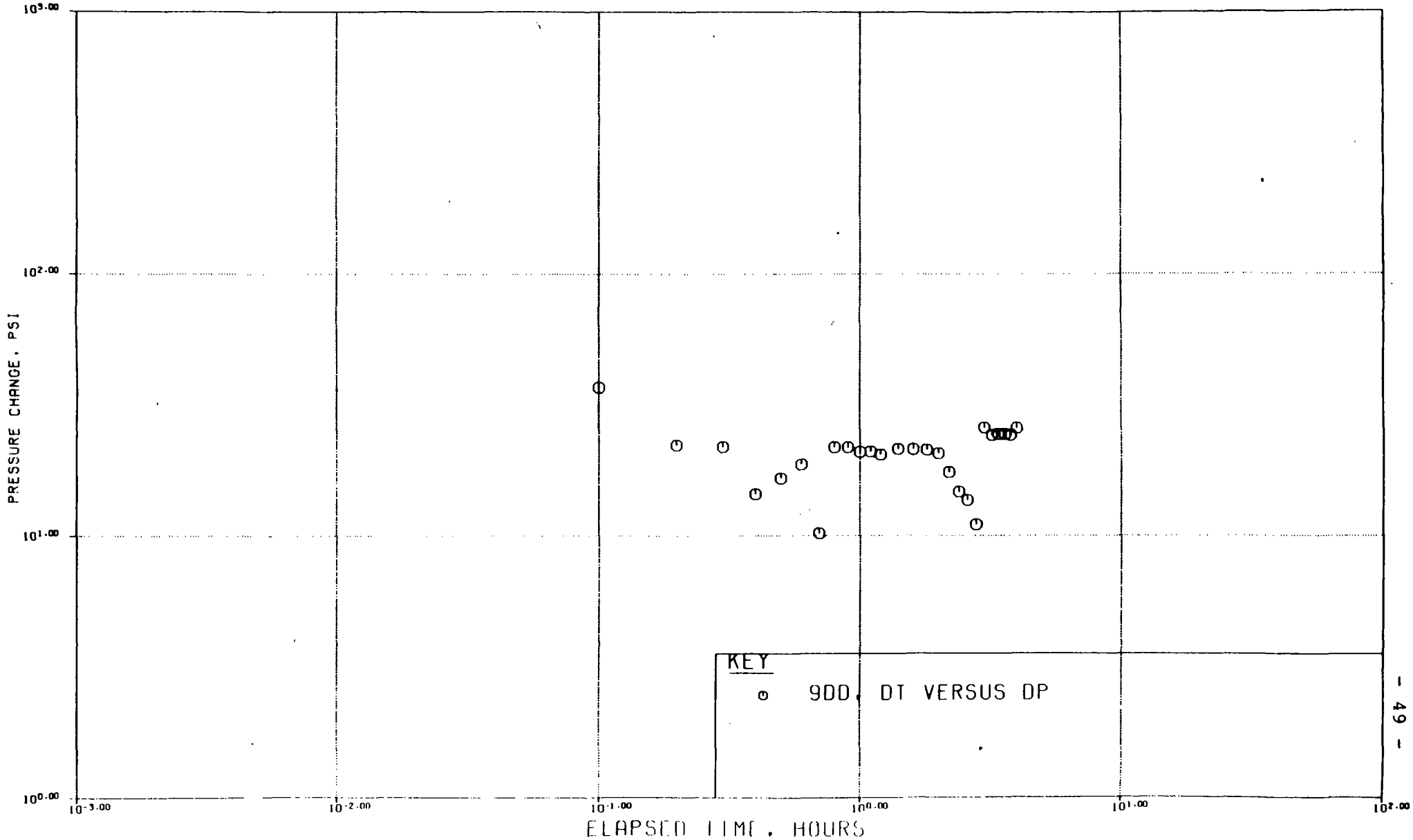

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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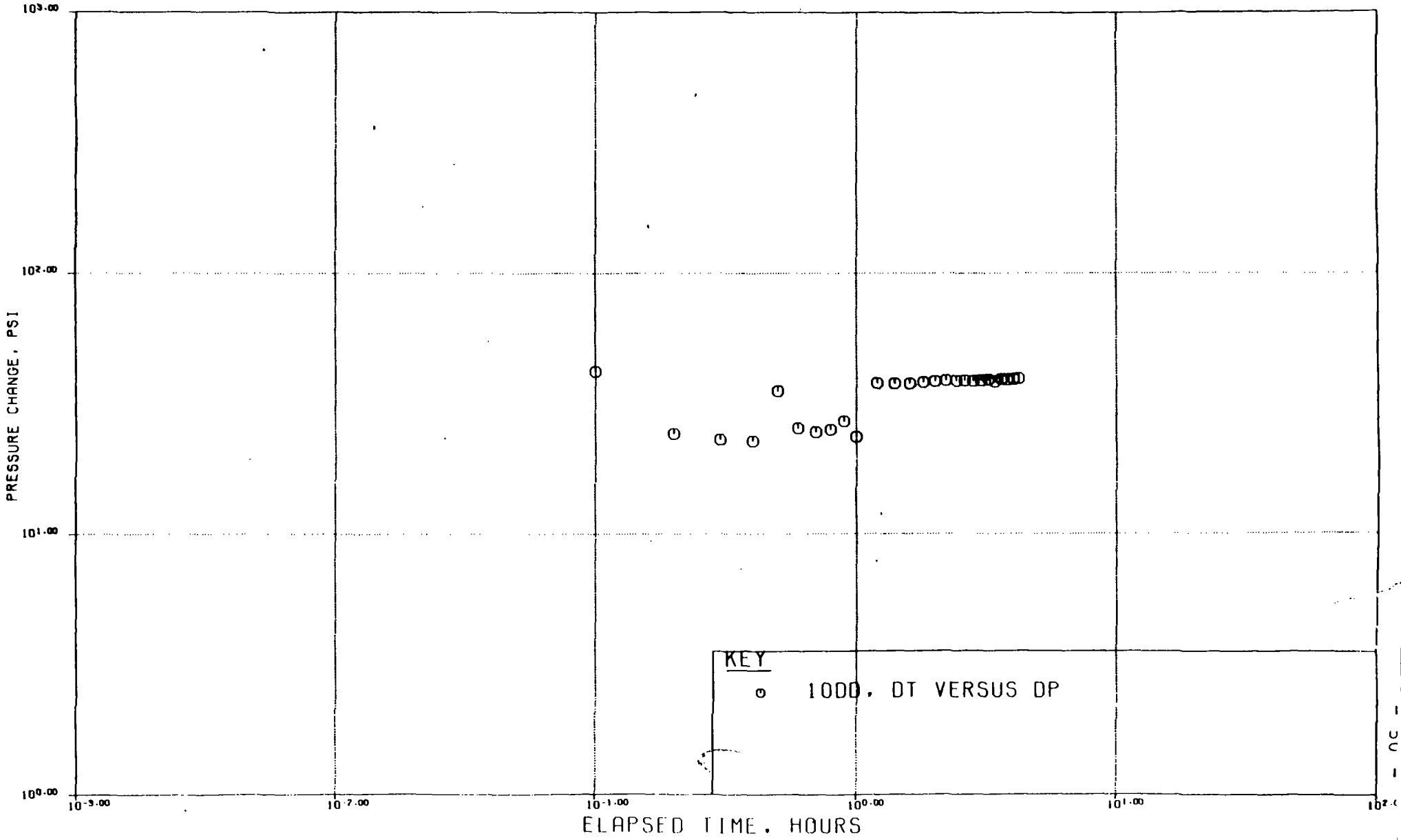

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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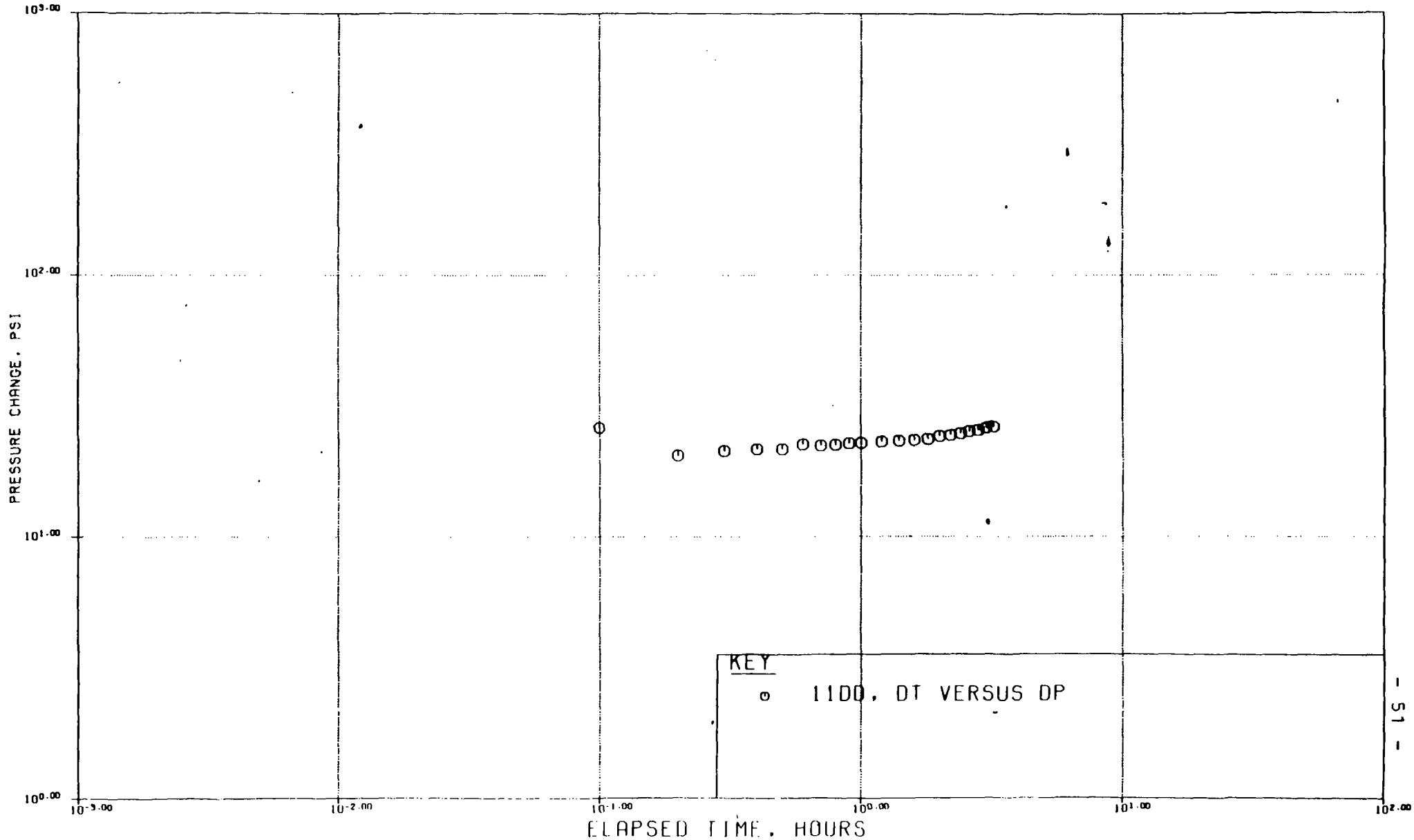

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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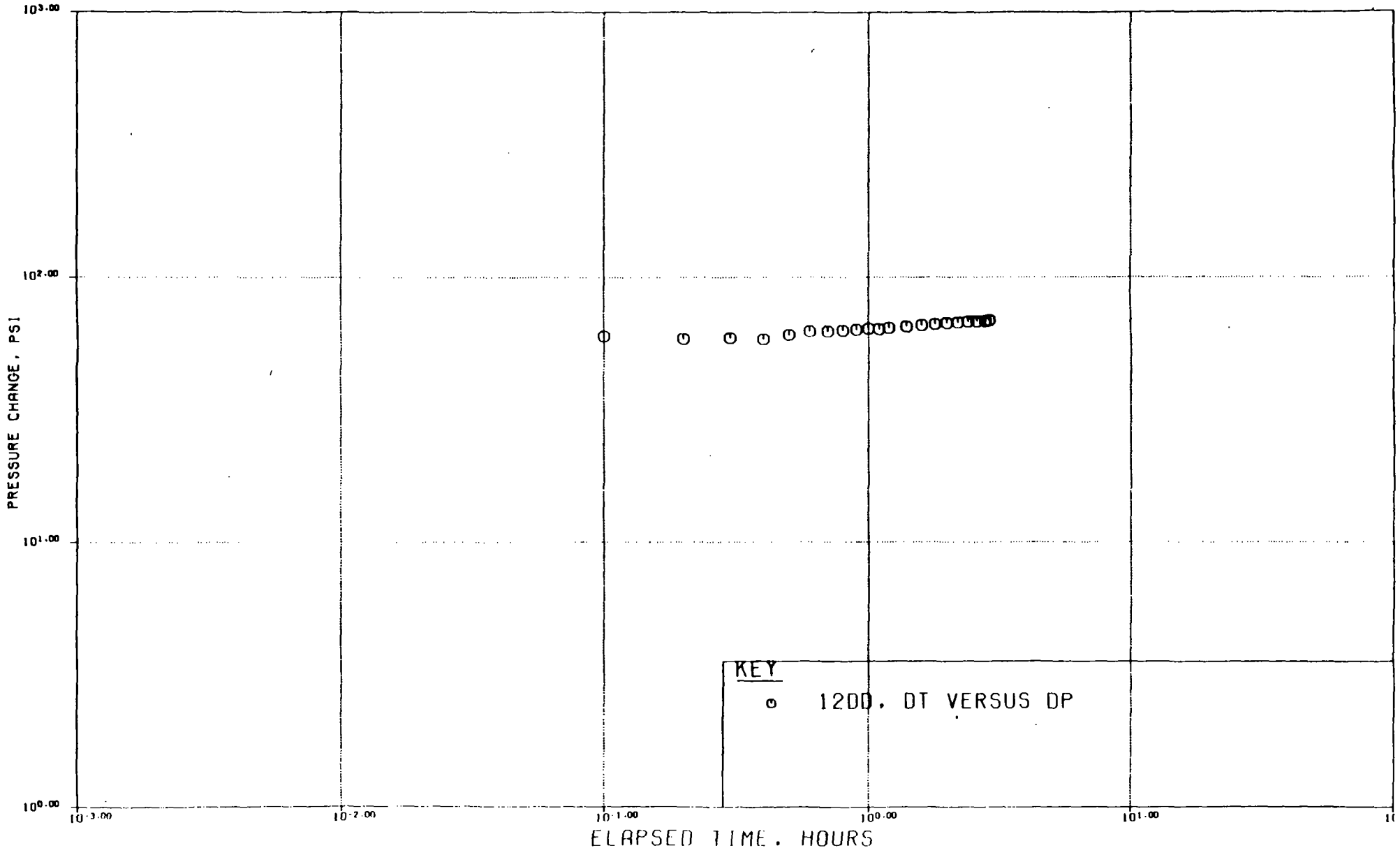

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
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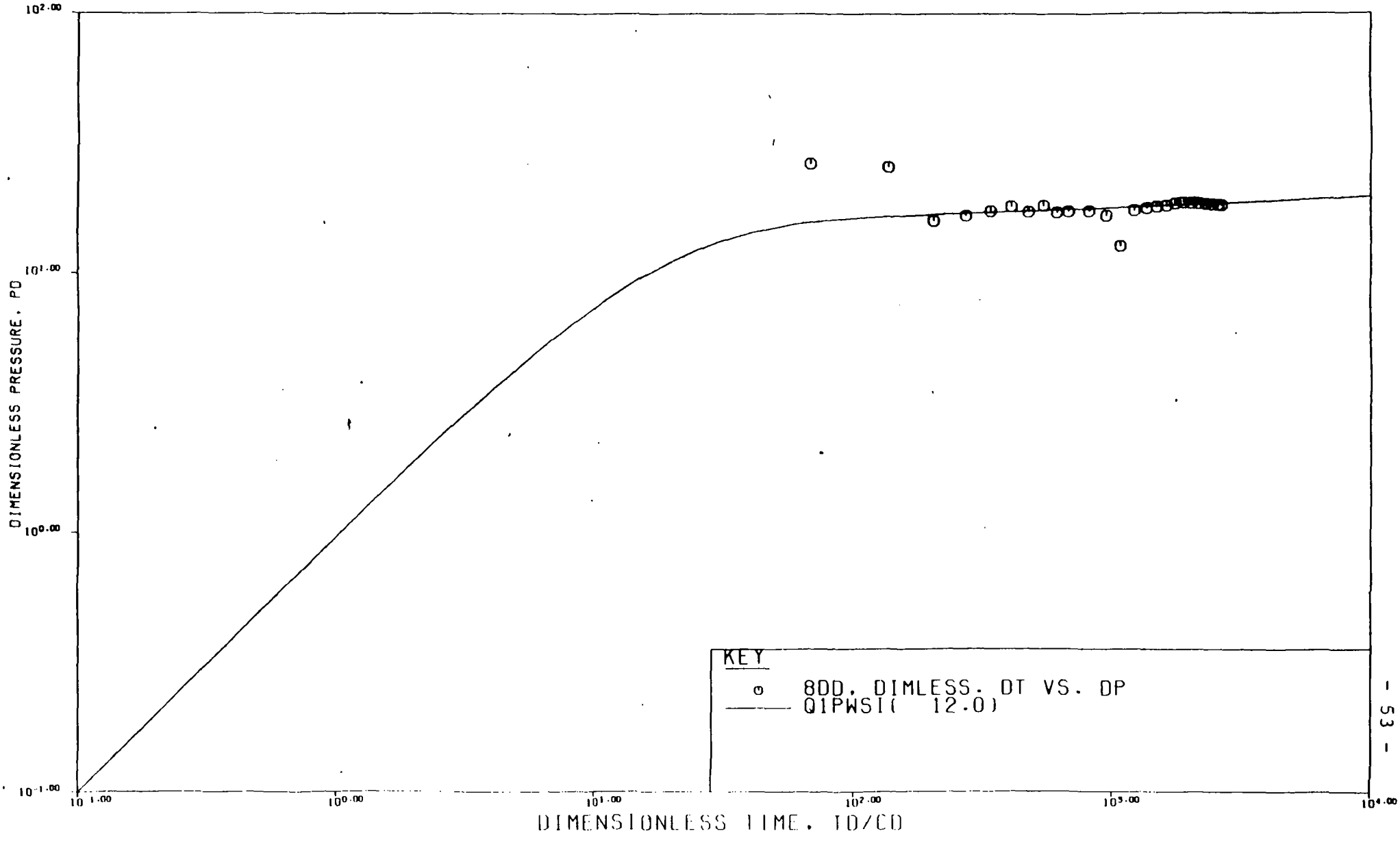

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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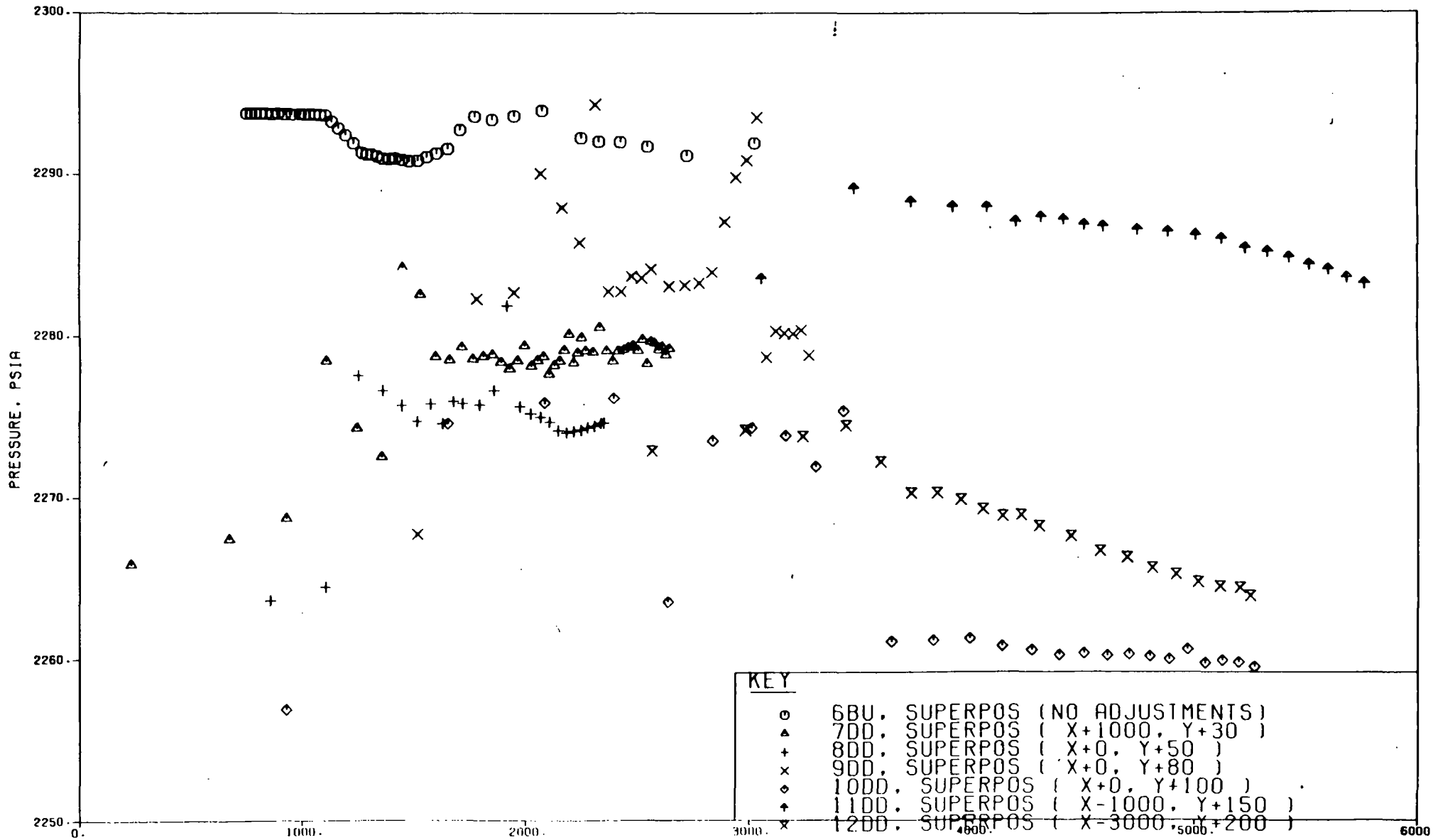

SUPERPOSITION FUNCTION, # FLOW RATES = 6

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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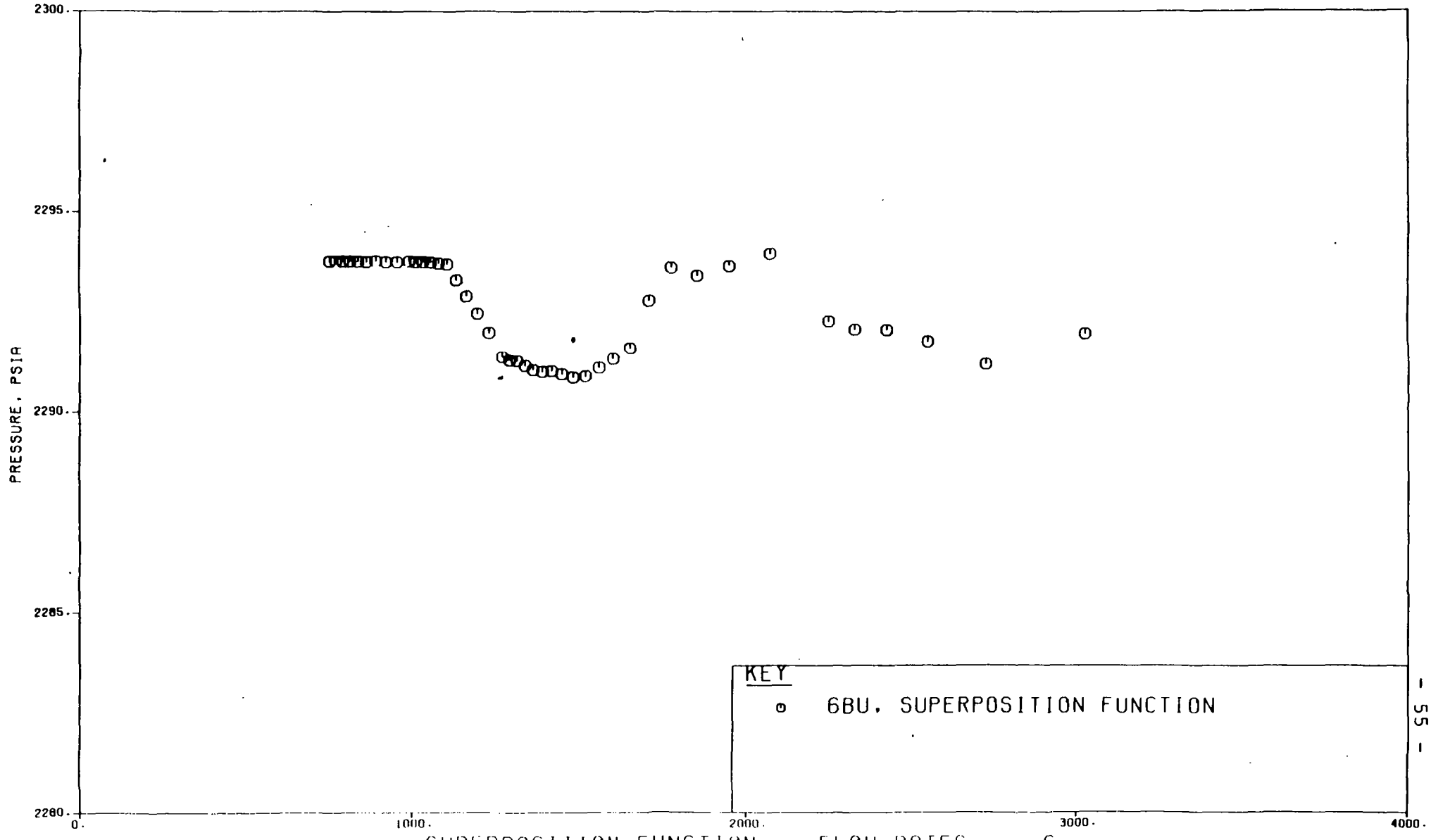

SUPERPOSITION FUNCTION. # FLOW RATES = 6

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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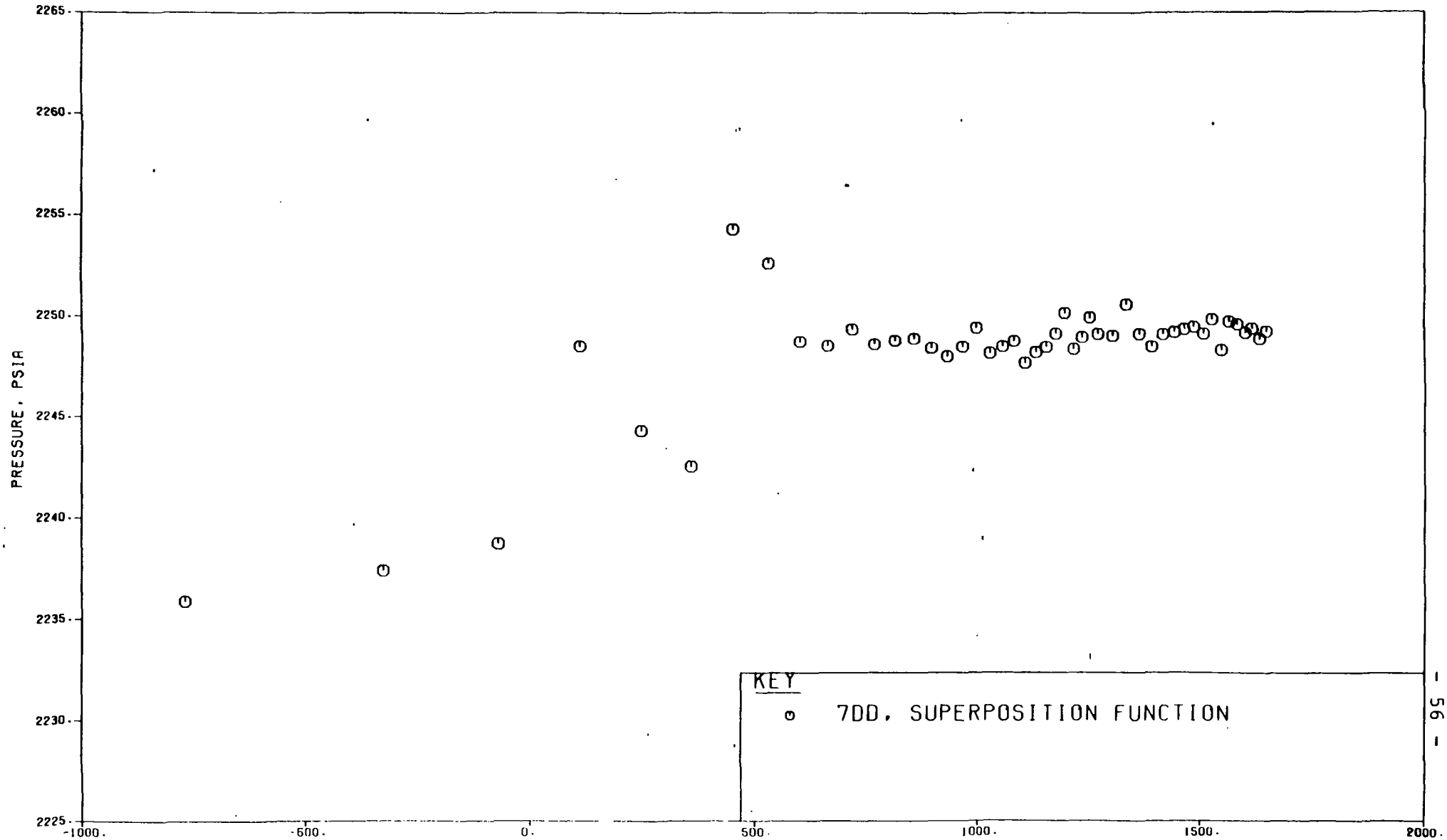

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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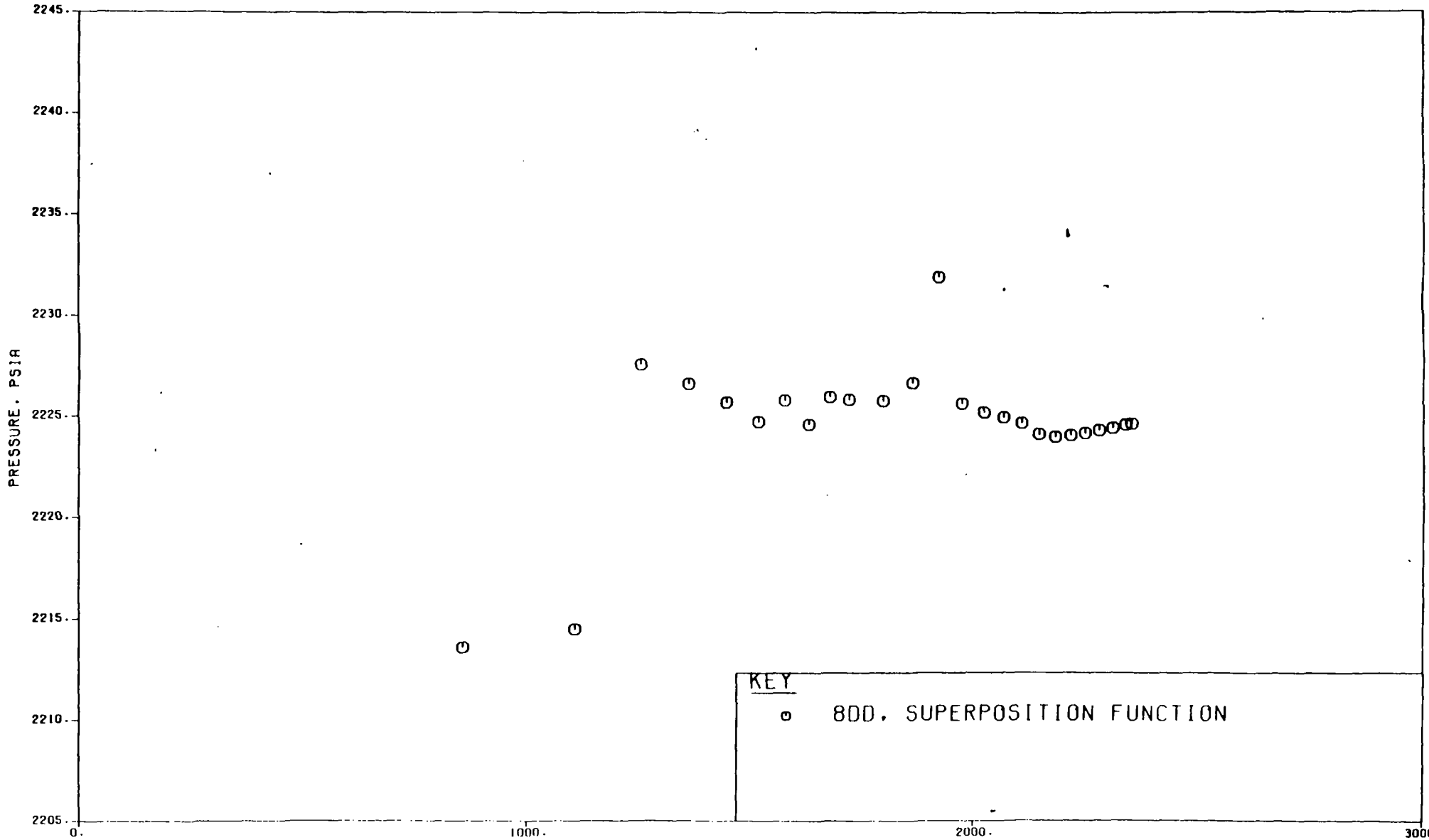

SUPERPOSITION FUNCTION, # FLOW RATES = 8

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
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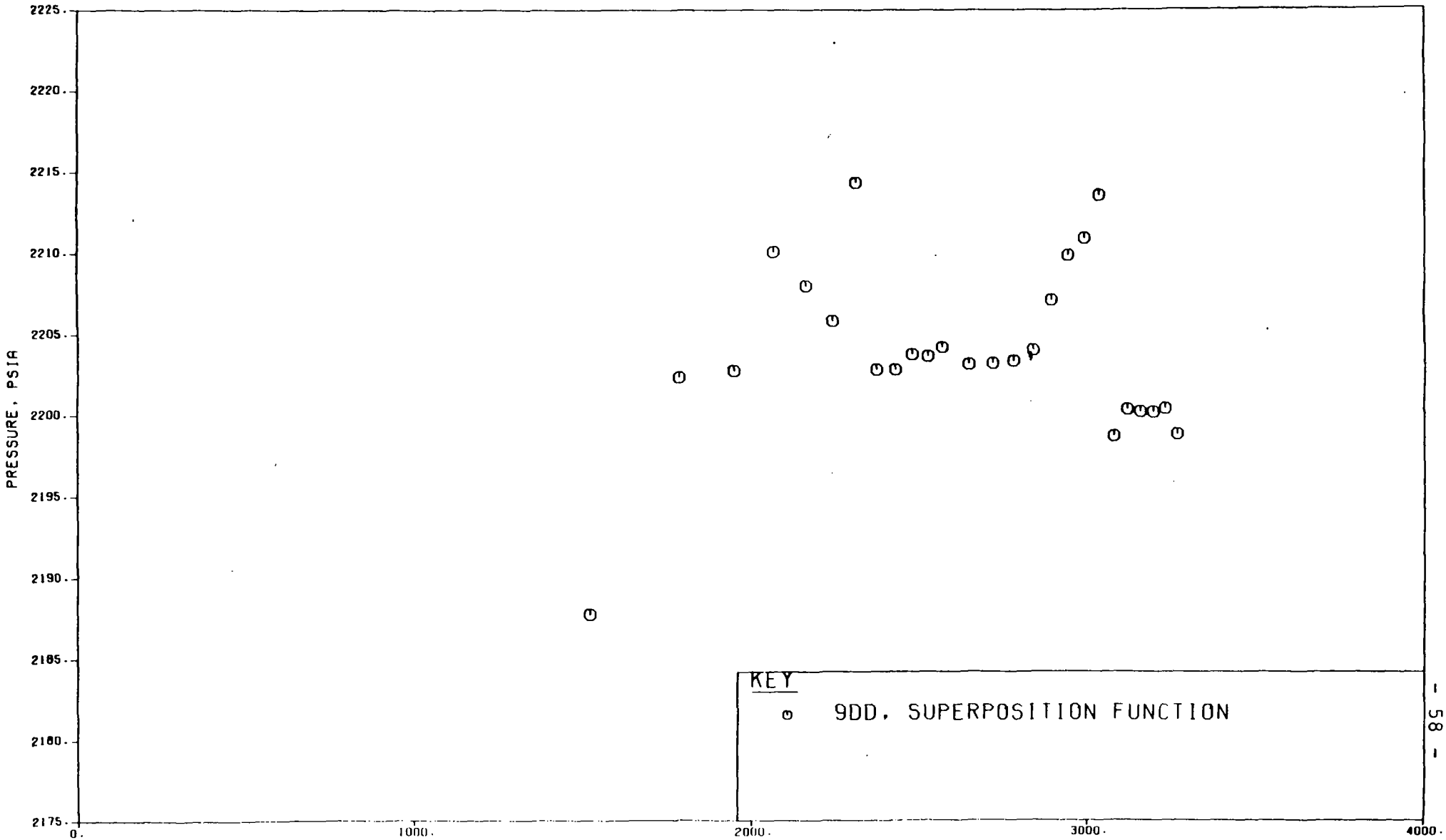
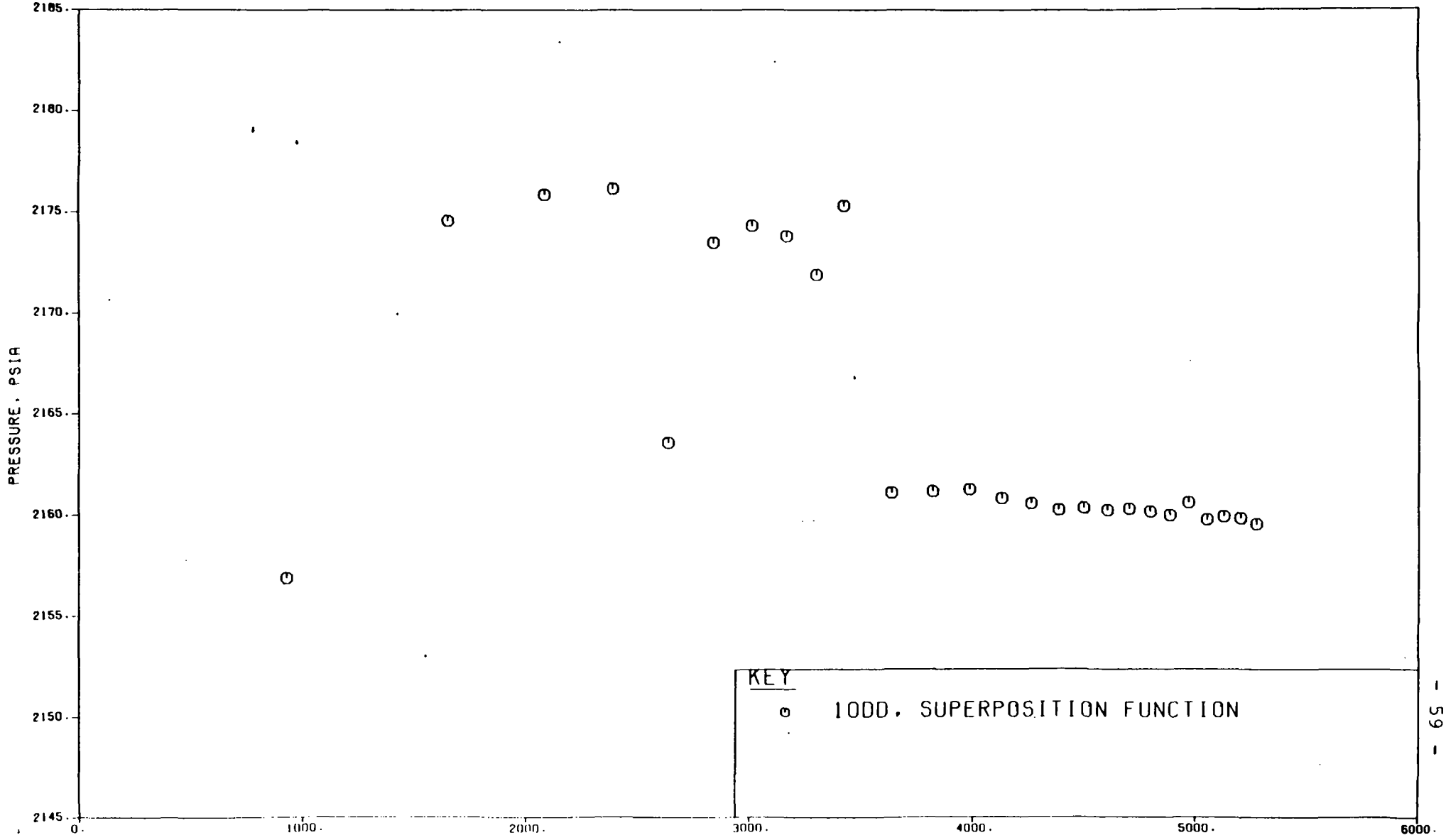


SUPERPOSITION FUNCTION, # FLOW RATES = 9

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
DISK2:[SINTP.NH]JOURNALI.DAT;413



PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
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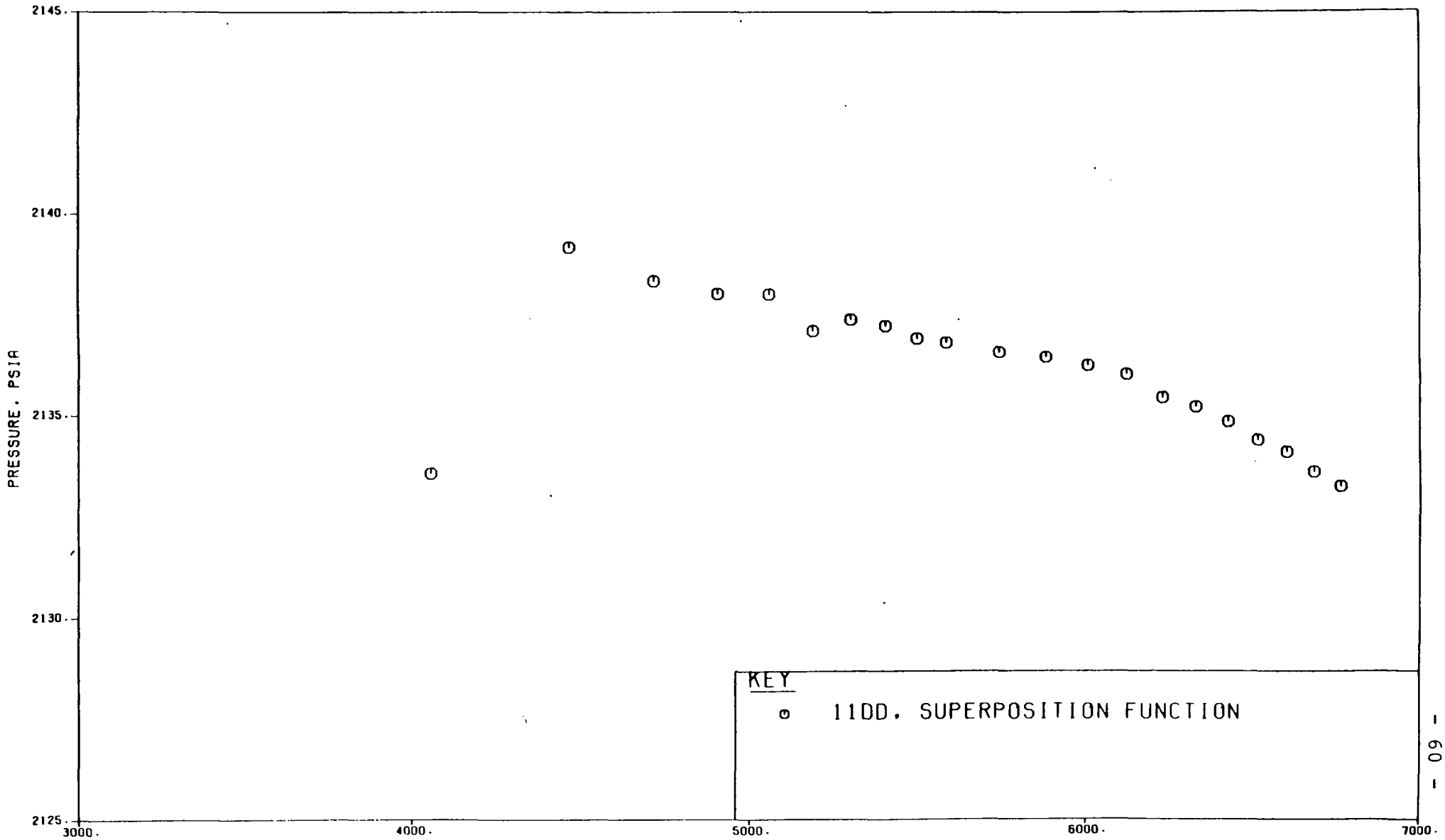

PRODUCTION TEST ON WELL 31/3-2 BY NORSK HYDRO
APRIL 20TH-23RD, 1984
FLOPETROL, SDP 82816 IN 30 SEC. MODE, SENSOR DEPTH 1564.16 M RKB
DISK2:[SINTP.NH]JOURNALI.DAT;413