

A BRIEF HAND FORMATION EVALUATION
OF GULF WELL 3/5-2, BRENT SAND

DONE BY PETROPHYSICAL SECTION
PRODUCTION DEPARTMENT, STATOIL

ENGINEER: R. RIISE
DATE: 5/9-1978

CONTENTS

	PAGE
- WELL DATA.....	1
- ABSTRACT.....	1
- TABLE OF SUMMARY.....	1
- INTRODUCTION.....	1
- RESISTIVITY CORRECTIONS.....	2
- CROSS PLOTS.....	2
- ESTIMATION OF RW.....	2
- ESTIMATION OF VSHALE.....	2
- POROSITIES.....	3
- DETERMINATION OF SW.....	3
- INPUT PARAMETERS.....	3
- CONCLUSIONS.....	4

NORWAY OFFSHORE
 LICENSE NO. 022

Well data

Well name : 3/5-2
 Location : 56°32' 34.456" N
 : 04°23' 11.073" E

Classification: Wildcat
 Prospect : Jurassic sands
 Drilling period: 29th June - 22nd August
 KB elevation : 25.3m
 Water depth : 67m

Abstract

The 3/5-2 well was drilled to explore the potential of the Jurassic sands in a structure south west of 3/5-1, and separated from the latter by a major fault.

The only logs available for this hand evaluation is GR/CAL/FDC/CNL-logs and GR/SP/ISF-Sonic-logs.

Table of Summary

	Interval, ft	Gross thickness, ft	Net thickness, ft
Zone 1	10421-10442	21	18
Zone 2 (Brent)	10968-11730	762	170± 5
Zone 3	12484-12538	54	18

Introduction

This report concentrates on the interval 10968-11730, which is a sequence of interbedded shales and deltaic sands. The formation is known as the Brent sand.

Resistivity corrections

There is no borehole correction on the Induction log in the 8½" hole. The thin bed corrections are negligible as the shoulder bed resistivity is approximately equal or slightly higher than the RIL. A small correction has been applied on the very thin beds with low resistivity, otherwise RIL has been used as Rt.

There is no Rxo-log available.

cross plots

The following cross plots have been made:

Fig 1: ρ_b vs. Rt

Fig 2: ρ_b vs. ϕ_N

Fig 3: ϕ_N vs. Δt

Estimation of Rw

The ρ_b vs. Rt plot has been used, and gives a Rw of 0.023 Ωm .

From the SP-log an average Rw has been calc. using following parameters.

SSP = -32, BHT = 230°F, Rmf (230°F) = 0.039 Ωm

This gives a Rw of 0.024 Ωm . Rw=0.023 Ωm has been used in the water saturation calculations.

Estimation of Vshale

The shale volume has been calculated from the GR-log using the following relation:

$$V_{sh} \leq \frac{GR - GR_{min}}{GR_{max} - GR_{min}}$$

The Vsh values are probably on the high side, which decreases the water saturation.

The ρ_b vs ϕ_N cross plot indicate Vsh values, which correspond roughly to those from the GR-curve.

Porosities

The FDC- and CNL logs have been used to determine the porosities, with the Sonic log as a check.

The porosities has been corrected for shale using the following formulaes.

$$\begin{aligned}\phi_{Ncorr} &= \phi_N - V_{sh} \cdot \phi_{Nsh} \\ \phi_{Dcorr} &= \phi_D - V_{sh} \cdot \phi_{Dsh}\end{aligned}$$

In addition the ϕ_N is corrected for sandstone matrix.

The final porosities have then been computed using:

$$\phi_1 = \frac{2 \phi_{Ncorr} + 7 \phi_{Dcorr}}{9}$$

Determination of Sw

The water saturations are calculated from the "Indonesian" water saturation formula:

$$\frac{1}{Rt} = \left[\frac{V_{cl} (1 - \frac{V_{cl}}{2})}{\sqrt{R_{cl}}} + \frac{\phi^{m/2}}{\sqrt{a R_w}} \right] \cdot SW^n$$

Input parameters

Interval (ft)	10968-10978	10978-11043	11043-11220	11220-11730
ρ_{ma} (g/cc)	2.65	2.65	2.65	2.65
Δt_{ma} (ms/ft)	55.5	55.5	55.0	55.0
ρ_{bsh} (g/cc)	2.45	2.45	2.45	2.45
ϕ_{Nsh} (%)	30	30	30	30
GRmax (API)	110	110	110	110
GRmin (API)	30	30	30	30
Rmf (Ωm)	0.039	0.039	0.039	0.039
Rw (Ωm)	0.023	0.023	0.023	0.023
Rsh (Ωm)	1.0	2.0	1.0	1.5
m	2.0	2.0	2.0	2.0
n	2.0	2.0	2.0	2.0
a	0.81	0.81	0.81	0.81
ρ_{fl} (g/cc)	1.0	1.0	1.0	1.0

Conclusions

The operator reports 100% watersaturation throughout. However, traces of fluorecence and a poor yellowish-white cut is reported in the daily drilling reports in the interval 10997-11048 ft.

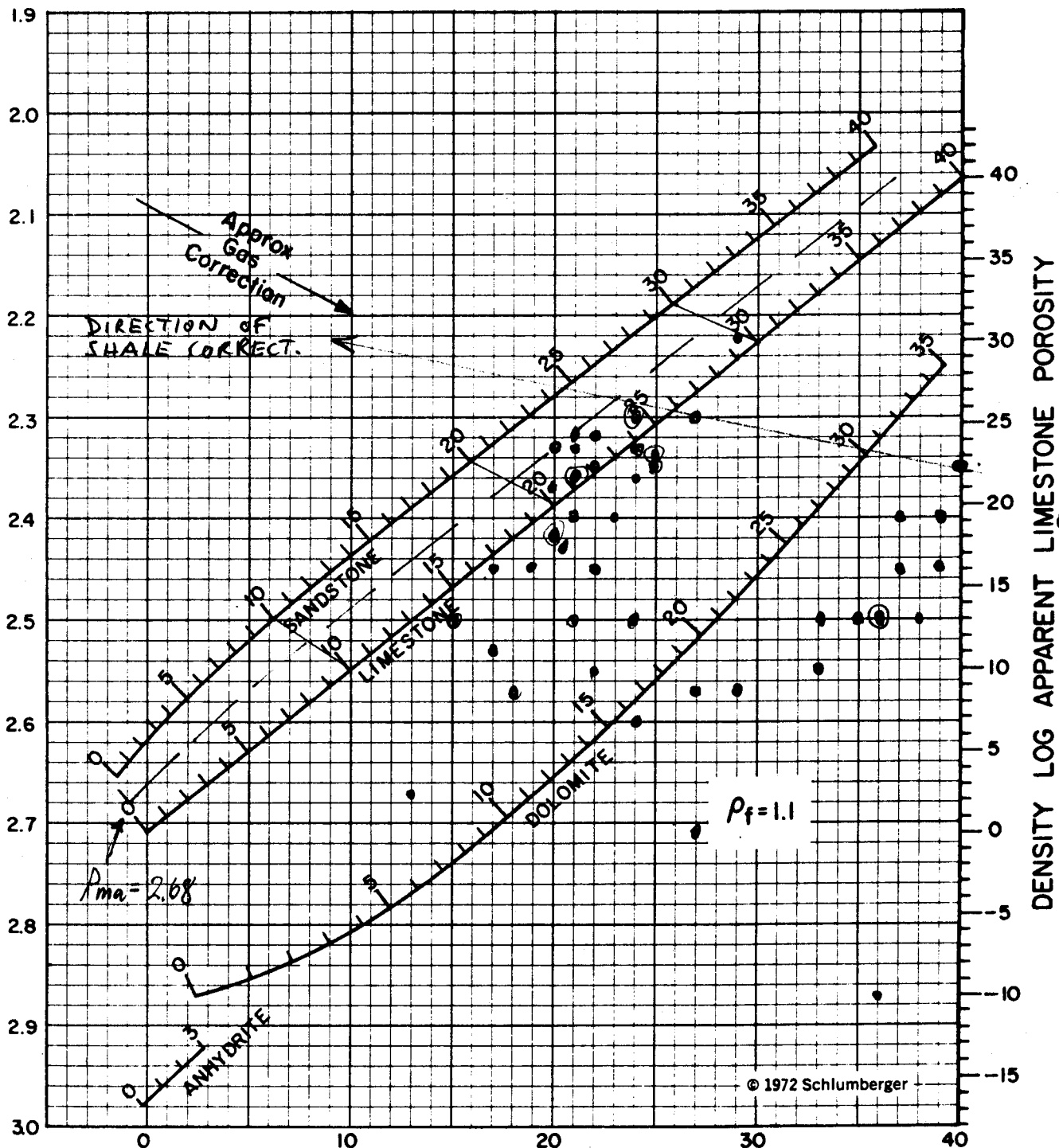
The log analysis indicate water through most of the Brent sand, with occasionally some, probably residual, hydrocarbons.

The attached data sheet shows an interval 11003-11006 with a Sw of 37%. A shale volume of 48% has been estimated, which might be high. A Vsh of 10% would however still give Sw of 45%. This thin layer probably contains movable hydrocarbons.

The interval 11222-11230 calculates a Sw of 64%. Also this layer contains a considerable shale volume, but nevertheless indicate a possible presence of hydrocarbons.

Zone 1 and 3 are waterbearing. These are not included in the data sheet.

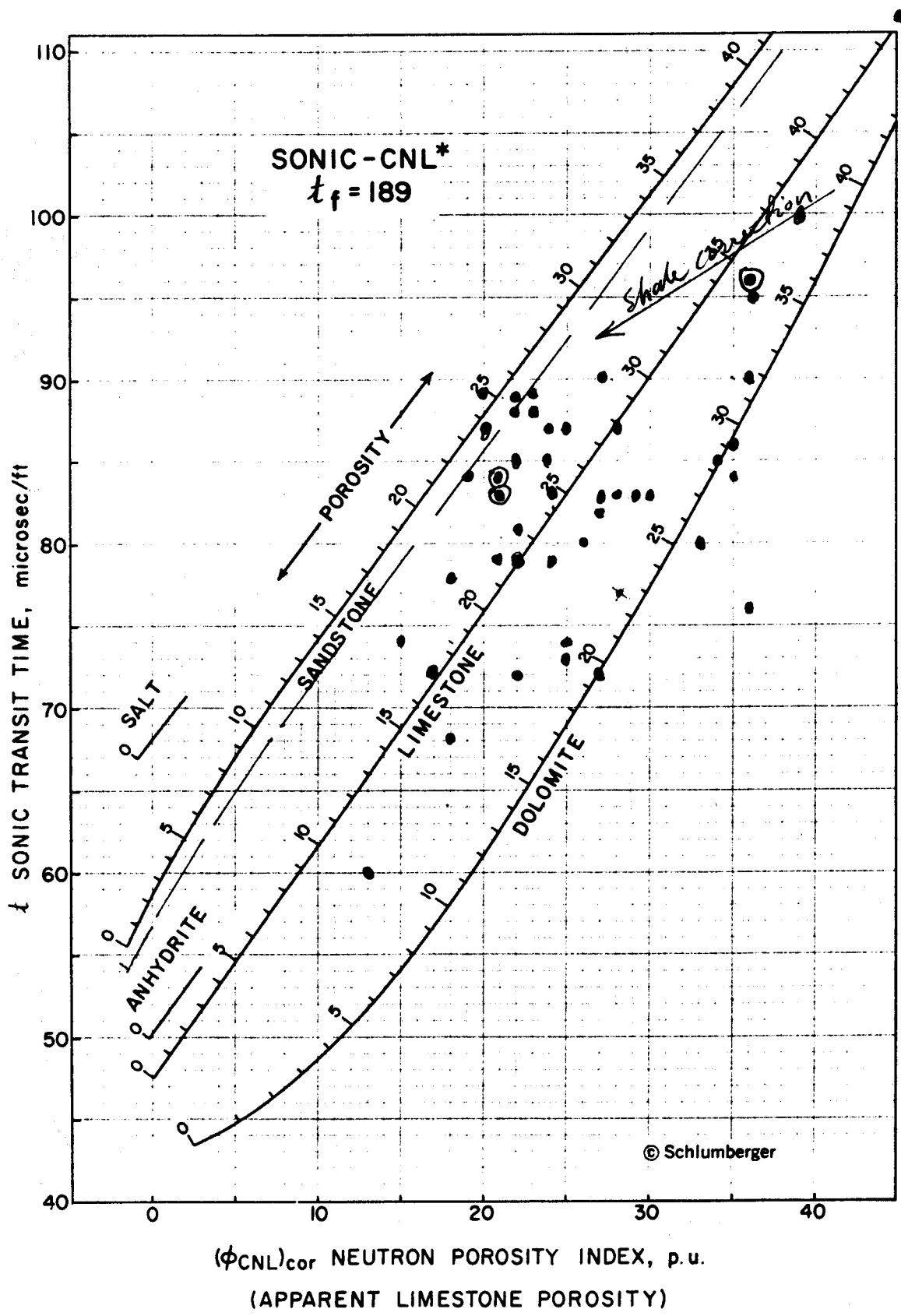
POROSITY AND LITHOLOGY DETERMINATION FROM
 FORMATION DENSITY LOG AND
 COMPENSATED NEUTRON LOG (CNL)
 SALT WATER, LIQUID-FILLED HOLES



CNL NEUTRON INDEX (ϕ_{CNL})_C (APPARENT LIMESTONE POROSITY)

- - Sand, shaly sand
- ◉ - two or more plots
- - Shale

POROSITY AND LITHOLOGY DETERMINATION FROM SONIC LOG AND COMPENSATED NEUTRON LOG (CNL*)



Gen
SP
Por
CP
Rxo
Rcor
Rint
Σ cor
SW
M k

© Schlumberger

POROSITY VS RESISTIVITY

WELL 3/5-2. BRENT SAND.

