

SIMPLE

Exercise simple: How to square log readings and determination of net thickness.

Objectives:

- Getting acquainted with the relations between FDC-CNL logs, porosity and shaliness of sandstone and shales.
- In this case porosity determination is an important objective. A comparable evaluation can be made for:
 - . water-influx tests from roof rock of coal seams and ore bodies.
 - . determination of the vertical lithology in fresh water reservoirs.

Well SIMPLE-6

Reservoir characteristics:

- The formation is an unconsolidated sandstone.
- Matrix densities measured on the core: approximately 2.65 g/cc.
- Formation temperature: 58°C.
- Qv-values measured on the core are approx. 0.04 meq/ml PV.
- Formation water salinity = 85000 ppm NaCl.
- $m = 1.6$

Mud characteristics

- $R_{mf} = 0.055 \text{ Ohm.m}$ at 58°C, thus 73000 ppm
- The RLLd does not have to be corrected for borehole and invasion effects.

SIMPLE Questions:

- Finish table 1 down to 1265 m (square Density and Neutron only).
- Plot the layers in a Density-Neutron cross plot.
- Determine fluid in the pores (Gas/Oil/Water).
- Calculate for the gas cap:
 - Net sand thickness,
 - Mean porosity,
 - Mean Sh,
 - Sh-column.
- Determine for each layer in interval 1250 -1265, using FDC-CNL plot:
 - Shaliness,
 - Total and effective porosity (using wet shale density = 2.55 gr/cc, shale Neutron por = 36 p.u. (porosity units), dry shale density = 2.65 gr/cc.)

Table 1: Squared and multiplexed log-values

Top	Depth	Density	Neutron	Rlld	Ø total	Sw	Fluid
Layer	(m)	(g/cc)	(p.u.)	(ohm.m)	(%)		type
1*	1240.2		27	6			
2	1240.9		24	6			
3	1241.4		24	6			
4	1242		7	90			
5	1242.5		7	140			
6	1243.3		6	55			
7	1244		8	200			
8	1244.4		6	60			
9	1245.1		29	60			
10	1245.9 1247.5		29	270			

* Layer 1 refers to the interval from 1240.2 - 1240.9 m. The depth in this column indicates the top of the layer.

Table 2: Gas net count results

Interval	thickness "h"	∅	h * ∅	Shc	h * ∅ * Shc
(m)	(m)		(m)		(m)

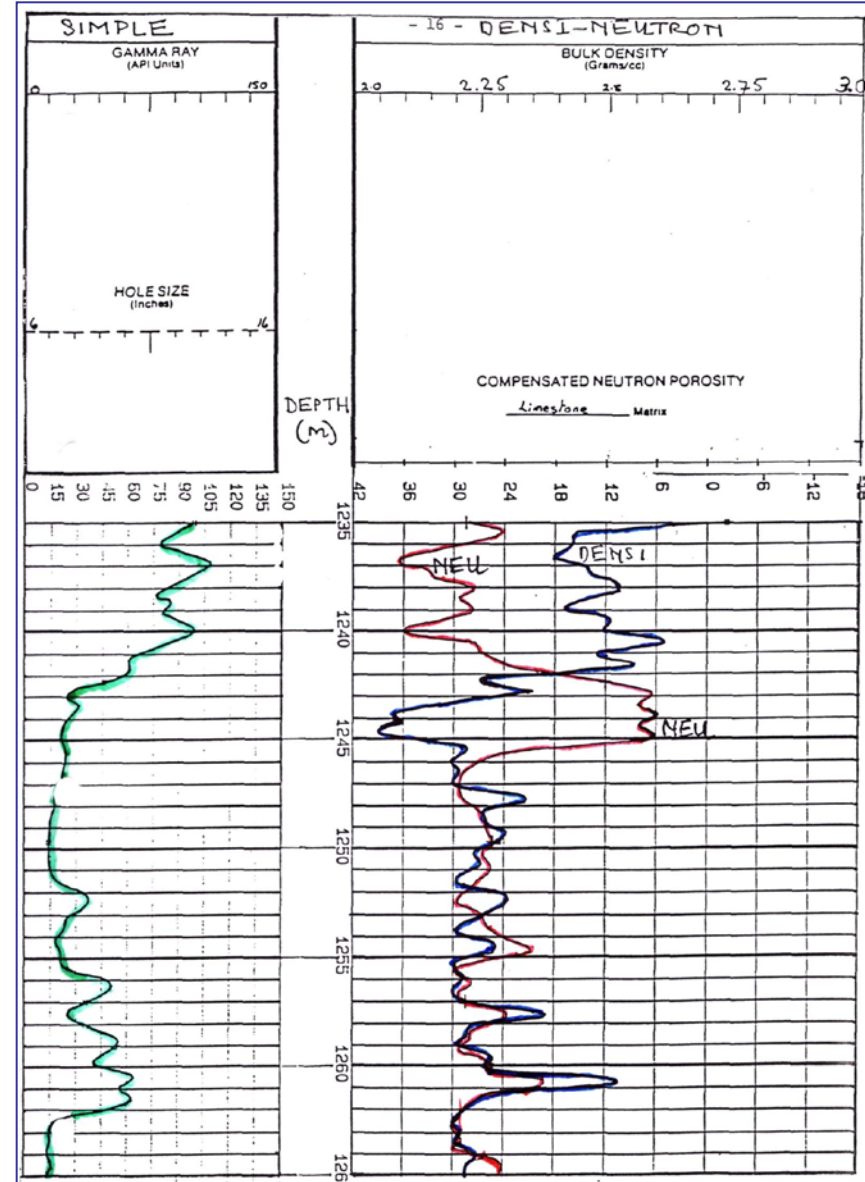
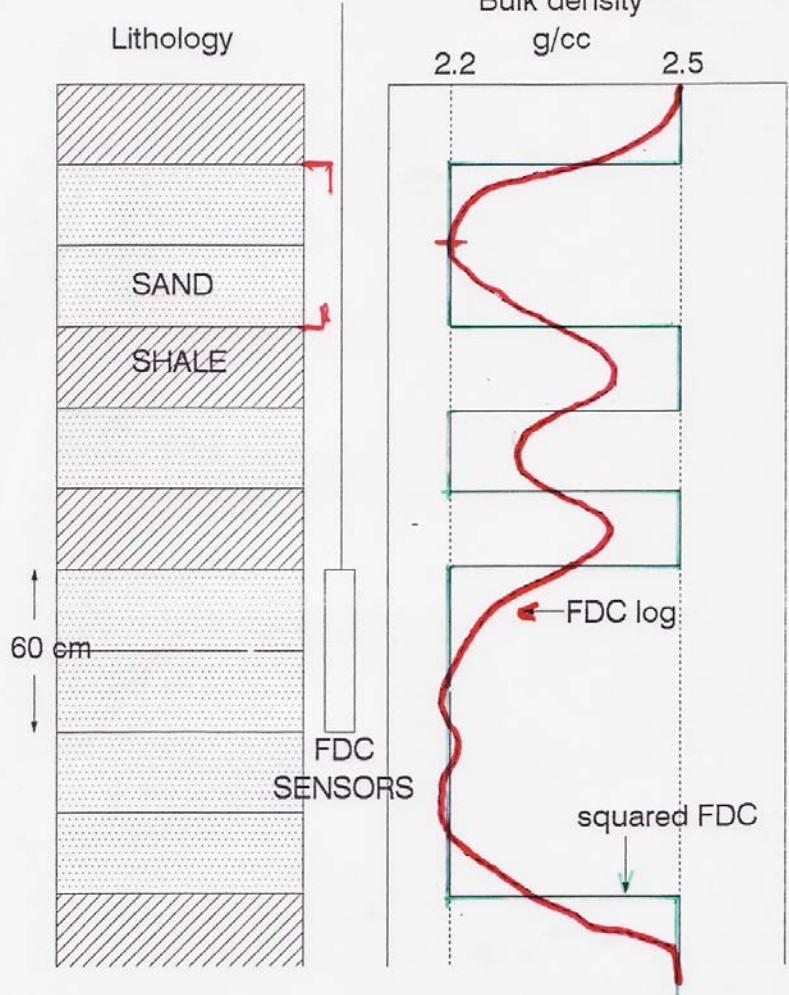
Mean porosity :
Porosity column :
Mean Shc :
h.c. column :

Table 3: FDC-CNL porosity and Vsh

Layer	Depth (m)	Density (g/cc)	Neutron (p.u.)	Vsh	ϕ total	ϕ eff
11	1247.5					
12						
13						
14						
15						
16						
17						
18						
19						
20						

EFFECT OF SQUARING is a function of:

- * thickness of the layer
- * vertical resolution of the tool
- * physical response formation $\pm 0.02 \text{ g/cc}$



FDC-CNL Cross Plot

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

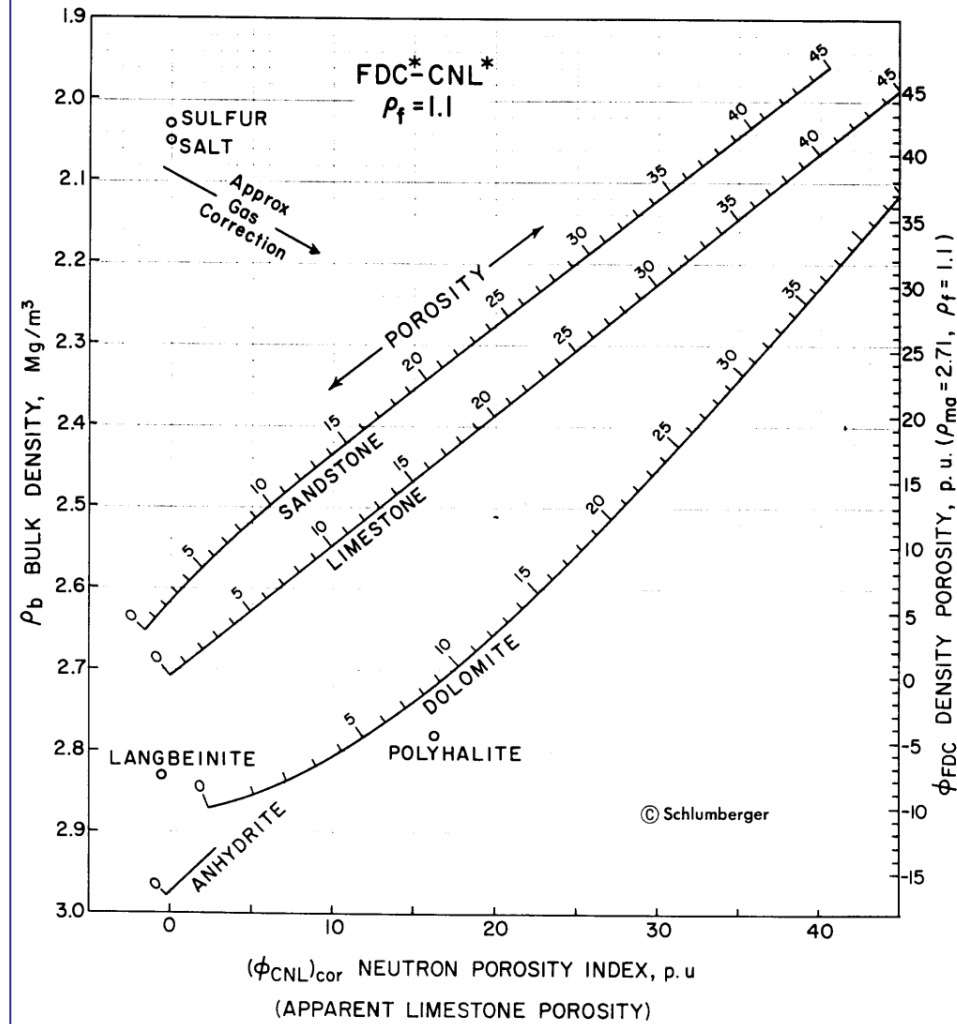


Figure 2: FDC-CNL plot, limestone compensated

