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Petro-Physical Analysis Of Reservoir Rock Of Fenchuganj Gas Field (Well#03) Using Wireline Log

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ABSTRACT: *The present paper highlights the results of a study conducted to determine and evaluate the petrophysical properties of Fenchuganj Gas Field, well#03 in Sylhet district of Bangladesh with a view to understand their effects on the reservoir hydrocarbon prospects and gas productivity of the field. The evaluated properties include porosity, permeability and fluid saturation which are all inferred from geophysical wireline logs. A suite of wireline logs comprising of gamma ray, spontaneous potential, caliper log, resistivity, neutron log, density log and sonic log for well # 03 from Fenchuganj Gas Field were analyzed for reservoir characterization of the field. The analysis carried out involves lithology identification and determinations of petrophysical parameters. Seven reservoirs zone namely: A, B, C, D, E, F and G were delineated with their tops and bases at depth from 1656 m to 2627 m. Computed petrophysical parameters across the reservoir gave porosity as ranging from 16 to 25%; permeability from 14 to 195 mili Darcy(md) and average hydrocarbon saturation of 86%, 35%, 57%, 52%, 47%, 97%, and 47% for reservoir zone A, B, C, D, E, F and G, respectively. These results suggest high hydrocarbon production potential and a reservoir system which performance is considered satisfactory for hydrocarbon production.*

KEYWORDS: *porosity, permeability, petrophysical properties, wireline logs.*

I. INTRODUCTION

Petrophysics is the study of rock properties and their interactions with fluids (gases, liquid hydrocarbons and aqueous solutions). The amount of hydrocarbon present in a reservoir is a function of its porosity and its hydrocarbon saturation [1]. In addition, the efficiency, reservoir can perform, is function of its permeability. Table 1 provides an effective explanation of porosity and permeability description of reservoirs [2].These parameters can be measured on core plugs, which are often considered as representing “ground truth.” However, core plug measurements are also affected by errors. In addition, coring is very expensive and there is never any guarantee that the target reservoir won’t be missed by the core, or that the full cored interval will be recovered. This is why wireline logs have become the primary source of data for petrophysical evaluation of reservoirs and are routinely recorded on every oil and gas well. . In this study the gamma ray (GR), spontaneous potential (SP), caliper log, resistivity log (LLD), and density (PHID) logs have been used to categorize the lithology of the prospective zones, differentiate between hydrocarbon bearing and non-hydrocarbon bearing zones and determine the values of petrophysical properties of the zones of interest (reservoir) in the field such as porosity, permeability, resistivity, water saturation and hydrocarbon saturation. The Fenchuganj Gas Field (FGF) is one of the largest gas fields of Bangladesh which is located in the northern-east part of the country (Figure 1). The major objective of the present study is to evaluate the petro-physical characterization of the reservoir rocks including the porosity, permeability and fluid saturation of the Fenchuganj Gas Field.

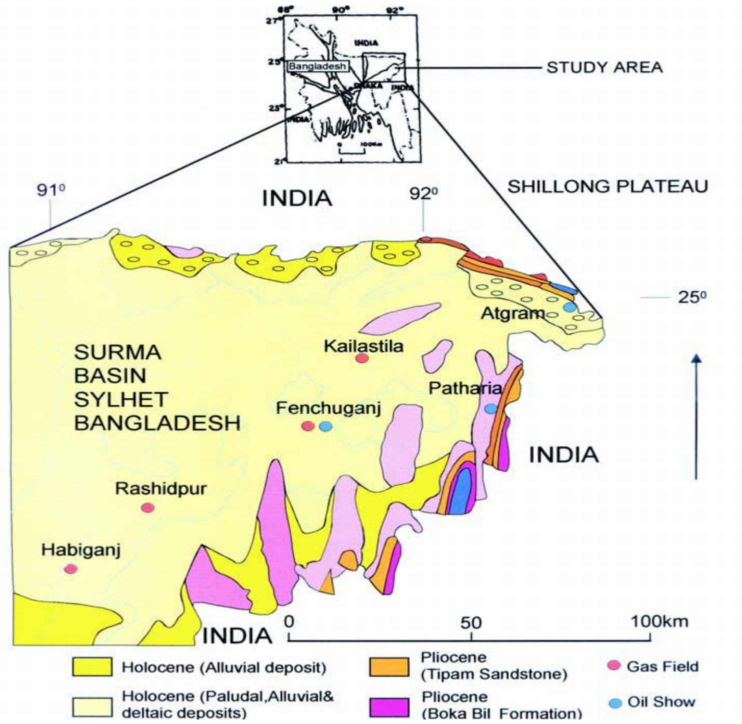

Figure 1: Geological map of Surma Basin, Sylhet, Bangladesh. Showing the location of Fenchuganj Gas Field.(after Alam et al. 1990 [3]

Table I: *Porosity and Permeability values for Reservoirs Qualitative Description [2] (Adapted from Rider, 1986)*

Qualitative Evaluation of Porosity	
Percentage Porosity (%)	*Qualitative Description*
0 - 5	Negligible
5 - 10	Poor
15 - 20	Good
20 – 30	Very Good
> 30	Excellent
Qualitative Evaluation of Permeability	
Average K Value (md)	*Qualitative Description*
< 10.5	Poor to fair
15 – 50	Moderate
50 – 250	Good
250 – 1000	Very Good
> 1000	Excellent

II. METHOD AND MATERIALS

LITHOLOGY IDENTIFICATION & PETROPHYSICAL ANALYSIS OF RESERVOIR ROCK

Reservoir rock :A rock capable of producing oil, gas and water is called a reservoir rock. In general, to be of commercial value, a reservoir rock must have sufficient thickness, areal extent and pore space to contain a large volume of hydrocarbons and must yield the contained fluids at a satisfactory rate when the reservoir is penetrated by a well. Any buried rock, be it sedimentary, igneous or metamorphic, that meets these conditions may be used as a reservoir rock by migrating hydrocarbons. Oil and gas fields are geological features that result from the coincident occurrence of four types of geologic features (Figures 2 and 3) [4]:

(1) Source Rocks,
(2) Reservoir Rocks,
(3) Seals, and (4) Traps

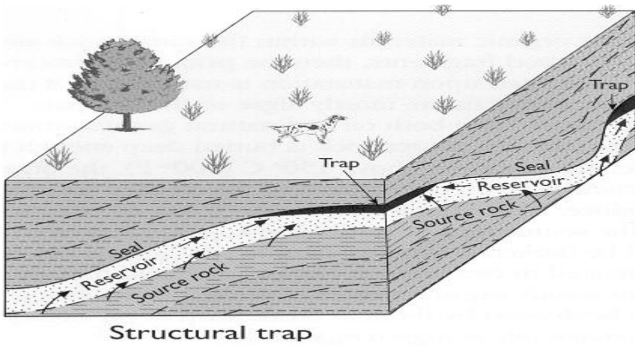

Figure 2: Structural Trap

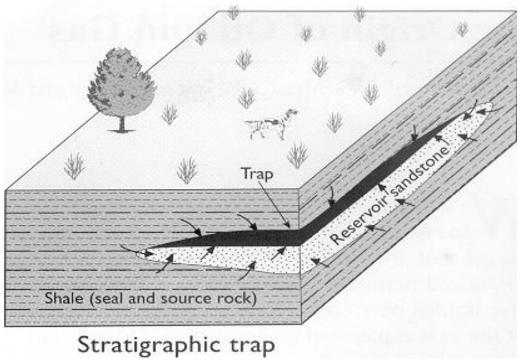

Figure 3: Stratigraphic Trap

However, most reservoir rocks are sedimentary rocks. Sandstones and carbonates (limestone and dolomites) are the most common reservoir rocks. They contain most of the world's petroleum reserves in about equal proportions even though carbonates make up only about 25% of sedimentary rocks. The reservoir character of a rock may be primary such as the intergranular porosity of a sandstone, or secondary, resulting from chemical or physical changes such as dolomitization, solution and fracturing.

Shales frequently form the impermeable cap rocks for petroleum traps. The distribution of reservoirs and the trend of pore space are the end product of numerous natural processes, some depositional and some post-depositional. Their prediction, and the explanation and prediction of their performance involve the recognition of the genesis of the ancient sediments, the interpretation of which depends upon an understanding of sedimentary and diagenetic processes.

Well Log Analysis : Well log is a continuous record of measurement made in borehole respond to variation in some physical properties of rocks through which the bore hole is drilled. Traditionally Logs are display on girded papers shown in figure. Nowadays the log may be taken as films, images, and in digital format [6]**.**

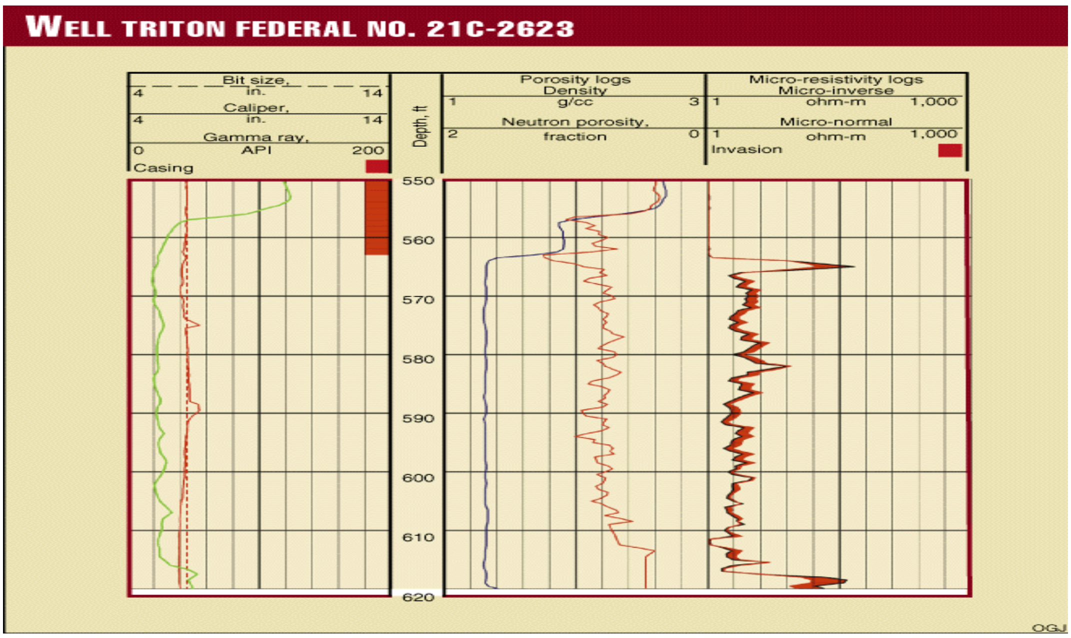

Figure 4: Well log showing different kinds of log presentation.

The analysis of petrophysical logs in this study was aimed at a qualitative and quantitative determination of the properties of delineated reservoirs. The gamma ray (GR) and spontaneous potential (SP) logs were examined for lithologic information. In the reservoir formations vis a vis at shale beds, gamma ray (GR) log which measures natural radioactivity in formations reflects the shale contents while the SP log displays excursion from the shale base line, hence both logs were used for the identification of sand / shale lithology in the study area [5]. The resistivity log in combination with the GR log were used to differentiate between hydrocarbon and non-hydrocarbon bearing zones. In hydrocarbon bearing formation, the resistivity log signatures show high resistivity values than when in water bearing formation. The discrimination of the various fluid types i.e. oil / gas within reservoirs could not be achieved because of the non availability of neutron log among materials used in carrying out the study.

Lithology Identification of Fenchugonj Gas Field (Well # 03) using Gamma Ray (GR) Log

Lithology is often used to describe the solid(matrix) portion of the rock, generally in the context of a description of the primary mineralogy of the rock (e.g., a sandstone as a description of a rock composed primarily of quartz grains , or a limestone composed primarily of calcium carbonate) [5]. The Gamma Ray (GR) log measures the natural radioactivity of the formations in the borehole. The log is therefore, useful for identifying lithologies and for correlation purposes. In sedimentary formations, the GR log normally reflects the shale content of the formations because of the concentration of radioactive materials in the shale\clays. Shale-free sandstones and carbonates have low gamma ray values, unless radioactive contaminants (volcanic ash, granite wash, or potassium rich fluids) are present [6]. Shale exhibit relatively high GR count rates due to presence of potassium ions in the lattice structure of clay mineral .On the other hand, reservoir rock (calcite, dolomite, quartz) exhibit relatively low GR count rates due to absence of potassium ions in the lattice structure of mineral [7].Some of low radioactivity and high radioactivity's material are shown in table II.

Table II: ***Distribution of common rocks with respect to their radio activities***

Low Radioactivity	High Radioactivity
Halite Gypsum Anhydrite Limestone Dolomite Sandstone	Shales Igneous rock

Scale of GR: It is plotted as API Gamma Ray Units ranging from a low of zero (0) to as high as two hundred (200) or more. One should always check the scale being used. In common use today is a scale of zero (0) to 200 API Units [8]

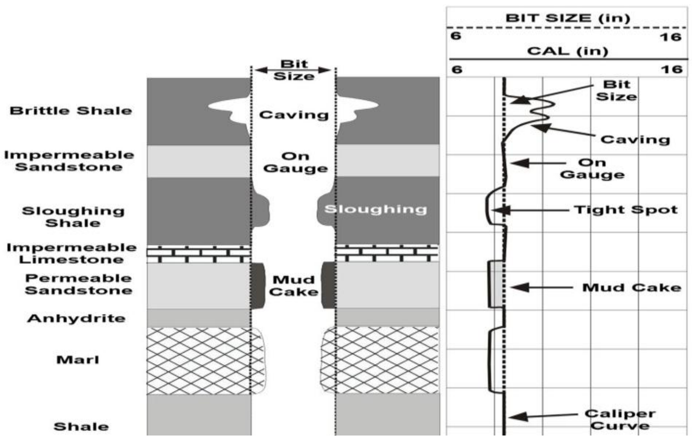

Figure 5: Well Log showing Gamma Ray , Caliper Log , Resistivity Log and Porosity log scale.

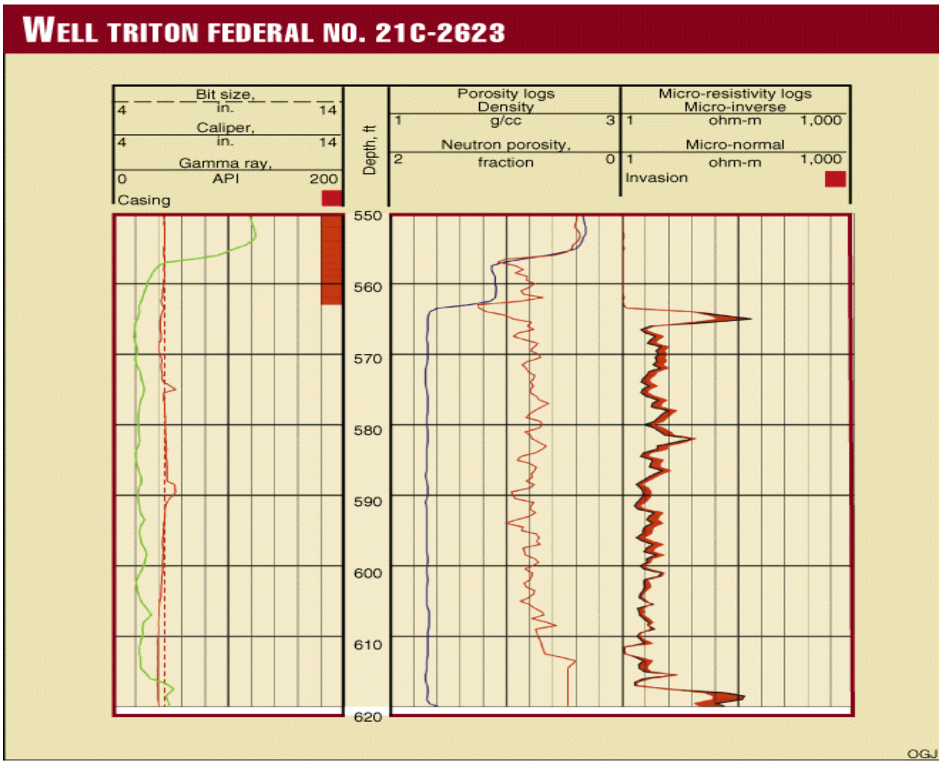

Figure 6: Mud cake formation in porous zone indicating permeability

Lithology Identification of Fenchugonj Gas Field (Well # 03) using Spontaneous Log (SP)

The SP tool is one of the simplest tools and is generally run as standard when logging a hole, along with the gamma ray. SP data can be used to find where the permeable formations are present. Permeable zone has been identified in the SP log. Since Negative maximum deflection from shale base line in SP log indicates the permeable zone [7]. Negative deflection at reservoir zone A, B, C, D, E, F and G which are indicating that these zone are porous formation at FGF (well#03).

Permeable formation determination based on Caliper log

Hole diameter is smaller than bit size due to development of mud cake for porous and permeable formation which are indicating the permeability [5,13]. According to Gamma Ray Log, SP Log and Caliper log, reservoir formation i.e. sandstone has been identified in FGF (well#03) and shown in table III.

Table III: ***Lithology Identification of Fenchugonj Gas Field (well # 3) using GR Log, SP Log and Caliper Log***

Depth (meter)	Lithology	Remark
1500-1656	Shale	
1656-1680	Sand	Zone A
1680-1992	Shale	
1992-2017	Sand	Zone B
2017-2030	Shale	
2030-2086	Sand	Zone C
2086-2148	Shale	
2148-2154	Sand	Zone D
2154-2206	Shale	
2206-2260	Sand	Zone E
2260-2511	Shale	
2511-2526	Sand	Zone F
2526-2612	Shale	
2612-2627	Sand	Zone G
2627-2700	Shale	

DETERMINATION POROSITY USING DENSITY LOG, NEUTRON LOG AND SONIC LOG

Definition of Porosity : Porosity gives an indication of the rock's ability to store fluids. It is defined as the ratio of the pore volume to the bulk volume of the porous medium as shown in the following equation [5]:

Porosity, $\emptyset = \frac{Vp}{Vb} = \frac{Vb-Vs}{Vb}$ (1)

where Φ= Porosity, %, V_p =Pure volume, V_b=Bulk volume and V_s=Solid volume

Principle of Density log:

The density logging tool has a relatively shallow depth of investigation, and as a result, is held against the side of the borehole during logging to maximize its response to the formation. The tool is comprised of a medium –energy gammy ray source (cobalt 60, cesium 137). Two gamma ray detectors provide some measure of compensation for borehole condition. When the emitted gamma rays collide with electrons in the formation, the collisions result in a loss of energy from the gamma ray particle. The scattered gamma rays that return to the detectors in the tool are measured in two energy ranges [5]. This type of interaction is known as Compton scattering. The scattered gamma rays reaching the detector, at a fixed distance from the source, are counted as an indication of the formation density.

Hence, the expression for bulk density is [7]

$$\rho_b = \rho_{ma} (1 - \phi) + \rho_f \ \phi \qquad (2)$$

Where, ϕ_d, ρ_{ma}, ρ_b and ρ_f are porosity from density log ,density of formation matrix, g/cm^3 (for Sand2.65), bulk density from log measurement, g/cm^3 and density of fluid in rock pores, g/cm^3 (formation water, 1.1) respectively.

Porosity from density log, Φ_D= (ρ_{ma-} ρ_b) /($\rho_{ma-}\rho_f$) (3)

Where ρ_{ma}= matrix of sand (2.65), ρ_b = Bulk density (from log data)

ρ_f = Fluid density (from chart , formation water, 1.1)

Principle of Neutron Log

Neutron logs are basically a measure of the amount of hydrogen contained in the formation [9]. High neutron count rate indicates low porosity, while low neutron count rate indicates high porosity. While there is very little difference between oil and water, the neutron tool will distinguish between gas and oil saturations. When gas is measured, the porosity will appear very low because there is a lower concentration of hydrogen in gas than in oil or water. A decrease in neutron porosity by the presence of gas is called gas effect [5].

Porosity from Density and Neutron log

The combination of the neutron and density measurements is probably most widely used porosity log combination. The response of the combination is such that for reconnaissance evaluation one can forego the crossplot and rely on recognition of the curve patterns to quickly determine the most likely predominant lithology and formation porosity [5].

$\Phi_{D\text{-}N} = \sqrt{(\Phi_D 2 + \Phi_N 2)/2}$ (4)

Where Φ_D = from equation (3)

Φ_N = Neutron Log provides Φ_N directly

Principle of Sonic Log (Acoustic Log)

The Sonic log is a porosity log that measures interval transit time (Δt) of a compressional sound wave travelling though the formation along the axis of the borehole. The sonic log device consists of one or more ultrasonic transmitters and two or more receivers [5]. Known as the interval transit time, Δt is the reciprocal of the velocity of the compressional sound wave. To avoid fractions, the interval transit time is scaled by 106 and reported in micro-seconds per ft (μsec/ft). Thus, Δt = 106/v, where Δt is the interval transit time in μsec/ft and V is the compressional wave velocity in ft/s

Wyllie time-average porosity equations (Wyllie et al.,1958):

$\Phi_s = (T_{log} - T_{matrix})/(T_f - T_{mat})$ (5)

T_{log} =from sonic log

T_{matrix}= 55-51 micro second, for sand

T_{fluid}= 185 micro second, for salt base water and 189 for fresh water.

Determining porosity from different log using above mentioned equation has been shown in **table V.**

III. RESULTS AND DISCUSSION

3.1 Qualitative Interpretation

According to GR log, SP log and Caliper Log, seven sand bodies marked reservoir zone A, B, C, D, E, F and G were found across the FGF at Well # 03. From the analysis, particularly the resistivity logs, all the seven delineated reservoirs were identified as hydrocarbon bearing reservoir across the FGF at well # 03.

3.2 Quantitative Interpretation

Quantitatively, the petrophysical parameters are estimated using empirical formulae as follows. The methodology as earlier reported was chosen for the quantitative interpretation of the delineated reservoirs in each reservoir zone. Table IV represents the results of some computed petrophysical parameters for well #03 in reservoir zone A.

Table IV: ***Picking value from FGF (well #03) log at zone A (depth 1656-1680 meter)***

Depth	GR	SP	LL3	ILM	ILD	Density log	Neutron log	Sonic transit time
Meter	API		Ohm-m	Ohm-m	Ohm-m	Bulk density(ρ) gm/cc	Porosity(Φ), %	T_{Log} μsec/ft
1656-1658	150	50	3.5	6.5	7	2.25	0.36	120
1658-1660	130	54	3	5.5	9	2.225	0.36	148
1660-1662	115	53	3.2	5	9.5	2.225	0.195	148
1662-1664	130	53	2.5	5	8	2.35	0.195	120
1664-1666	130	52	2.8	5	6	2.3	0.195	100
1666-1668	130	52	3.5	5	5.5	2.35	0.195	95
1668-1670	130	52	3.5	5	6	2.35	0.195	100
1670-1672	130	52	3.5	5	6	2.32	0.195	98
1672-1674	130	52	5	5	6	2.28	0.195	100
1674-1676	130	55	5	5.5	8	2.3	0.195	100
1676-1678	130	52	5	5.5	5.5	2.32	0.195	100
1678-1680	150	50	3.5	5	6.5	2.33	0.195	90

Table V: ***Porosity calculation for reservoir zone A at FGF (well#03) using above mentioned equation***

Reservoir Zone A/ Depth	Bulk density from Density log, eq[2]	Porosity from Density log,eq[3]	Porosity from Neutron log	Porosity from Density- Neutron log,eq[4]	Transit time from Sonic log,	Porosity from Sonic log Eq[5]
(meter)	ρ_b (gm/cc)	Φ_D (100%)	Φ_N(100%)	$\Phi_{D\text{-}N}$ (100%)	T Log(μsec/ft)	Φs(100%)
1656-1658	2.25	0.258	0.36	0.31318	120	0.507576
1658-1660	2.25	0.27412	0.36	0.319957	148	0.719697
1660-1662	2.22	0.27412	0.195	0.237876	148	0.719697
1662-1664	2.35	0.1935	0.195	0.194251	120	0.507576
1664-1666	2.3	0.2257	0.195	0.211	100	0.356
1666-1668	2.35	0.1935	0.195	0.194251	95	0.318182
1668-1670	2.35	0.1935	0.195	0.194251	100	0.356061
1670-1672	2.32	0.21285	0.195	0.20412	98	0.340909
1672-1674	2.28	0.23865	0.195	0.217921	100	0.356061
1674-1676	2.3	0.22575	0.195	0.210936	100	0.356061
1676-1678	2.32	0.21285	0.195	0.20412	100	0.356061
1678-1680	2.33	0.2064	0.195	0.200781	90	0.280303
Average		0.22575	0.2225	0.225215		43.119%

4.2.7: Porosity determination from neutron Log, density log, density-neutron log and sonic log

After calculating porosity for Zone A, we can similarly estimate the porosities for Zone B, Zone C, Zone D, Zone E, Zone F and Zone G **revealed in table VI**.

Table VI: ***Average porosity for reservoir Zone A, B, C. D, E, F and G at FGF Well # 03***

Zone /Depth	Average Density porosity %	Average Neutron porosity%	Average Density-Neutron porosity%	Average Sonic porosity %
A(1656m-1680)	22.575	22.25	22.5215	43.1187
B (1992-2018)	18.66	21.24	20.08	52.38
C(2030- 2086)	26.81	19.01	23.38	54.89
D(2148-2154)	29.50	20.67	25.72	46.04
E (2206-2260)	20.54	23.67	22.27	34.01
F (2511-2526)	21.45	24.75	16.39	18.51
G(2612-2628)	17.01	23.13	20.52	22.92

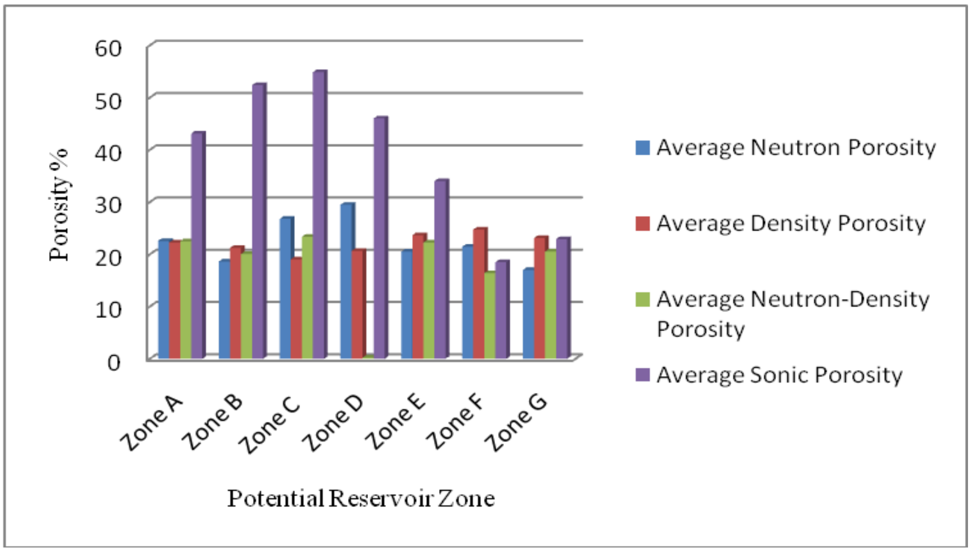

Figure 7: Comparison of porosities of neutron log, density log, density-neutron log and sonic log

HYDROCARBON ZONE DETECTION BASED ON RESISTIVITY LOG

The resistivity log is a measure of a formation's resistivity. In log interpretation, the hydrocarbons, the rock, and and the fresh water of the formaton are all assumed to act as insulators and are, therefore, nonconductive (or at least very highly resistive) to electric current flow. Salt water, however, is a conductor and has a low resistivity. Resistivity is a basic measurement of a reservoir's fluid saturation and is a function of porosity, type of fluid (i.e. hydrocarbon, salt water, or fresh water),amount of fluid , and type of rock . because both the rock and hydrocarbons act as insulators but salt water is conductive, resisitivity measurements made by loggong tools can be used to detect hydrocarbons and estimate the porosity of a reservoir [5]. In this research, deep resistivity and shallow resistivity were studied. Deep resistivity is the resistivity recorded farther away from the inversion core created by the drilling mud. Shallow resistivity log is the resistivity recorded close to the oil well bore. A deep resistivity and shallow resistivity with low gamma ray log is indicative of hydrocarbon (HC) presence. Shales show low resistivity values with high gamma ray values.

CALCULATION OF WATER SATURATION

To calculate water saturation, Sw of uninvaded zone, the method used requires a water resistivity *Rw* value at formation temperature calculated from the porosity and resistivity logs within clean water zone, using the Ro method given by the following equation:

$$Rw = \frac{\emptyset^{m} * Ro}{a} \qquad (6)$$

Rw is the water resistivity at formation temperature, Φ and Ro are the total porosity and deep resistivity values in the water zone respectively. Tortuosity factor is represented as "a" and m is the cementation exponent, usually 2 for sands [10]. In the water zone, saturation should be equal to 1, as water resistivity *Rw* at formation temperature is equal to *Rwa,* Water saturation, Sw can then be calculated using Archie's method, given by:

$$Sw = \sqrt[n]{(Rw/Rwa)} \qquad (7)$$

where *n* is the saturation exponent and *Rwa* is water resistivity in the zone of interest, calculated in the same manner as *Rw* at formation temperature [11].

Formation water equivalent Resistivity

$R_{we} = \Phi_{D\text{-}N}2$ *R (8)

R_0 = Formation water resistivity =LL3 (from log data), for 100% water

Lowest value of $R_{we} = R_w$

R_t/R_{LL3}= ? (using R_{LL3}/R_{ILD} versus R_{LL3}/R_{ILM} at tornedo curve (9)

$R_t = (R_t/R_{LL3}) * R_{LL3}$ (10)

F =0.81/ $\Phi_{D\text{-}N}2$, if $\Phi_{D\text{-}N}$ value less than 16% (11)

F=0.62/ $\Phi_{D\text{-}N}2.15$, if $\Phi_{D\text{-}N}$ value greater than 16% (12)

$$Sw = \sqrt{(Ro/Rt)} = \sqrt{(FRw/Rt)} \qquad (13)$$

Determination of Hydrocarbon Saturation

Hydrocarbon Saturation, Shc is the percentage of pore volume in a formation occupied by hydrocarbon. It can be determined by subtracting the value obtained for water saturation from 100%

i.e. $S_{HC} = 1 - S_W$ (14)

Determination of Permeability

Permeability, K is the property of a rock to transmit fluids. For each identified reservoir permeability, K is calculated using equation [10].

$$K = \sqrt{\frac{250 * \emptyset^2}{Swi}} \qquad (15)$$

where *Swir* is the irreducible water saturation [12]

Table VII: Picking value from Well Log of FGF(well #03) and determine formation factor, hydrocarbon saturation

Depth	Φ_{D-N}	R_{LL3}	R_{we}	R_{ILM}	R_{ID}	R_{LL3}/R_{ILM}	R_{LL3}/R_{ILD}	R_t/R_{LL3}	R_t	F	S_W	Shc	Permeability
(meter)	%		Eq[3] (Ω-m	Ω-m	Ω-m			Eq[9]	Eq[10] Ω-m	Eq[11/12]	Eq[13] %	Eq[14] %	Eq[15] md
1656-1658	0.3	3.5	0.23	6.5	7	0.54	0.5	1.9	6.65	7.52	0.06	0.93	194
1658-1660	0.3	3	0.22	5.5	9	0.55	0.33	1.9	5.7	7.18	0.07	0.93	179
1660-1662	0.2	3.2	0.24	5	9.5	0.64	0.34	1.9	6.1	13.6	0.13	0.87	88
1662-1664	0.2	2.5	0.09	5	8	0.5	0.31	1.9	4.8	21.0	0.25	0.75	63
1664-1666	0.1	2.8	0.14	5	6	0.56	0.47	1.9	5.3	17.6	0.19	0.81	36
1666-1668	0.2	3.5	0.13	5	5.5	0.7	0.64	1.9	6.6	21.0	0.18	0.82	75
1668-1670	0.2	3.5	0.13	5	6	0.7	0.58	1.9	6.6	21.0	0.18	0.81	75
1670-1672	0.2	3.5	0.16	5	6	0.7	0.58	1.9	6.6	18.9	0.16	0.84	79
1672-1674	0.2	5	0.28	5	6	1	0.83	1.9	9.5	16.4	0.11	0.90	95
1674-1676	0.2	5	0.25	5.5	8	0.91	0.63	1.9	9.5	17.6	0.11	0.89	95
1676-1678	0.2	5	0.23	5.5	5.5	0.91	0.91	1.9	9.5	18.9	0.11	0.88	95
1678-1680	0.2	3.5	0.15	5	6.5	0.7	0.54	1.9	6.6	19.6	0.17	0.83	77
Average									6.9	0.14			95

Table VIII: ***Summary of the Average Petrophysical Parameters for Reservoirs zone A, B, C, D, E, F and G at well #03 of FGF***

Reservoir Zone	Average Porosity	Average Water Saturation (%)	Average Hydrocarbon Saturation (%)	Average Permeability md
A (1656-1680)	22.5215	14.25	85.68	95
B (1992-2017)	20.0726	64.8	35.2	85
C (2030-2086)	23.375	42.99	57.01	91
D (2148-2154)	25.72	47.24	52.76	105
E (2206-2260)	22.27125	53.14	46.86	48
F (2511-2526)	16.3945	2.80	97.20	14
G (2612-2627	20.52	52.85	47.145	32

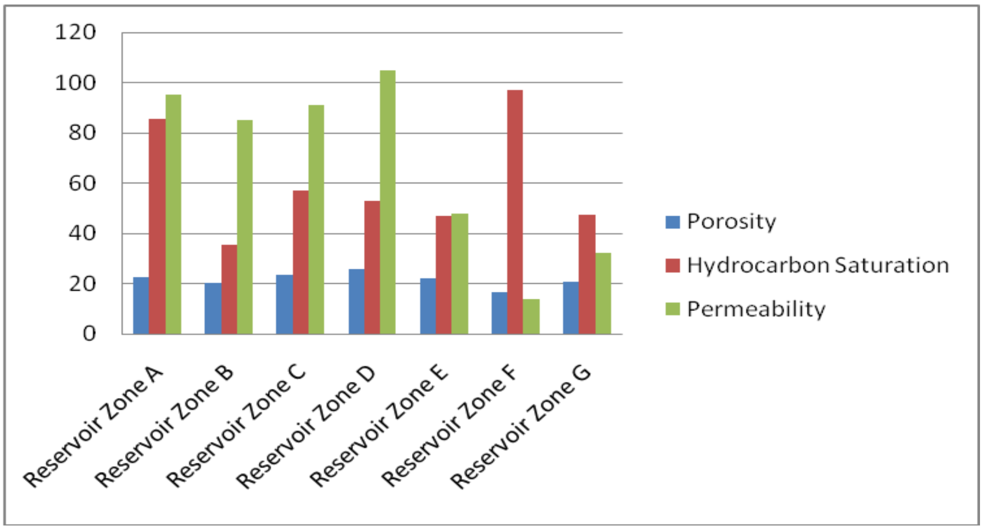

Figure 8: *Relationship between percentage average effective porosity, water saturation, hydrocarbon saturation and permeability of reservoir zone A – G.*

IV. CONCLUSION

An engineer or geologist or geophysicist can interpret the log readings to reach certain conclusions about the formation. For example, negative maximum deflection from shale base line in SP log indicates the permeable zone and an increase in a porosity log might indicate that the formation has porosity and is permeable [7].Besides, resistivity logs determine what types of fluids are present in the reservoir rocks by measuring how effective these rocks are at conducting electricity. Because fresh water, oil and gas are poor conductors of electricity. They have high resistivity [5]. By contrast, most formation waters are salty enough that they conduct electricity with ease. Thus, formation waters generally have low resistivity. Hydrocarbon saturation and formation porosity are the two key parameters determined from wire line logs that are used in the evaluation of a subsurface reservoir as a potential hydrocarbon producer. They are the measures of reservoir content but not reservoir performance and by themselves do not provide an actual indication of the hydrocarbon productivity of a reservoir.

The petrophysical properties evaluation of 'FGF' (Well# 03) field for its reservoirs characterization was made possible by careful analysis and interpretation of its well logs. The results show the field's delineated reservoir units having porosity ranging from 0.16 to 0.25 indicating a suitable reservoir quality, permeability values from 14 md to 105 md attributed to the well sorted nature of the sands and hydrocarbon saturation range from 35.2% to 97.20% implying high hydrocarbon production. These results suggest high hydrocarbon potential and a reservoir system which performance is considered satisfactory for hydrocarbon production.
The endeavor of this paper is to show the petrophysical properties of reservoir rock of FGF (well#03) using wire line logging technique. This work has introduced the practical application of wireline log and interpreted porosity, water saturation, hydrocarbon saturation and permeability. All calculation in this work was done without consideration of mud composition, mud temperature plus other sophisticated parameter.

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