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Approximation of Porosity in Clay Formations

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Abstract: Two proposed expressions are presented for the calculation of porosity for deposits with present clay, using sonic tools, mentioning the equations developed over the years and in practice their use, 3 cases will be tested where the equations obtained for to calculate the porosity part of the methodology is detailed by Karter H. Makar and Mostafa H Kamel (2011), statistical estimators of error and approximation are considered to verify their results.
Keywords: Wyllie, Raymer, Raiga – Clemenceau Equations, Porosity, Clay

Introduction

As porosity is a measure of the storage capacity of the rock and the type of porosity of the reservoir rock can be determined by various methods, whether direct or indirect, in this case it will be present through geophysical records as the tool Sonic or sonic (BHC) in addition to factors that affect it, There are several factors that affect the porosity of the rock, among these we can mention the following:

- Type of packaging.
- Presence of cementitious material.
- Geometry and grain size distribution.
- Pressure of the supra layers.

The presence of cementitious material is one of the basic points in which the grains that make up the rock matrix are joined together by the cementing material, which is mainly composed of silica, calcium carbonate or clay. The presence of cementitious material affects the firmness and compaction of the rock, and affects its porosity. As the amount of cementitious material increases, the porosity decreases, because this material is housed between the spaces available for fluid accumulation.

Equations for the calculation of porosity

With the passage of time numerous methods have been developed for the calculation of this parameter, among which the analysis of nuclei stands out, however in the absence of said samples an estimation is made through the use of geophysical records which was mentioned previously and unfortunately, measuring it is not enough, a series of calculations is required to help us minimize errors caused by the volume of clay present.

An example of equations to obtain such measurement are those proposed by Wyllie (1956) and Raymer (1980), who considered the effect of the matrix and fluids in clean formations, using the data derived from the sonic register, which Delta t means the one measured by the geophysical record, that of the matrix and the fluid that invades it.

$$\emptyset_s = \frac{\Delta_t - \Delta_{tma}}{\Delta_{tf} - \Delta_{tma}} \quad \textbf{(1)}$$

For unconsolidated sands, Tixier (1959) introduced the compaction factor in Wyllie's formula, leaving:

$$\emptyset_s = \frac{\Delta_t - \Delta_{tma}}{\Delta_{tf} - \Delta_{tma}} \times \frac{\mathbf{1}}{\boldsymbol{C_p}} \quad \textbf{(2)}$$

Where C_p the compaction factor and is equal to $\frac{(\Delta_{tsh} \times C)}{100}$ (C is a constant that is normally 1 and in microseconds on foot as units of measurement in transit time).

In 1980, the researcher L.L. Raymer introduced to the industry a sonic porosity equation that currently continues to be used. The result of transit time and the porosity obtained from other registers, whereby it is possible to approximate with appropriate precision in the áreas of interest.

$$\Delta_t = \left[\frac{(1-\emptyset_s)^2}{\Delta_{tma}} + \frac{\emptyset_s}{\Delta_{tf}}\right]^{-1} \quad (3)$$

Finally Raiga-Clemenceau (1988), had a better approach than Wyllie regarding transit time and porosity:

$$\emptyset_s = 1 - \left(\frac{\Delta_{tma}}{\Delta_t}\right)^{1/x} \quad (4)$$

In summary we can put this table where its advantages and limitations of each equation mentioned are given

Table 1. Equations for the porosity calculation (Ref. [1])

REFERENCE	EQUATIONS	OBSERVATIONS
Wyllie et al., 1956 (More detailed introduction)	$\emptyset_s = \frac{\Delta_t - \Delta_{tma}}{\Delta_{tf} - \Delta_{tms}}$	Very popular
		It works with consolidated sands and carbonates with intergranular porosity.
Tixier et al., 1959	$\emptyset_s = \frac{\Delta_t - \Delta_{tma}}{\Delta_{tf} - \Delta_{tms}} x \frac{1}{C_p}$	It gives a good correlation between porosity and the transit time interval
		Use 55.5 µs / feet for sands 49 µs / feet for limestones and 43.5µs / feet for dolomites
	$C_p = \frac{\Delta_{tsh} \times C}{100}$	Essentially empirical
	$\Delta_t = \left[\frac{(1-\emptyset_s)^2}{\Delta_{tma}} + \frac{\emptyset_s}{\Delta_{tf}}\right]^{-1}$	Assume that the fluid is a liquid, and not a gas
		Use 54 µs / feet for sands 49 µs / feet for limestones and 44 µs / feet for dolomites
Raiga-Clemenceau et. al.,1988	$\emptyset_s = 1 - \left(\frac{\Delta_{tma}}{\Delta_t}\right)^{1/x}$	It does not detect effects on pore fluids.
		x is the exponent related to the nature of the matrix. 1.6 for sands 1.76 for limestones and 2 for dolomite

Porosity Estimation

As already mentioned in the qualitative reading of wells, porosity values are always evaluated from nucleus analysis or from the analysis of porosity records (Density, Neutron and Sonic). Having no possibility to perform nucleus analysis, combining at least two porosity tools is useful for evaluating it. In mature wells, lacking such tools hinders the determination of the parameters, as well as the use of empirical formulas of high demand.

Karter and Mostafa (2011) in the article entitled "An approach to minimize errors in the calculation of the effective porosity in clay deposits in view of the Wyllie-Raymer_Raiga relationship" proposed an equation as an alternative for the determination of parameters in the tools sonic, which contemplates the union of the equations of Wyllie, Raymer and Raiga-Clemenceau, which we will see next and then the new proposed equation and an observation in the exponent x that contemplates a cementation-type exponent.

First we equate the Wyllie equation (1) with that of Raiga-Clemenceau, and by slightly algebraizing the following is obtained:

$$\frac{\Delta_{tma}}{\Delta_t} = \left(1 - \frac{\Delta_t - \Delta_{tma}}{\Delta_{tf} - \Delta_{tma}}\right)^x$$

Later they rewrote the previous equation in terms of Δt, being as follows:

$$\Delta_t = \frac{\Delta_{tma}}{\left(\frac{\Delta_{tf} - \Delta_t}{\Delta_{tf} - \Delta_{tma}}\right)^x}$$

Then we take that result and match it with the Raymer equation, to later reorder it and get:

$$\left[\frac{(1-\emptyset_s)^2}{\Delta_{tma}}+\frac{\emptyset_s}{\Delta_{tf}}\right]^{-1}=\frac{\Delta_{tma}}{\left(\frac{\Delta_{tf}-\Delta_t}{\Delta_{tf}-\Delta_{tma}}\right)^x}$$

$$\frac{(1-\emptyset_s)^2}{\Delta_{tma}}+\frac{\emptyset_s}{\Delta_{tf}}=\frac{\left(\frac{\Delta_{tf}-\Delta_t}{\Delta_{tf}-\Delta_{tma}}\right)^x}{\Delta_{tma}}$$

Finally they multiplied the previous formula by Δtma and by reordering it, they obtained the following quadratic equation:

$$\emptyset_s^2+\left(\frac{\Delta_{tma}}{\Delta_{tf}}-2\right)\emptyset_s+1-\left(\frac{\Delta_{tf}-\Delta_t}{\Delta_{tf}-\Delta_{tma}}\right)^x=0 \quad (5)$$

The previous equation is of type $Ax^2+Bx+C=0$so it can be solved through the general equation.

$$x=\frac{-B\pm\sqrt{B^2-4AC}}{2A}$$

So:

$x=\emptyset_s$

$A=1$

$B=\left(\frac{\Delta_{tma}}{\Delta_{tf}}-2\right)$

$C=1-\left(\frac{\Delta_{tf}-\Delta_t}{\Delta_{tf}-\Delta_{tma}}\right)^x$

In order to make the equation functional in clay formations, the term of clay proposed by Dresser Atlas (1979) will be subtracted from Wyllie's equation, to finally obtain:

$$x_a=\frac{-B\pm\sqrt{B^2-4AC}}{2A}-V_{sh}\frac{\Delta_{tsh}-\Delta_{tma}}{\Delta_{tf}-\Delta_{tma}}$$

It should be noted that in very clayey sands the value of Vsh is close to 1, and the porosity effect (ØE) approaches 0, now within the mentioned article it is successfully tested, which will no longer be tested here, only A case where the clay volume of the test well 1 when evaluating the equation does not give optimal results, so according to the above development, the only thing that is proposed is to match the Raiga Equation with the Tixier proposal to finally give:

$$\frac{\Delta t-\Delta tma}{\Delta tf-\Delta tma}\left(\frac{1}{Cp}\right)=1-\left(\frac{\Delta tma}{\Delta t}\right)^{1/x}$$

A=1

$B=\left(\frac{\Delta tma}{\Delta tf}-2\right)$

$C=1-\left[\frac{\Delta tf-\frac{\Delta t}{Cp}+\left(\frac{1-Cp}{Cp}\right)\Delta tma}{\Delta tf-\Delta tma}\right]^x$

$$\emptyset=\frac{-B\pm\sqrt{B^2-4AC}}{2A}$$

With certain cases where using the Dresser Atlas

$$\emptyset t=\emptyset-Vsh\left[\frac{\Delta tsh-\Delta tma}{\Delta tf-\Delta tma}\right]$$

According to the exponent x, the new final expression is obtained, if you can see if there is no considerable clay transit time, the Cp = 1 and thus the expression is the same as that proposed by Karter and Mostafa (2011).

Without loss of generality when Cp = 1, is the previous equation proposed

Proposed Equation Z

$$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \frac{\Delta t}{Cp} + \left(\frac{1-Cp}{Cp}\right)\Delta tma}{\Delta tf - \Delta tma}\right]^x = 0 \quad (6)$$

Now we are going to make an observation with the exponent x we are going to study the behavior of the exponent with respect to transit times of the sonic register so we can use some equation like in Raymer to be able to see it

$$[(1-\emptyset)^x] = \frac{\Delta tm}{\Delta t}$$

Which clearing the exponent x gives us

$$x = -\frac{ln\left(\frac{\Delta tm}{\Delta tl}\right)}{ln(\emptyset)} \quad (7)$$

Now taking the maximum and minimum reading values for the times of the matrix, the sonic reading and the porosity gives us the following in the figure shown:

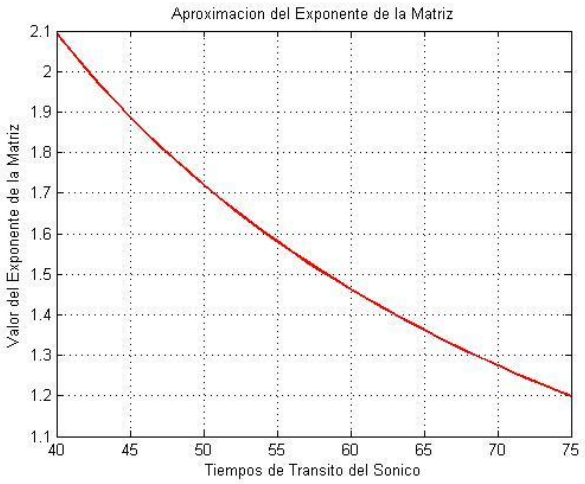


Figure 1. Behavior of the exponent x (own elaboration)

We can see that the behavior is the same as that of the other figure that we have

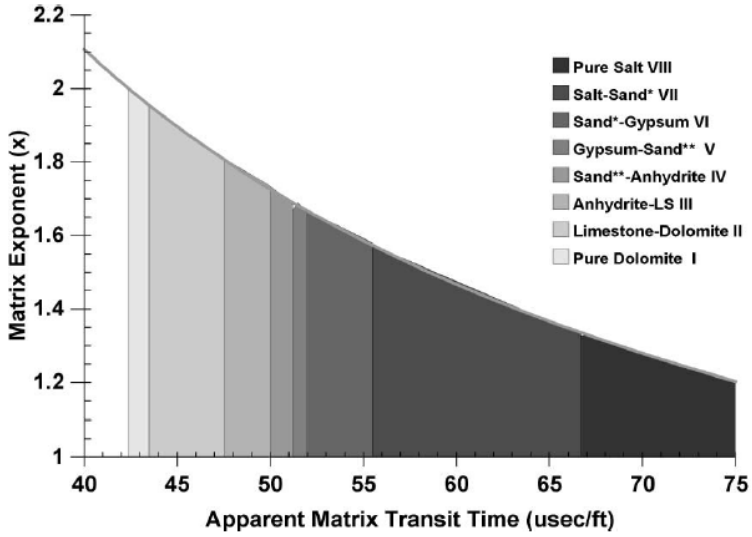


Figure 2. Determination of the matrix exponent and identification of the type of lithology (Ref. [5])

Lithologic type	Δ_{tma}	x
Salt	67	1.33
Sandstone 1 ($V_{ma}=18{,}000$, $\phi>10\%$)	55.5	1.58
Gypsum	52	1.66
Sandstone 2 ($V_{ma}=19{,}500$, $\phi<10\%$)	51.2	1.68
Anhydrite	50	1.735
Limestone	47.5	1.81
Dolomite	43.5	1.955

Figure 3. Matrix exponent and identification of the type of lithology (Ref. [5])

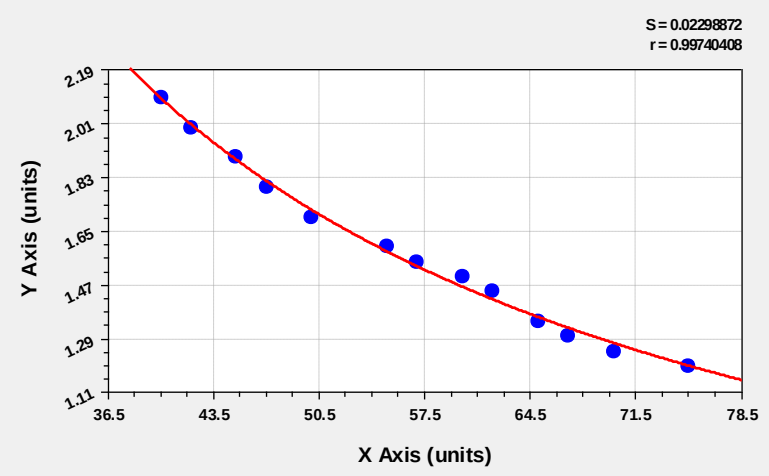
Zone no.	Name	Matrix range	x range
I	Pure salt	67	1.33
II	Salt–sand[a]	67–55.5	1.33–1.58
III	Sand[a]–gypsum	55.5–52	1.58–1.66
IV	Gypsum–sand[b]	52–51.2	1.66–1.68
V	Sand[b]–anhydrite	51.2–50	1.68–1.735
VI	Anhydrite–limestone	50–47.5	1.735–1.81
VII	Limestone–dolomite	47.5–43.5	1.81–1.955
VIII	Pure dolomite	43.5	1.955

[a] $V_{ma}=18{,}000$, $\phi>10\%$.
[b] $V_{ma}=19{,}500$, $\phi<10\%$.

Figure 4. Matrix exponent and identification of the type of lithology (Ref. [5])

Then we proceed to adjust given the transit time points of the matrix to be able to have other expressions of the same exponent, thus three adjustment expressions were obtained given the previous graph of the variation of the matrix exponent and the transit time.

Table 2 Settings

Regresión	Using the package CurveExpert 1.6
Logistic Adjustment y=a/(1+b*exp(-cx)) a =1.338E-001 b =-9.937E-001 c =1.4936E-003 Standard Error: 0.0229887 Correlation Coefficient: 0.9974041	

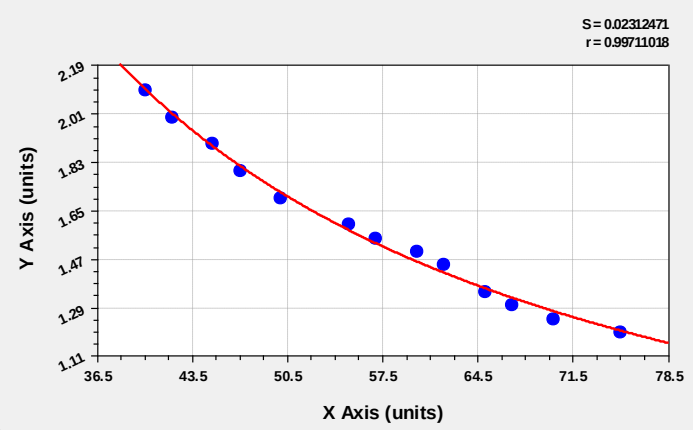
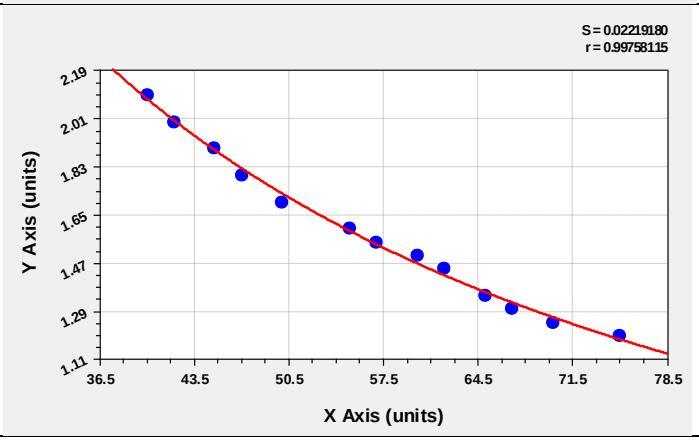
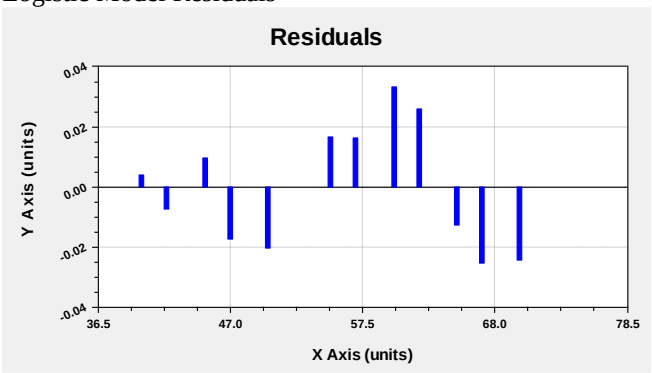
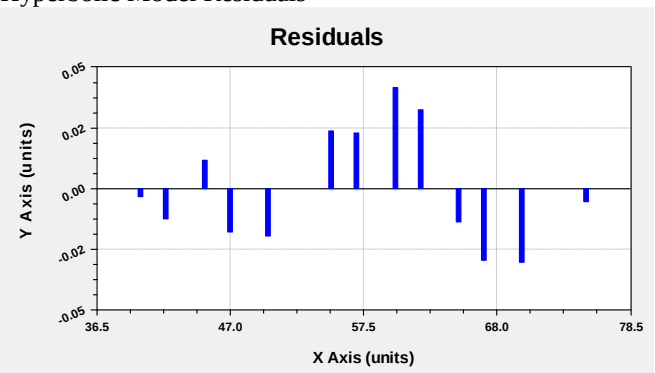
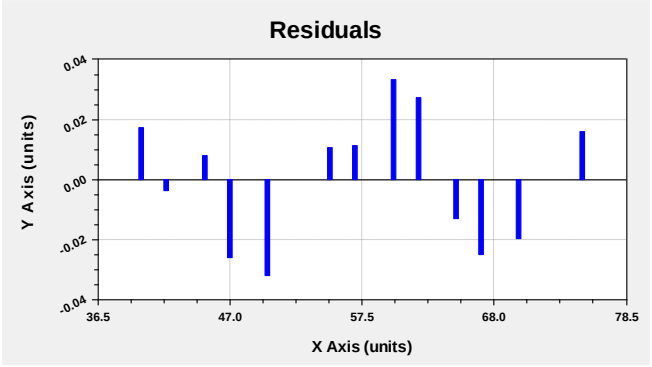
Hyperbolic Adjustment: y=a+b/x a =1.7830E-001 b =7.6989E+001 Standard Error: 0.0231247 Correlation Coefficient: 0.9971102	
Reciprocal Quadratic Adjustment: y=1/(a+bx+cx^2) a =1.33834123472E-001 b =7.71834525227E-003 c =2.33255009749E-005 Standard Error: 0.0221918 Correlation Coefficient: 0.9975812	

Table 3

Logistic Model Residuals 	Hyperbolic Model Residuals 
Residuals of the Reciprocal Quadratic Model 	

Giving us the following values (reading from left to right):

Reciprocal Quadratic Matrix Exponent

1.87294975721023	1.86634534556714	1.85962600442160	1.85279471289755
1.84585446486190	1.83880826608765	1.83165913146417	1.82441008225859
1.81706414343175	1.80962434101200	1.80209369952992	1.79447523951675
1.78677197506917	1.77898691148269	1.77112304295576	1.76318335036656
1.75517079912396	1.74708833709419	1.73893889260438	1.73072537252385
1.72245066042405	1.71411761481765	1.70572906747712	1.69728782183304
1.68879665145199	1.68025829859406	1.67167547284945	1.66305084985366
1.65438707008075	1.64568673771373	1.63695241959120	

Hyperbolic Matrix Exponent

2.10305456753650	2.05610947457351	2.01139986222781	1.96876976673540
1.92807740285627	1.88919358848289	1.85200037473443	1.81638985093272
1.78226309895608	1.74952927563155	1.71810480524000	1.68791266702067
1.65888176488669	1.63094636849362	1.60404561641141	1.57812307349582
1.55312633568436	1.52900667639260	1.50571872949021	1.48322020451671
1.46147163037567	1.44043612423925	1.42007918281690	1.40036849350321
1.38127376323056	1.36276656312015	1.34482018725552	1.32740952410325
1.31051093927900	1.29410216850762	1.27816221975829	

Giving a better approximation of the Hyperbolic Regression as seen in the previous table, now this matrix exponent has the following relationship as has been demonstrated in other research papers

$$\boldsymbol{x = \frac{1}{\Delta t}}$$

Thus we obtain the following with Δtma from 40 to 76 microseconds on foot

Logístic Model

$$\boldsymbol{x = \frac{a}{(1 + be^{-c\Delta tma})}}$$

Hyperbólic Model

$$\boldsymbol{x = a + \frac{b}{\Delta tma}}$$

Reciprocal Quadratic Model

$$\boldsymbol{x = \frac{1}{(a + b\Delta tma + c\Delta tma^2)}}$$

And so also the expression obtained by Kamel (2002)

$$\boldsymbol{x = \frac{55.196}{\Delta tma^{0.8843}}} \qquad \textbf{(8)}$$

Now let's make an observation based on the Wyllie equation.

$$\boldsymbol{\emptyset = \frac{\Delta t - \Delta tma}{\Delta tf - \Delta tma} \rightarrow} \qquad \boldsymbol{[\Delta tf - \Delta tma]\emptyset = \Delta t - \Delta tma}$$

$$\boldsymbol{\left[1 - \frac{\Delta tma}{\Delta tf}\right]\emptyset = \left[1 - \frac{\Delta tma}{\Delta t}\right]} \qquad \boldsymbol{\emptyset = \frac{\left[1 - \frac{\Delta tma}{\Delta t}\right]}{\left[1 - \frac{\Delta tma}{\Delta tf}\right]}}$$

We can see the similarity with the other expression of Raymer, which is found in various literatures.

$$\boldsymbol{\emptyset = 0.625\left[1 - \left(\frac{\Delta tma}{\Delta t}\right)\right]} \qquad \boldsymbol{\emptyset = \frac{1}{\left[1 - \frac{\Delta tma}{\Delta tf}\right]}\left[1 - \frac{\Delta tma}{\Delta t}\right]}$$

If the Δtf gets bigger the term of Δtma / Δtf gets smaller so we will assume that it tends to zero, so we have only

$$\boldsymbol{\emptyset = \left[1 - \left(\frac{\Delta tma}{\Delta t}\right)\right]}$$

So we substitute in

$$[(1-\emptyset)^x] = \frac{\Delta tma}{\Delta t}$$

$$\left[\left(1-\left[1-\left(\frac{\Delta tma}{\Delta t}\right)\right]\right)^x\right] = \frac{\Delta tma}{\Delta t}$$

$$\left[\left(\frac{\Delta tma}{\Delta t}\right)^x\right] = \frac{\Delta tma}{\Delta t}$$

Or also

$$\left[\left(\frac{\Delta tma}{\Delta t}\right)\right] = \left[\frac{\Delta tma}{\Delta t}\right]^{\frac{1}{x}}$$

It has both representations, which is made valid, and only depends on the expression of the exponent to see how the porosity increases or decreases.

Now let's look at the thesis this way from Raymer

$$\left[\frac{(1-\emptyset)^2}{\Delta tma} + \frac{\emptyset}{\Delta tf}\right] = \frac{1}{\Delta t}$$

With the next step

$$[(\mathbf{1}-\emptyset)^{\mathbf{2}}] = \frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}} \rightarrow \qquad [(\mathbf{1}-\emptyset)^{\boldsymbol{x}}] = \frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}}$$

Now from the Proposed Equation, solving the expression for Δt (from left to right)

$$\frac{\boldsymbol{\Delta t - \Delta tma}}{\boldsymbol{\Delta tf - \Delta tma}} = \mathbf{1} - \left(\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}}\right)^{\boldsymbol{x}} \qquad \mathbf{1} - \frac{\boldsymbol{\Delta t - \Delta tma}}{\boldsymbol{\Delta tf - \Delta tma}} = \left(\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}}\right)^{\boldsymbol{x}}$$

$$\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}} = \left[\mathbf{1} - \frac{\boldsymbol{\Delta t - \Delta tma}}{\boldsymbol{\Delta tf - \Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}} \qquad \frac{\Delta tma}{\Delta t}\frac{1}{\left[1-\frac{\Delta t-\Delta tma}{\Delta tf-\Delta tma}\right]^{\frac{1}{x}}} = \frac{\left[1-\frac{\Delta t-\Delta tma}{\Delta tf-\Delta tma}\right]^{\frac{1}{x}}}{\left[1-\frac{\Delta t-\Delta tma}{\Delta tf-\Delta tma}\right]^{\frac{1}{x}}}$$

$$\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta t}}\frac{\mathbf{1}}{\left[\mathbf{1}-\frac{\boldsymbol{\Delta t-\Delta tma}}{\boldsymbol{\Delta tf-\Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}}} = \mathbf{1} \qquad \frac{\Delta tma}{\left[1-\frac{\Delta t-\Delta tma}{\Delta tf-\Delta tma}\right]^{\frac{1}{x}}} = \Delta t$$

$$\frac{\boldsymbol{\Delta tma}}{\left[\frac{\boldsymbol{\Delta tf-\Delta t}}{\boldsymbol{\Delta tf-\Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}}} = \Delta t$$

Raymer Equation

$$\left[\frac{(1-\emptyset)^2}{\Delta tma} + \frac{\emptyset}{\Delta tf}\right] = \frac{1}{\Delta t}$$

Now replacing in Raymer Eq.

$$\left[\frac{(\mathbf{1}-\emptyset)^{\mathbf{2}}}{\boldsymbol{\Delta tma}} + \frac{\emptyset}{\boldsymbol{\Delta tf}}\right] = \frac{\mathbf{1}}{\frac{\boldsymbol{\Delta tma}}{\left[\frac{\boldsymbol{\Delta tf-\Delta t}}{\boldsymbol{\Delta tf-\Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}}}} \qquad \left[\frac{(1-\emptyset)^2}{\Delta tma} + \frac{\emptyset}{\Delta tf}\right] = \frac{\left[\frac{\Delta tf-\Delta t}{\Delta tf-\Delta tma}\right]^{\frac{1}{x}}}{\Delta tma}$$

Developing the expression you have

$$\emptyset^{\mathbf{2}} + \left(\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta tf}} - \mathbf{2}\right)\emptyset + \mathbf{1} - \left[\frac{\boldsymbol{\Delta tf - \Delta t}}{\boldsymbol{\Delta tf - \Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}} = \mathbf{0} \qquad \textbf{(9)}$$

With

A=1 **B=**$\left(\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta tf}} - \mathbf{2}\right)$ **C=1** $- \left[\frac{\boldsymbol{\Delta tf-\Delta t}}{\boldsymbol{\Delta tf-\Delta tma}}\right]^{\frac{\mathbf{1}}{\boldsymbol{x}}}$

$$\emptyset = \frac{-\boldsymbol{B} \pm \sqrt{\boldsymbol{B^2 - 4AC}}}{\boldsymbol{2A}}$$

And using the Dresser Atlas Equation we have

$$\boldsymbol{\emptyset t = \emptyset - Vsh\left[\frac{\Delta tsh - \Delta tma}{\Delta tf - \Delta tma}\right]}$$

According to the expression found above

$$\emptyset^{\mathbf{2}} + \left(\frac{\boldsymbol{\Delta tma}}{\boldsymbol{\Delta tf}} - \mathbf{2}\right)\emptyset + \mathbf{1} - \left[\frac{\boldsymbol{\Delta tf - \Delta t}}{\boldsymbol{\Delta tf - \Delta tma}}\right]^{\boldsymbol{x}} = \mathbf{0}$$

The variations are very interesting in both equations.
So in summary you have the following:

Table 4

Proposed Equation	$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^x = 0$
Proposed Equation Z	$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \frac{\Delta t}{Cp} + \left(\frac{1-Cp}{Cp}\right)\Delta tma}{\Delta tf - \Delta tma}\right]^x = 0$ Without loss of generality when Cp1, is the previous equation proposed
With the Clay Volume Correction.	$\emptyset t = \emptyset - Vsh\left[\frac{\Delta tsh - \Delta tma}{\Delta tf - \Delta tma}\right]$
Equation Test Proposal 2	$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^{\frac{1}{x}} = 0$

Adjustment Indicator

The deviation indicators of a group of data in relation to a model can be used to assess the goodness of fit between the two. Among the most common indicators are the following: RMSE, MAE, NRMSE, CV-MRSE, SDR, and R ^ 2. The one that was used to determine the degree of error was the mean square error (RMSE), Table 2 gives the equations for the adjustment indicators that have been used by Lu (2003) and Junninen et al. (2002).

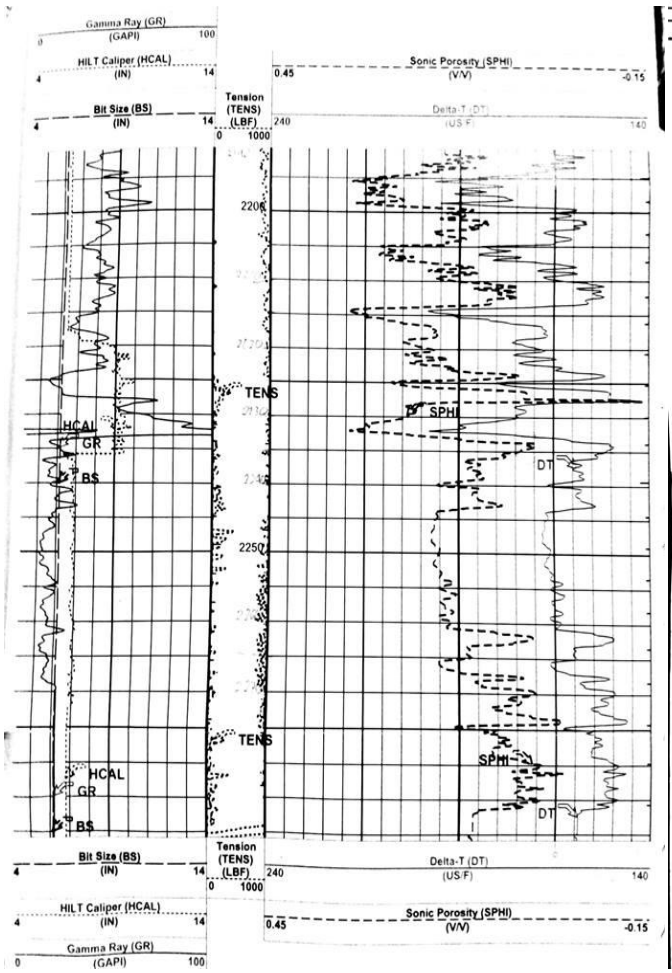
Table 5. Adjustment Indicators

Indicators	Equation
Root Mean Square Error	$\boldsymbol{RMSE = \sqrt{\left(\frac{1}{N-1}\right)\sum_{i=1}^{N}(Pi - Oi)^2}}$

Results with the following Wells

Well 1

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.8130	204	47.6
Proven Equations	Wyllie, Tixier, Raymer, Raiga	Proposed Equation and Proposed Test Z



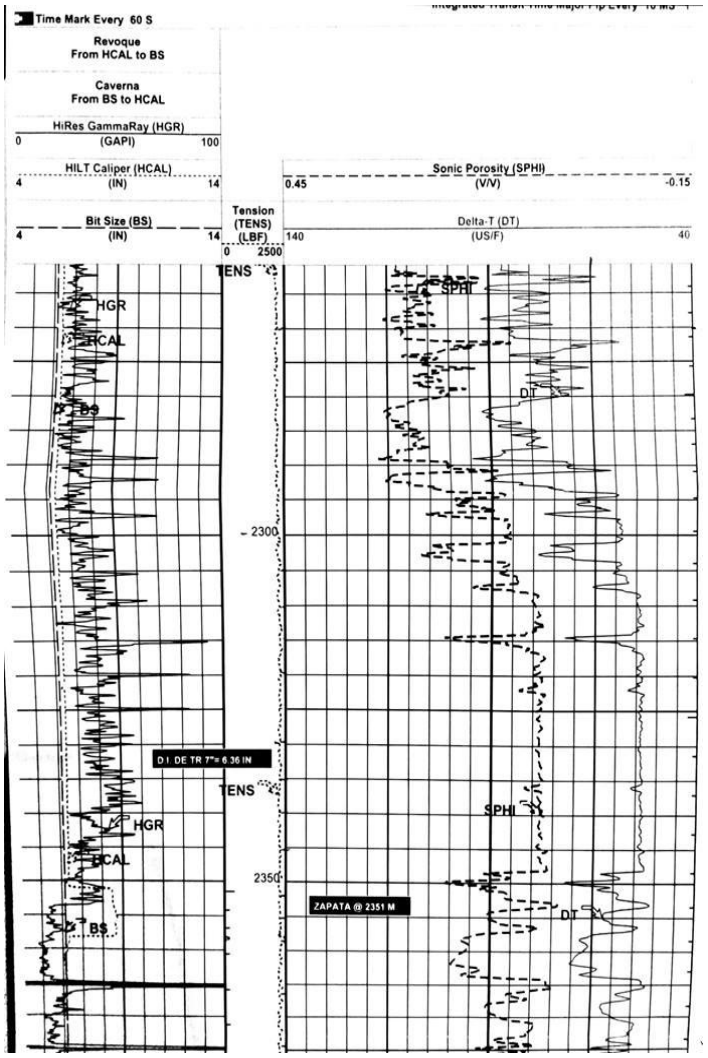
Parameter Insert Created: 18-JUL-2012 20:28

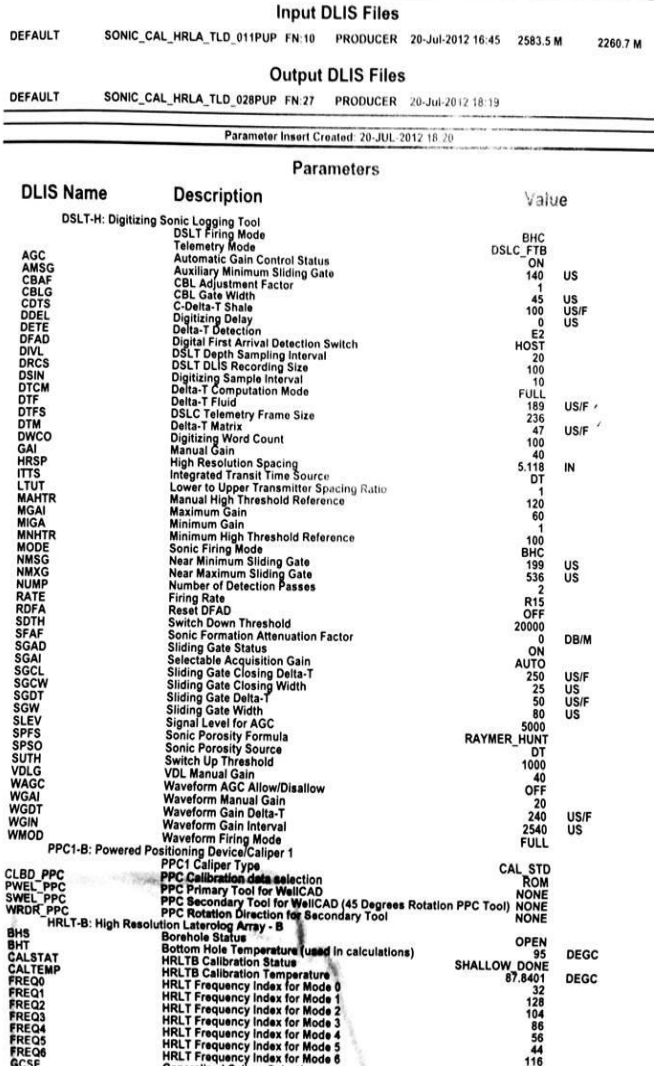
Parameters

DLIS Name	Description	Value	
	DSLT-H: Digitizing Sonic Logging Tool		
	Telemetry Mode	DSLC_FTB	
	DSLT Firing Mode	BHC	
AGC	Automatic Gain Control Status	ON	
AMSG	Auxiliary Minimum Sliding Gate	140	US
CBAF	CBL Adjustment Factor	1	
CBLG	CBL Gate Width	5	US
CDTS	C-Delta-T Shale	100	US/F
DDEL	Digitizing Delay	5	US
DETE	Delta-T Detection	5	
DFAD	Digital First Arrival Detection Switch	RISE	
DIVL	DSLT Depth Sampling Interval	240	
DRCS	DSLT DLIS Recording Size	240	
DSIN	Digitizing Sample Interval	10	
DTCM	Delta-T Computation Mode	FULL	
DTF	Delta-T Fluid	204.5	US/F
DTFS	DSLC Telemetry Frame Size	236	
DTM	Delta-T Matrix	47	US/F
DWCO	Digitizing Word Count	100	
GAI	Manual Gain	40	
HRSP	High Resolution Spacing	5.118	IN
ITTS	Integrated Transit Time Source	DT	
LTUT	Lower to Upper Transmitter Spacing Ratio	1	
MAHTR	Manual High Threshold Reference	40	
MGAI	Maximum Gain	60	
MIGA	Minimum Gain	1	
MNHTR	Minimum High Threshold Reference	30	
MODE	Sonic Firing Mode	BHC	
NMSG	Near Minimum Sliding Gate	140	US
NMXG	Near Maximum Sliding Gate	750	US
NUMP	Number of Detection Passes	2	
RATE	Firing Rate	R15	
RDFA	Reset DFAD	OFF	
SDTH	Switch Down Threshold	20000	
SFAF	Sonic Formation Attenuation Factor	0	DB/M
SGAD	Sliding Gate Status	ON	
SGAI	Selectable Acquisition Gain	AUTO	
SGCL	Sliding Gate Closing Delta-T	250	US/F
SGCW	Sliding Gate Closing Width	25	US
SGDT	Sliding Gate Delta-T	50	US/F
SGW	Sliding Gate Width	80	US
SLEV	Signal Level for AGC	3000	
SPFS	Sonic Porosity Formula	RAYMER_HUNT	
SPSO	Sonic Porosity Source	DT	
SUTH	Switch Up Threshold	1000	
VDLG	VDL Manual Gain	5	
WAGC	Waveform AGC Allow/Disallow	OFF	
WGAI	Waveform Manual Gain	20	
WGDT	Waveform Gain Delta-T	240	US/F
WGIN	Waveform Gain Interval	2540	US
WMOD	Waveform Firing Mode	FULL	
	PPC1-B: Powered Positioning Device/Caliper 1		
	PPC1 Caliper Type	CAL_STD	
CLBD_PPC	PPC Calibration data selection	ROM	
PWEL_PPC	PPC Primary Tool for WellCAD	NONE	
SWEL_PPC	PPC Secondary Tool for WellCAD (45 Degrees Rotation PPC Tool)	NONE	
WRDR_PPC	PPC Rotation Direction for Secondary Tool	NONE	
	HRLT-B: High Resolution Laterolog Array - B		
BHS	Borehole Status	OPEN	
BHT	Bottom Hole Temperature (used in calculations)	99	DEGC
CALSTAT	HRLTB Calibration Status	SHALLOW_DONE	
CALTEMP	HRLTB Calibration Temperature	48.3362	DEGC
FREQ0	HRLT Frequency Index for Mode 0	32	
FREQ1	HRLT Frequency Index for Mode 1	128	
FREQ2	HRLT Frequency Index for Mode 2	104	
FREQ3	HRLT Frequency Index for Mode 3	86	
FREQ4	HRLT Frequency Index for Mode 4	56	
FREQ5	HRLT Frequency Index for Mode 5	44	
FREQ6	HRLT Frequency Index for Mode 6	116	
GCSE	Generalized Caliper Selection	HCAL	
GDEV	Average Angular Deviation of Borehole from Normal	0	DEG
GGRD	Geothermal Gradient	0.018227	DC/M
GRSE	Generalized Mud Resistivity Selection	CHART_GEN_9	
GTSE	Generalized Temperature Selection	LINEAR_ESTIMATE	
	Barite Mud Switch	NOBARITE	

Well 2

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.8130	189	47.6
Proven Equations	Raymer y Raiga	Proposed Equation, Proposed Equation Z and Proposed Test 2





Well 3

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.83	204	47.6
Proven Equations	Wyllie, Raymer y Raiga	Proposed Equation and Proposed Equation Z

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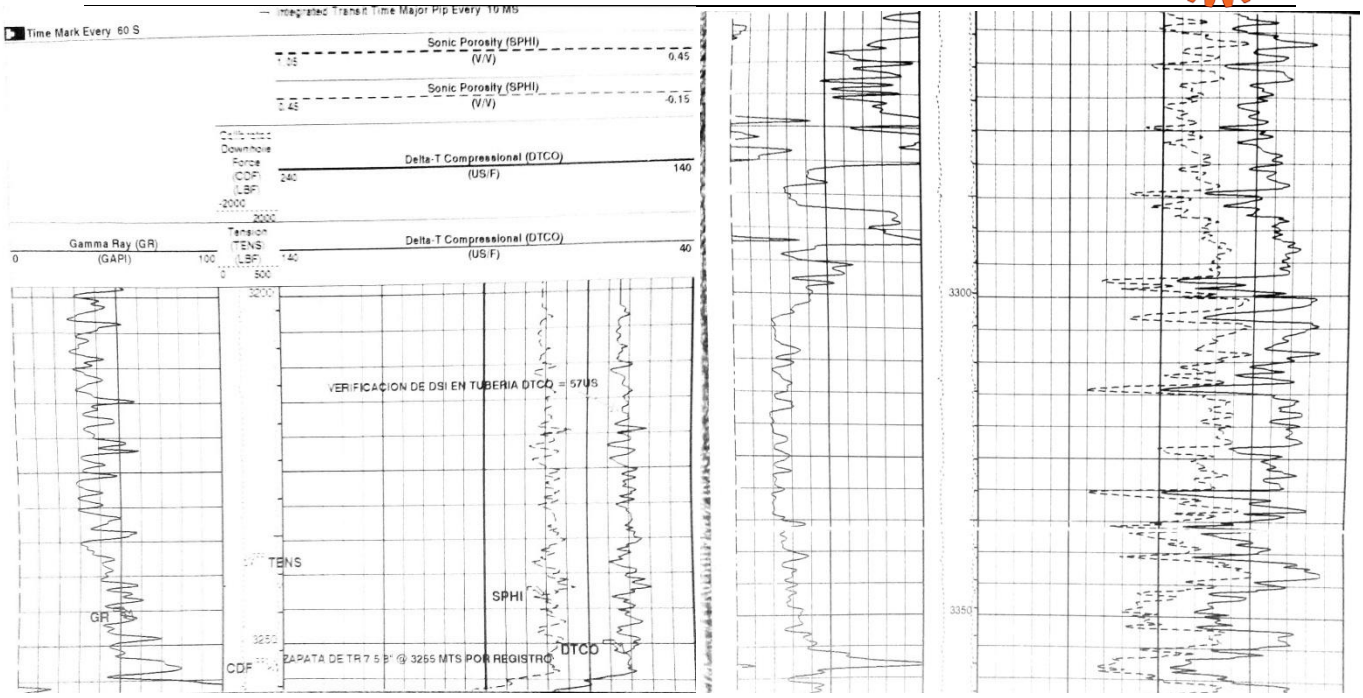

STC Baseline Removal - Monopole P&S	ON	
STC Search Bandwidth - Lower Dipole	8000	US
STC Search Bandwidth - Upper Dipole	8000	US
STC Search Bandwidth - Monopole Stoneley	6000	US
STC Search Bandwidth - Monopole P&S	2000	US
STC Formation Character - Lower Dipole	SELECTABLE	
STC Formation Character - Upper Dipole	SELECTABLE	
STC Formation Character - Monopole Stoneley	SELECTABLE	
STC Formation Character - Monopole P&S	SELECTABLE	
STC Filter - Lower Dipole	B1-3K	
STC Filter - Upper Dipole	B1-3K	
STC Filter - Monopole Stoneley	B.5-1.5K	
STC Filter - Monopole P&S	B3-20K	
Label Slowness Lower Limit - Monopole P&S Shear	75	US/F
Surface Hole Temperature	30	DEGC
Label Slowness Upper Limit - Monopole P&S Shear	180	US/F
STC Slowness Lower Limit - Lower Dipole	75	US/F
STC Slowness Lower Limit - Upper Dipole	75	US/F
STC Slowness Lower Limit - Monopole Stoneley	180	US/F
STC Slowness Lower Limit - Monopole P&S	40	US/F
Sonic Porosity Formula	WYLLIE	
Sonic Porosity Source	DTCO	
STC Slowness Step - Lower Dipole	4	US/F
STC Slowness Step - Upper Dipole	4	US/F
STC Slowness Step - Monopole Stoneley	4	US/F
STC Slowness Step - Monopole P&S	2	US/F
STC Source Waveform - Lower Dipole	EVEN IN SAMX	

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Well 1 Results of Porosity Calculation, the section was zoned

Profundidad	GR_{Min}	GR_{Max}	GR_X	ΔT_{Ma}	ΔT_F	ΔT_{SH}	ΔT_x	I_{SH}	willie	C_P	Tixier	Raymer-Hun	x	Raiga
2190	25	65	50	47.6	204	140	165	0.625	0.750639	1.4	0.536171	0.621219	1.813008	0.496244
2195	25	65	42	47.6	204	140	180	0.425	0.846547	1.4	0.604677	0.671996	1.813008	0.51985
2200	25	65	40	47.6	204	140	160	0.375	0.71867	1.4	0.513336	0.6045519	1.813008	0.487621
2205	25	65	30	47.6	204	140	165	0.125	0.750639	1.4	0.536171	0.621219	1.813008	0.496244
2210	25	65	38	47.6	204	140	157	0.325	0.699488	1.4	0.499635	0.5945362	1.813008	0.482243
2215	25	65	40	47.6	204	140	172	0.375	0.795396	1.4	0.56814	0.6446636	1.813008	0.507657
2220	25	65	40	47.6	204	140	170	0.375	0.782609	1.4	0.559006	0.6379376	1.813008	0.504471
2225	10	40	15	47.6	204	240	180	0.166667	0.846547	2.4	0.352728	0.671996	1.813008	0.51985
2230	25	130	60	47.6	204	140	175	0.333333	0.814578	1.4	0.581841	0.6548185	1.813008	0.512331
2235	10	40	15	47.6	204	240	154	0.166667	0.680307	2.4	0.283461	0.5844855	1.813008	0.476704
2240	10	40	18	47.6	204	160	165	0.266667	0.750639	1.6	0.46915	0.621219	1.813008	0.496244
2245	10	40	18	47.6	204	160	167	0.266667	0.763427	1.6	0.477142	0.6278945	1.813008	0.49958
2250	10	40	16	47.6	204	160	165	0.2	0.750639	1.6	0.46915	0.621219	1.813008	0.496244
2255	10	40	18	47.6	204	160	165	0.266667	0.750639	1.6	0.46915	0.621219	1.813008	0.496244
2260	10	40	18	47.6	204	160	164	0.266667	0.744246	1.6	0.465153	0.6178847	1.813008	0.494552
2265	10	40	18	47.6	204	160	160	0.266667	0.71867	1.6	0.449169	0.6045519	1.813008	0.487621
2270	10	40	20	47.6	204	160	150	0.333333	0.654731	1.6	0.409207	0.5709995	1.813008	0.469053

C	EP1	C	EP2	Draser-Atlas \	Draser-Atlas T	Draser-Atlas RH	Draser-Atlas R	Draser-Atlas EP2
0.91938	#¡NUM!	0.535154	0.388293	0.381393862	0.166925466	0.251973496	0.12699836	0.019047659
0.966568	#¡NUM!	0.644362	0.514745	0.595460358	0.353589697	0.420909027	0.268762621	0.263658102
0.899672	#¡NUM!	0.503174	0.356982	0.497122762	0.291788455	0.383004606	0.266073493	0.135435142
0.91938	#¡NUM!	0.535154	0.388293	0.676790281	0.462321885	0.547369915	0.422394779	0.314444078
0.886927	#¡NUM!	0.484766	0.339778	0.507480818	0.307626964	0.402528507	0.290235817	0.147769966
0.943678	#¡NUM!	0.583207	0.439472	0.573849105	0.346592985	0.423116299	0.286109949	0.217925086
0.937134	#¡NUM!	0.569034	0.423784	0.561061381	0.337458897	0.416390311	0.282923491	0.202237111
0.966568	#¡NUM!	0.644362	0.514745	0.641517477	0.14769821	0.466966146	0.314819739	0.309715221
0.952884	#¡NUM!	0.605234	0.465021	0.617647059	0.384910486	0.457887525	0.315399696	0.268089727
0.873504	#¡NUM!	0.466879	0.323565	0.475277067	0.078431373	0.379455711	0.271674504	0.11853524
0.91938	#¡NUM!	0.535154	0.388293	0.558994032	0.277504263	0.429573666	0.30459853	0.196647829
0.926719	#¡NUM!	0.548458	0.401917	0.571781756	0.28549659	0.436249141	0.30793514	0.210272098
0.91938	#¡NUM!	0.535154	0.388293	0.606905371	0.325415601	0.477485005	0.352509869	0.244559168
0.91938	#¡NUM!	0.535154	0.388293	0.558994032	0.277504263	0.429573666	0.30459853	0.196647829
0.915593	#¡NUM!	0.528618	0.381734	0.552600171	0.273508099	0.42623936	0.302906593	0.190088897
0.899672	#¡NUM!	0.503174	0.356982	0.527024723	0.257523444	0.412906567	0.295975453	0.165337103
0.854563	#¡NUM!	0.443761	0.303283	0.415174766	0.169650469	0.331442795	0.229496183	0.063726327
						RMSE	**RMSE**	**RMSE**
						0.005180184	0.002809174	0.025905656
						0.019855354	0.000126279	0.000267058
						0.054291147	0.013473056	0.000212135
						0.07693407	0.023224169	0.001975276
						0.049518936	0.012151935	0.001038775
						0.010632971	0.001148536	0.010419288
						0.046824767	0.006876305	5.00466E-06
						0.042834985	0.003005204	0.002471603
						0.051932724	0.007293108	0.001450827
						0.102051951	0.044806096	0.003426374
						0.062287015	0.015524794	0.00027715
						0.065663622	0.0163674	0.0009164
						0.088497328	0.029759655	0.004167886
						0.062287015	0.015524794	0.00027715
						0.070883397	0.020422294	0.000905342
						0.069119863	0.021308833	0.000235227
						0.090867759	0.039798727	0.001137465
						0.969663088	0.273620357	0.055088618
						0.246178681	**0.130771833**	**0.058677411**

PHI Real

0.18

0.28

0.15

0.27

0.18
0.32
0.2
0.26
0.23
0.06
0.18
0.18
0.18
0.18
0.16
0.15
0.03

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.8130	204	47.6
Proven Equations	Wyllie, Tixier, Raymer, Raiga	Equation Tested EP1 $\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^x = 0$ EP2 $\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^{\frac{1}{x}} = 0$
Clay correction	$\emptyset t = \emptyset - Vsh\left[\frac{\Delta tsh - \Delta tma}{\Delta tf - \Delta tma}\right]$	

Well 2 Results

						SIN CORRECCION							CORRECCION			
	PROFUNDIDA	ϕ-	Δt1	Δt-	Δt2	Raiga	Ec1	Ec2	Raymer-Hut		GR	V-1	ϕ-1Z1	Raiga	Ec1	Raymer-Hut
	2270	29	85	47	189	0.27614	1.45163	0.29969	1.65705	0.09428	0.31021994	29	0.1	24.5634	0.2353	0.25885	0.269374866
	2275	24	78	47	189	0.2414	1.5108	0.24052	1.67634	0.07499	0.26792217	30	0.125	18.4542	0.19035	0.18946	0.216865828
	2280	21	73	47	189	0.21349	1.55166	0.19967	1.68951	0.06182	0.2348662	26	0.025	19.8908	0.20328	0.18945	0.224654929
	2285	26	80	47	189	0.25181	1.49415	0.25717	1.67093	0.08039	0.28044474	29	0.1	21.5634	0.21096	0.21632	0.239599668
	2290	21	70	47	189	0.19528	1.5757	0.17563	1.69719	0.05414	0.21368599	34	0.225	11.0176	0.10338	0.08373	0.121784578
	2295	19	70	47	189	0.19528	1.5757	0.17563	1.69719	0.05414	0.21368599	26	0.025	17.8908	0.18507	0.16542	0.203474719
	2300	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	28	0.075	9.67254	0.09407	0.06697	0.103329401
	2305	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	32	0.057143	10.666	0.10136	0.07427	0.110623164
ZONA 1	2310	10	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	40	0.285714	-1.67	-0.0345	-0.0571	-0.02928263
	2315	21	70	47	189	0.19528	1.5757	0.17563	1.69719	0.05414	0.21368599	40	0.285714	9.32998	0.07858	0.05893	0.096985785
	2320	8	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	40	0.285714	-3.67	-0.0345	-0.0571	-0.02928263
	2325	8	54	47	189	0.07293	1.69923	0.05209	1.73565	0.01567	0.0774426	40	0.285714	-3.67	-0.0438	-0.0646	-0.0392576
	2330	8	54	47	189	0.07293	1.69923	0.05209	1.73565	0.01567	0.0774426	40	0.285714	-3.67	-0.0438	-0.0646	-0.0392576
	2335	8	54	47	189	0.07293	1.69923	0.05209	1.73565	0.01567	0.0774426	40	0.285714	-3.67	-0.0438	-0.0646	-0.0392576
	2340	8	54	47	189	0.07293	1.69923	0.05209	1.73565	0.01567	0.0774426	32	0.057143	5.666	0.04959	0.02875	0.054102559
	2345	8	54	47	189	0.07293	1.69923	0.05209	1.73565	0.01567	0.0774426	32	0.057143	5.666	0.04959	0.02875	0.054102559
	2350	21	72	47	189	0.20755	1.55971	0.19162	1.69209	0.05924	0.22792638	32	0.057143	18.666	0.18421	0.16828	0.204586341
	2355	15	63	47	189	0.14769	1.63062	0.12071	1.71451	0.03682	0.15955064	14	0.133333	9.08451	0.09323	0.06625	0.105090543
	2360	18	66	47	189	0.16904	1.60727	0.14406	1.70718	0.04414	0.18363243	13	0.1	13.5634	0.12819	0.10321	0.142787363
	2365	7	53	47	189	0.06343	1.70673	0.04459	1.73793	0.01339	0.06722134	13	0.1	2.56338	0.02258	0.00374	0.026376266
	2370	14	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	16	0.2	5.12676	0.04301	0.01592	0.052273063
	2375	17	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	10	0	17	0.08216	0.05962	0.087417569
	2380	18	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	22	0.4	0.25352	-0.0013	-0.0271	0.012381267
	2385	17	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	15	0.166667	9.60563	0.09402	0.06817	0.107686431
	2390	15	63	47	189	0.14769	1.63062	0.12071	1.71451	0.03682	0.15955064	10	0	15	0.14769	0.12071	0.159550636
	2395	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	20	0.333333	0.21127	-0.0114	-0.0385	-0.00218703
	2400	16	63	47	189	0.14769	1.63062	0.12071	1.71451	0.03682	0.15955064	10	0	16	0.14769	0.12071	0.159550636
	2405	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	20	0.333333	0.21127	-0.0114	-0.0385	-0.00218703
	2410	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	19	0.3	1.69014	0.00217	-0.0249	0.011427993
	2415	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	18	0.266667	0.16901	-0.0091	-0.0342	-0.00224792
	2420	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	18	0.266667	3.16901	0.01578	-0.0113	0.025043016
	2425	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	18	0.266667	1.16901	0.01578	-0.0113	0.025043016
	2430	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	12	0.066667	10.0423	0.09747	0.07038	0.106733157
	2435	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	12	0.066667	12.0423	0.11299	0.08575	0.12396783
	2440	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	12	0.066667	12.0423	0.11299	0.08575	0.12396783
	2445	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	13	0.1	10.5634	0.09937	0.07213	0.110352807
	2450	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	13	0.1	7.56338	0.05902	0.0339	0.065827197

ZONA 2	2375	17	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	10	0	17	0.08216	0.05962	0.087417569
	2380	18	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	22	0.4	0.25352	-0.0013	-0.0271	0.012381267
	2385	17	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	15	0.166667	9.60563	0.09402	0.06817	0.107686431
	2390	15	63	47	189	0.14769	1.63062	0.12071	1.71451	0.03682	0.15955064	10	0	15	0.14769	0.12071	0.159550636
	2395	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	20	0.333333	0.21127	-0.0114	-0.0385	-0.00218703
	2400	16	63	47	189	0.14769	1.63062	0.12071	1.71451	0.03682	0.15955064	10	0	16	0.14769	0.12071	0.159550636
	2405	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	20	0.333333	0.21127	-0.0114	-0.0385	-0.00218703
	2410	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	19	0.3	1.69014	0.00217	-0.0249	0.011427993
	2415	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	18	0.266667	0.16901	-0.0091	-0.0342	-0.00224792
	2420	15	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	18	0.266667	3.16901	0.01578	-0.0113	0.025043016
	2425	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	18	0.266667	1.16901	0.01578	-0.0113	0.025043016
	2430	13	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	12	0.066667	10.0423	0.09747	0.07038	0.106733157
	2435	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	12	0.066667	12.0423	0.11299	0.08575	0.12396783
	2440	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	12	0.066667	12.0423	0.11299	0.08575	0.12396783
	2445	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	13	0.1	10.5634	0.09937	0.07213	0.110352807
	2450	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	13	0.1	7.56338	0.05902	0.0339	0.065827197
	2455	17	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	13	0.1	12.5634	0.12125	0.0954	0.134916478
	2460	10	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	13	0.1	5.56338	0.04131	0.01878	0.046572498
	2465	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	13	0.1	7.56338	0.05902	0.0339	0.065827197
	2470	13	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	17	0.233333	2.64789	0.00456	-0.0206	0.011367103
	2475	13	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	14	0.133333	7.08451	0.04541	0.02028	0.052212174
	2480	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	14	0.133333	9.08451	0.08576	0.05852	0.096737783
	2485	14	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	15	0.166667	6.60563	0.05663	0.02953	0.065888086
	2490	10	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	14	0.133333	4.08451	0.0277	0.00516	0.032957475
	2495	10	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	14	0.133333	4.08451	0.04541	0.02028	0.052212174
	2500	15	62	47	189	0.14022	1.63834	0.11298	1.71692	0.03441	0.15119788	13	0.1	10.5634	0.09937	0.07213	0.110352807
	2505	16	64	47	189	0.15498	1.62286	0.12846	1.71208	0.03924	0.16773635	13	0.1	11.5634	0.11413	0.08761	0.126891278
	2510	15	65	47	189	0.16209	1.61508	0.13624	1.70964	0.04168	0.17576155	13	0.1	10.5634	0.12125	0.0954	0.134916478
	2515	10	56	47	189	0.09114	1.68415	0.06717	1.73106	0.02027	0.09715732	13	0.1	5.56338	0.05029	0.02633	0.056312253
	2520	12	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	12	0.066667	9.04225	0.09747	0.07038	0.106733157
	2525	11	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	13	0.1	6.56338	0.05902	0.0339	0.065827197
	2530	14	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	12	0.066667	11.0423	0.09747	0.07038	0.106733157
	2535	9	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	13	0.1	4.56338	0.04131	0.01878	0.046572498
	2540	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	12	0.066667	9.04225	0.07264	0.04751	0.079442221
	2545	12	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	12	0.066667	9.04225	0.07264	0.04751	0.079442221
	2550	6	50	47	189	0.03318	1.72912	0.0222	1.74469	0.00664	0.0349576	13	0.1	1.56338	-0.0077	-0.0186	-0.00588747
	2555	11	57	47	189	0.09987	1.67658	0.07474	1.72874	0.02259	0.10667227	15	0.166667	3.60563	0.03179	0.00667	0.03859715
	2560	9	55	47	189	0.08216	1.6917	0.05962	1.73336	0.01796	0.08741757	15	0.166667	1.60563	0.01408	-0.0085	0.019342451
	2565	12	60	47	189	0.1247	1.65372	0.09761	1.72169	0.02963	0.1339632	12	0.066667	9.04225	0.09747	0.07038	0.106733157

										CON CORRECCION			
						Porosidad		RMSE					
Ecuacion Propuesta Z					Raiz +	Raiz -	ϕ-		Raiga	Ragmer	Ec1	Ecuacion Propuesta Z	
3.067131	1.66756	1.399572	1.183035	1.751323	1.467179	0.284144	29		0.002992	0.000425	0.00097	3.42941E-05	
3.067131	1.391067	1.676065	1.2946291	1.751323	1.522976	0.228347	24		0.002465	0.000535	0.002554	0.000135797	
3.067131	1.184988	1.882143	1.3719122	1.751323	1.561617	0.189705	21		4.51E-05	0.000215	0.000422	0.000411875	
3.067131	1.4715	1.595631	1.263183	1.751323	1.507253	0.24407	26		0.002405	0.000416	0.001908	0.000253769	
3.067131	1.057932	2.0092	1.4174624	1.751323	1.584393	0.16693	21		0.011367	0.007782	0.015945	0.001855009	
3.067131	1.057932	2.0092	1.4174624	1.751323	1.584393	0.16693	19		2.43E-05	0.000182	0.000604	0.000532217	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.001291	0.000711	0.003972	0.001378578	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.00082	0.000375	0.003106	0.001378578	
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	10		0.018101	0.016714	0.024674	0.001870484	
3.067131	1.057932	2.0092	1.4174624	1.751323	1.584393	0.16693	21		0.01727	0.012772	0.022823	0.001855009	
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	8		0.01312	0.011943	0.018791	0.00054052	
3.067131	0.337558	2.729574	1.6521422	1.751323	1.701732	0.04959	8		0.01532	0.014222	0.020911	0.000924751	
3.067131	0.337558	2.729574	1.6521422	1.751323	1.701732	0.04959	8		0.01532	0.014222	0.020911	0.000924751	
3.067131	0.337558	2.729574	1.6521422	1.751323	1.701732	0.04959	8		0.01532	0.014222	0.020911	0.000924751	
3.067131	0.337558	2.729574	1.6521422	1.751323	1.701732	0.04959	8		0.000925	0.000671	0.002626	0.000924751	
3.067131	0.337558	2.729574	1.6521422	1.751323	1.701732	0.04959	8		0.000925	0.000671	0.002626	0.000924751	
3.067131	1.14292	1.924212	1.3871596	1.751323	1.569241	0.182082	21		0.000665	2.93E-05	0.001741	0.000779439	
3.067131	0.751588	2.315544	1.5216911	1.751323	1.636507	0.114816	15		0.003223	0.002017	0.007015	0.001237926	
3.067131	0.884566	2.182565	1.4773507	1.751323	1.614337	0.136986	18		0.002684	0.001385	0.005896	0.001850202	
3.067131	0.290164	2.776967	1.6664235	1.751323	1.708873	0.04245	7		0.002248	0.001903	0.00439	0.000759024	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	14		0.009407	0.007696	0.015397	0.002221162	
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	17		0.007716	0.00682	0.012184	0.012825356	
3.067131	0.840521	2.226611	1.4921831	1.751323	1.621753	0.12957	18		0.032866	0.028096	0.042906	0.002543205	
3.067131	0.840521	2.226611	1.4921831	1.751323	1.621753	0.12957	17		0.005774	0.003883	0.01037	0.001634601	
3.067131	0.751588	2.315544	1.5216911	1.751323	1.636507	0.114816	15		5.36E-06	9.12E-05	0.000858	0.001237926	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.026066	0.023161	0.035548	0.003263746	
3.067131	0.751588	2.315544	1.5216911	1.751323	1.636507	0.114816	16		0.000152	2.02E-07	0.001544	0.00204161	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.026066	0.023161	0.035548	0.003263746	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.021855	0.019202	0.0306	0.003263746	
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.016655	0.014945	0.023771	0.002387889	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.018015	0.015614	0.026022	0.003263746	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.013046	0.011016	0.019969	0.001378578	
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.001058	0.000541	0.003555	0.001378578	
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.00137	0.000678	0.004128	0.001808233	
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.00137	0.000678	0.004128	0.001808233	
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.002563	0.001572	0.006063	0.001808233	
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.003718	0.002935	0.007414	0.002387889	

3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.026066	0.023161	0.035548	0.003263746
3.067131	0.751588	2.315544	1.5216911	1.751323	1.636507	0.114816	16		0.000152	2.02E-07	0.001544	0.00204161
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.026066	0.023161	0.035548	0.003263746
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.021855	0.019202	0.0306	0.003263746
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.016655	0.014945	0.023771	0.002387889
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	15		0.018015	0.015614	0.026022	0.003263746
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.013046	0.011016	0.019969	0.001378578
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	13		0.001058	0.000541	0.003555	0.001378578
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.00137	0.000678	0.004128	0.001808233
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.00137	0.000678	0.004128	0.001808233
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.002563	0.001572	0.006063	0.001808233
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.003718	0.002935	0.007414	0.002387889
3.067131	0.840521	2.226611	1.4921831	1.751323	1.621753	0.12957	17		0.002377	0.001231	0.005565	0.001634601
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	10		0.003444	0.002854	0.006597	0.001870484
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.003718	0.002935	0.007414	0.002387889
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	13		0.015735	0.014074	0.022669	0.003465209
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	13		0.007156	0.006051	0.012038	0.003465209
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.004127	0.002837	0.008369	0.001808233
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	14		0.006951	0.005493	0.012203	0.002221162
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	10		0.005227	0.004495	0.008994	0.001870484
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	10		0.00298	0.002284	0.006355	0.000833248
3.067131	0.7067	2.360431	1.5363694	1.751323	1.643846	0.107477	15		0.002563	0.001572	0.006063	0.001808233
3.067131	0.796194	2.270937	1.5069628	1.751323	1.629143	0.12218	16		0.002104	0.001096	0.00524	0.001430354
3.067131	0.840521	2.226611	1.4921831	1.751323	1.621753	0.12957	15		0.000827	0.000228	0.002981	0.000417393
3.067131	0.431513	2.635618	1.6234588	1.751323	1.687391	0.063932	10		0.002471	0.001909	0.005428	0.001300902
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	12		0.000508	0.000176	0.002462	0.000735994
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	11		0.002599	0.001951	0.005792	0.001510568
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	14		0.001809	0.001107	0.004847	0.002221162
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	9		0.00237	0.001886	0.005073	0.001105502
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.002243	0.001645	0.005254	0.002387889
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	12		0.002243	0.001645	0.005254	0.002387889
3.067131	0.146323	2.920808	1.7090371	1.751323	1.73018	0.021143	6		0.004578	0.004341	0.006184	0.001509881
3.067131	0.478074	2.589057	1.6090548	1.751323	1.680189	0.071134	11		0.006116	0.005098	0.010678	0.001510568
3.067131	0.384674	2.682457	1.6378209	1.751323	1.694572	0.056751	9		0.005763	0.004992	0.009693	0.001105502
3.067131	0.616087	2.451044	1.5655812	1.751323	1.658452	0.092871	12		0.000508	0.000176	0.002462	0.000735994
#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	-					
#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	-		0.402652	0.331576	0.630419	0.107737295
#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	-					
#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	#¡VALOR!	-	**Resultado**	0.082611	0.074966	0.103369	0.040712367
#¡DIV/0!	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!	#¡DIV/0!						

Well 2

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.8130	189	47.6
Proven Equations	Raymer andRaiga Clay correction $$\emptyset t = \emptyset - Vsh\left[\frac{\Delta tsh - \Delta tma}{\Delta tf - \Delta tma}\right]$$	Proposed Equation (Ec1) $$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^x = 0$$ Proposed Test Equation 2 (Ec2) $$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^{\frac{1}{x}} = 0$$ Proposed Equation Z $$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \frac{\Delta t}{Cp} + \left(\frac{1-Cp}{Cp}\right)\Delta tma}{\Delta tf - \Delta tma}\right]^x = 0$$

Well 3 Results

Profundidad	DTiempo	Porosidad	Dtshale		Wyllie	Raiga		Raymer		Discriminante	Raiz +	Raiz -
3250	57	0.05	110		0.063492	0.100046		-1.77017	3.133506	1.559407423	1.664789	0.105382
3255	65	0.12	110		0.114286	0.162371		-1.77017	3.133506	1.423310785	1.596741	0.17343
3260	68	0.15	110		0.133333	0.182771		-1.77017	3.133506	1.377756067	1.573964	0.196208
3265	73	0.17	110		0.165079	0.21385		-1.77017	3.133506	1.307229269	1.5387	0.231471
3270	65	0.09	110		0.114286	0.162371		-1.77017	3.133506	1.423310785	1.596741	0.17343
3275	75	0.16	110		0.177778	0.225376		-1.77017	3.133506	1.280692221	1.525432	0.244739
3280	60	0.1	110		0.08254	0.124921		-1.77017	3.133506	1.505602614	1.637887	0.132284
3285	66	0.15	110		0.120635	0.16933		-1.77017	3.133506	1.407831931	1.589002	0.18117
3290	58	0.08	110		0.069841	0.108559		-1.77017	3.133506	1.541066257	1.655619	0.114552
3295	56	0.06	110		0.057143	0.0913		-1.77017	3.133506	1.578178936	1.674175	0.095996
3300	60	0.12	110		0.08254	0.124921		-1.77017	3.133506	1.505602614	1.637887	0.132284
3305	46	0.03	110		-0.00635	-0.01182		-1.77017	3.133506	1.794564688	1.782368	-0.0122
3310	55	0.06	110		0.050794	0.082308		-1.77017	3.133506	1.597400299	1.683786	0.086385
3315	65	0.12	110		0.114286	0.162371		-1.77017	3.133506	1.423310785	1.596741	0.17343
3320	53	0.06	110		0.038095	0.063544		-1.77017	3.133506	1.637276919	1.703724	0.066447
3325	60	0.09	110		0.08254	0.124921		-1.77017	3.133506	1.505602614	1.637887	0.132284
3330	87	0.26	110		0.253968	0.285721		-1.77017	3.133506	1.137728191	1.45395	0.316221
3335	73	0.15	110		0.165079	0.21385		-1.77017	3.133506	1.307229269	1.5387	0.231471
3340	70	0.15	110		0.146032	0.195614		-1.77017	3.133506	1.348784706	1.559478	0.210693
3345	57	0.09	110		0.063492	0.100046		-1.77017	3.133506	1.559407423	1.664789	0.105382
3350	77	0.18	110		0.190476	0.236436		-1.77017	3.133506	1.255015673	1.512593	0.257578
3355	75	0.18	110		0.177778	0.225376		-1.77017	3.133506	1.280692221	1.525432	0.244739
3360	73	0.15	110		0.165079	0.21385		-1.77017	3.133506	1.307229269	1.5387	0.231471
3365	75	0.18	110		0.177778	0.225376		-1.77017	3.133506	1.280692221	1.525432	0.244739
3370	63	0.09	110		0.101587	0.147943		-1.77017	3.133506	1.455208879	1.61269	0.157481
3375	53	0.03	110		0.038095	0.063544		-1.77017	3.133506	1.637276919	1.703724	0.066447
3380	57	0.06	110		0.063492	0.100046		-1.77017	3.133506	1.559407423	1.664789	0.105382
3385	55	0.09	110		0.050794	0.082308		-1.77017	3.133506	1.597400299	1.683786	0.086385
3390	80	0.21	110		0.209524	0.252218		-1.77017	3.133506	1.217992569	1.494082	0.276089
3395	55	0.06	110		0.050794	0.082308		-1.77017	3.133506	1.597400299	1.683786	0.086385
3400	60	0.1	110		0.08254	0.124921		-1.77017	3.133506	1.505602614	1.637887	0.132284

Ecuacion PropuestaZ	Cp			Raiz +	Raiz -	Porosidad
	1.1	-0.41236	1.649591	1.709881	0.06029	0.05
	1.1	-0.72753	1.551121	1.660646	0.109525	0.12
	1.1	-0.84232	1.513666	1.641918	0.128253	0.15
	1.1	-1.0295	1.450518	1.610345	0.159826	0.17
	1.1	-0.72753	1.551121	1.660646	0.109525	0.09
	1.1	-1.10292	1.424986	1.597579	0.172592	0.16
	1.1	-0.53209	1.612892	1.691532	0.07864	0.1
	1.1	-0.766	1.53867	1.654421	0.11575	0.15
	1.1	-0.45247	1.637387	1.703779	0.066392	0.08
	1.1	-0.37204	1.661767	1.715969	0.054202	0.06
	1.1	-0.53209	1.612892	1.691532	0.07864	0.12
	1.1	0.042352	1.782094	1.776132	-0.00596	0.03
	1.1	-0.33151	1.673915	1.722043	0.048128	0.06
	1.1	-0.72753	1.551121	1.660646	0.109525	0.12
	1.1	-0.24986	1.698131	1.734151	0.03602	0.06
	1.1	-0.53209	1.612892	1.691532	0.07864	0.09
	1.1	-1.52583	1.26794	1.519056	0.251115	0.26
	1.1	-1.0295	1.450518	1.610345	0.159826	0.15
	1.1	-0.91782	1.488519	1.629345	0.140826	0.15
	1.1	-0.41236	1.649591	1.709881	0.06029	0.09
	1.1	-1.1755	1.399287	1.584729	0.185442	0.18
	1.1	-1.10292	1.424986	1.597579	0.172592	0.18
	1.1	-1.0295	1.450518	1.610345	0.159826	0.15
	1.1	-1.10292	1.424986	1.597579	0.172592	0.18
	1.1	-0.64997	1.575924	1.673048	0.097123	0.09
	1.1	-0.24986	1.698131	1.734151	0.03602	0.03
	1.1	-0.41236	1.649591	1.709881	0.06029	0.06
	1.1	-0.33151	1.673915	1.722043	0.048128	0.09
	1.1	-1.28281	1.360403	1.565287	0.204884	0.21
	1.1	-0.33151	1.673915	1.722043	0.048128	0.06
	1.1	-0.53209	1.612892	1.691532	0.07864	0.1

Ecuacion Propuesta			Raiz +	Raiz -		RMSE	Wyllie	Raiga	Raymer	EPZ
	-0.45247	1.893668	1.831919	-0.06175			0.000182	0.002505	0.003067	0.000106
	-0.79663	1.982457	1.876314	-0.10614			3.27E-05	0.001795	0.002855	0.00011
	-0.92157	2.013722	1.891946	-0.12178			0.000278	0.001074	0.002135	0.000473
	-1.12478	2.063562	1.916867	-0.1467			2.42E-05	0.001923	0.003779	0.000104
	-0.79663	1.982457	1.876314	-0.10614			0.00059	0.005238	0.006961	0.000381
	-1.2043	2.08274	1.926456	-0.15628			0.000316	0.004274	0.007181	0.000159
	-0.5834	1.927927	1.849049	-0.07888			0.000305	0.000621	0.001042	0.000456
	-0.83853	1.992996	1.881583	-0.11141			0.000862	0.000374	0.000972	0.001173
	-0.49636	1.905221	1.837696	-0.06752			0.000103	0.000816	0.001194	0.000185
	-0.40833	1.881978	1.826074	-0.0559			8.16E-06	0.00098	0.001296	3.36E-05
	-0.5834	1.927927	1.849049	-0.07888			0.001403	2.42E-05	0.000151	0.001711
	0.046599	1.75696	1.763565	0.006606			0.001321	0.001749	0.001781	0.001293
	-0.36395	1.870148	1.82016	-0.04999			8.48E-05	0.000498	0.000696	0.000141
	-0.79663	1.982457	1.876314	-0.10614			3.27E-05	0.001795	0.002855	0.00011
	-0.27444	1.846062	1.808117	-0.03795			0.00048	1.26E-05	4.16E-05	0.000575
	-0.5834	1.927927	1.849049	-0.07888			5.57E-05	0.001219	0.001788	0.000129
	-1.66005	2.18942	1.979796	-0.20962			3.64E-05	0.000662	0.003161	7.89E-05
	-1.12478	2.063562	1.916867	-0.1467			0.000227	0.004077	0.006638	9.66E-05
	-1.00361	2.03399	1.902081	-0.13191			1.57E-05	0.002081	0.003684	8.42E-05
	-0.45247	1.893668	1.831919	-0.06175			0.000703	0.000101	0.000237	0.000883
	-1.28281	2.101503	1.935837	-0.16567			0.00011	0.003185	0.006018	2.96E-05
	-1.2043	2.08274	1.926456	-0.15628			4.94E-06	0.002059	0.004191	5.49E-05
	-1.12478	2.063562	1.916867	-0.1467			0.000227	0.004077	0.006638	9.66E-05
	-1.2043	2.08274	1.926456	-0.15628			4.94E-06	0.002059	0.004191	5.49E-05
	-0.71208	1.961017	1.865594	-0.09542			0.000134	0.003357	0.004554	5.07E-05
	-0.27444	1.846062	1.808117	-0.03795			6.55E-05	0.001125	0.001328	3.62E-05
	-0.45247	1.893668	1.831919	-0.06175			1.22E-05	0.001604	0.00206	8.42E-08
	-0.36395	1.870148	1.82016	-0.04999			0.001537	5.92E-05	1.31E-05	0.001753
	-1.39866	2.128889	1.94953	-0.17936			2.27E-07	0.001782	0.004368	2.62E-05
	-0.36395	1.870148	1.82016	-0.04999			8.48E-05	0.000498	0.000696	0.000141
	-0.5834	1.927927	1.849049	-0.07888			0.000305	0.000621	0.001042	0.000456
						Resultado	**0.00955**	**0.05224**	**0.08661**	**0.01098**

Well 3

Matrix Exponent	Fluid Transit Time	Matrix Transit Time
1.83	204	47.6
Proven Equations	Wyllie, Raymer and Raiga	Proposed Equation $$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \Delta t}{\Delta tf - \Delta tma}\right]^x = 0$$ Proposed Equation Z $$\emptyset^2 + \left(\frac{\Delta tma}{\Delta tf} - 2\right)\emptyset + 1 - \left[\frac{\Delta tf - \frac{\Delta t}{Cp} + \left(\frac{1-Cp}{Cp}\right)\Delta tma}{\Delta tf - \Delta tma}\right]^x = 0$$

Conclusions

The results with respect to well 1 the evaluation of the proposed equation (EP1) did not give optimal values, in fact it gave negative values doing the respective zoning, the well is very clayey, equation (EP2) gave better results approaching rather the porosity given by the geophysical record, the result of the RMSE gave a better low value of the error compared to the other equations shown.

Well 2 Raymer's equations, the proposed equation and Z, gave better results with the small values of the RMSE margin of error.

Well 3 the equations of Wyllie, Raiga, Raymer and Z gave the best result the errors are very close between them, except the proposal this equation gave negative values as seen in the table.

This work resulted from the fusion of different equations that are already known (Wyllie et al. (1956), Dresser Atlas (1979), Raymer et al. (1980) and Raiga-Clemenceau (1988)), the Vsh model of second order by the inheritance of the proposed Raymer equation and with the now Tixier version it is able to evaluate the porosity of sonic and gamma ray records and the clay effect is treated in terms of correction, the mean square root of the error They give low values, that indicates good approximation. However, the proposed model can be applied in much more detail when evaluating the porosity of other deposits and adjusting the data to the core tests, both in new wells and in old wells, for safety reasons no more data are presented. wells or more porosity data.

Another important point is the Δtsh which must be chosen according to the experience or criteria of the interpreter, in order to give a better approximation regarding the porosity obtained, for a layer of clean sand (Vsh 10%) the Δtsh is replaced with the transit time of the sand for this layer, [see Ref (1)]. The volume of clay is of importance given that these proposed equations depend on that percentage that is best seated.

Also the evaluation of the exponent x in its fractional form which gives valid approximations but for certain cases, in this part more details and tests should be made regarding the behavior of the exponent x.

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