SOURCE ROCK ANALYSIS FROM WELL LOGS IN THE SOUTHERN DEZFUL EMBAYMENT

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ABSTRACT:

Wire line tools are known as advanced and economic methods for formation evaluation of depositional basins.

Wire line logs and data can be used to recognition of oil generation potential in a source rock . source rocks exhibit various especial properties in wire line logs

Also their ability to oil generation can be recognized by hydrogen percentage (as a qualitative indicator) and total volume of organic matter(as a quantitative indicator).

A method is known as "ΔlogR" organized for" TOC" calculation . Another method is for neural network. This article explain the usage of there methods in detail to determine the volume of "TOC" in different source rocks (Papdeh , Gurpi & kazhdumi) in Aghajari , Parsi , Pazanan & Karanj fields in the southern Dezful embayment.

INTRODUCTION:

There are three main indicators to estimate the hydrocarbon potential of a formation , which are: organic matter of rock , organic matter quality and organic matter maturity grade. The total quantity of organic carbon is called "TOC".

The value of rock ability to hydrocarbon generation is estimated by Hydrogen volume(as a qualitative indicator) and TOC (as a quantitative indicator)

Geochemical analysis can be done to determine mentioned properties. This analysis can be done on cuttings of each well.

This method regardless it's great advantages , has some problems such as lack of analysis results in some intervals (The cuttings analysis with 18 meter space between each two samples), costly and time consuming of the method , and the probability of lost of reach intervals in sample providing.

Previous studies shows that rich organic shale's have low velocity in sonic logs and high resistance in resistivity logs. So the value of "TOC" can be calculated by extracting especial relationships from these logs. The goal of this study is to determine TOC percentage and its distribution in Pabdeh ,Gurpi & Kazhdumi formation in Aghajari , Parsi , Pazanan & Karanj fields base on ΔlogR(*Passey et al. 1990*)and neural network methods.

THE METHOD OF ΔlogR (USING SONIC AND RESISTIVITY LOGS):

The digitization of logs of subject wells in Pabdeh , Gurpi & Kazhdumi formation is the first stage. After the digitization and converting the curves to suitable scale, in the intervals with fine grain rocks and non-source rocks , the sonic and resistivity logs
are shows coincidence and base line can be drawn.

The intervals with rich content of organic matter, can be recognized by the dissociation between two logs and the dissociation can be calculated in any depth.

ΔlogR dissociation is linear and a function of maturity. Maturity grade or" L.O.M" is determined by thermal history, burial history or samples analyzing(Ro or T_{max}).

Incorrect determine of L.O.M can cause to mistake in pure TOC value.

The bottom formula can be used to ΔlogR calculation:

$\Delta logR = \log_{10}(R/R_{base\ line}) + .02(\Delta T - \Delta T_{base\ line})$

$\Delta logR$= calculated dissociation between sonic and resistivity logs

$R_{base\ line}$ = base line resistivity reading

$\Delta T_{base\ line}$= base line different time reading

R = resistivity reading base on log

ΔT = different time base on sonic log

And an experimental relationship to TOC calculation in clay rocks (rich of organic matter) is suggested as below:

$TOC = (\Delta logR) * 10^{(2.297 - .1688 * LOM)}$

USING NEURAL NETWORK:

neural network is categorized in smart dynamic free modeling systems and based on experimental data. This system transports the hidden rule/relationship behind the data , to the network structure by analyzing experimental data. The system operates like human's brain which can remember the data in addition to training them .in other word , if the system be trained successfully, it processes the data and makes the mathematical models very good.

Furthermore, the artificial neural network, can be able training nonlinear relationships from a huge volume of data.

Huange & Williams (**1996**) have employed the neural networks to modeling and description of source rocks.

DISCUSSION:

In this study the value of TOC was calculated for Pabdeh & Gurpi formations by using of $\Delta logR$ method. Then, some drilling cuttings sample of these formations analyzed by Rock-Eval pyrolysis.

A comparison it recognized that, there is a notable variance between the results.

So the neural network is used. The calculated TOC results after correlation with pyrolysis TOC results, show the comparative similarity. So the results show that neural network method is processing so much better the other one for estimation of TOC.

In addition, stratigraphy and lithology section of the studied well were plotted and correlated with previous results(FIG.3). Finally, the maps of distribution and development of TOC in Aghajari , Parsi , Pazanan & Karanj fields were produced.

CONCLUSION:

According to TOC distribution map, the TOC value is maximum in Aghajari field and minimum in Karanj field .After comprising thermal gradient and TOC value, it's obvious that there is a inverse relationship between TOC and thermal gradient.

It means that, when thermal gradient increases, TOC value decreases. Because of positioning of the well A of Aghajari field nearby a paleo high, and increasing thermal gradient in this region, the lowest TOC is found in this well because conversion of TOC to Bitumen and more oil generation.

Otherwise, there is a direct relationship between TOC value and shale content, for example the well B(FIG-1) of Aghajari field has the most value of TOC and maximum shale in lithological column.

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-Passey, Q., Creaney, J., Kulla, F., Moretti, F.and Stroud, J.: 1990, A practical model for organic richness from porosity and resistivity logs, AAPG Bull., V. 74, PP.1777-1794.

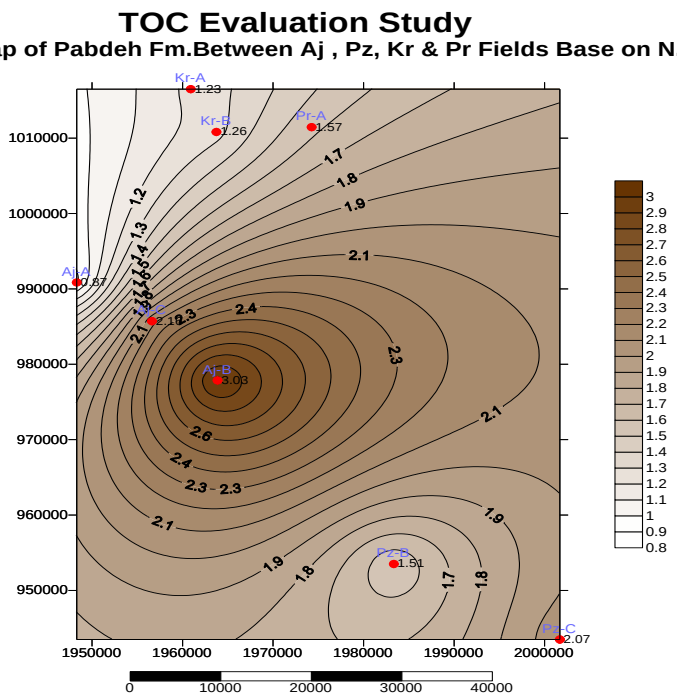

TOC Evaluation Study
Iso Toc Map of Pabdeh Fm.Between Aj , Pz, Kr & Pr Fields Base on N.N (2D)
N
Kr-A 1.23
Kr-B 1.26
Pr-A 1.57
Aj-A 0.87
Aj-B 3.03
Pz-B 1.51
Pr-C 2.07
1010000
1000000
990000
980000
970000
960000
950000
1950000
1960000
1970000
1980000
1990000
2000000
0
10000
20000
30000
40000
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8

FIG- 1

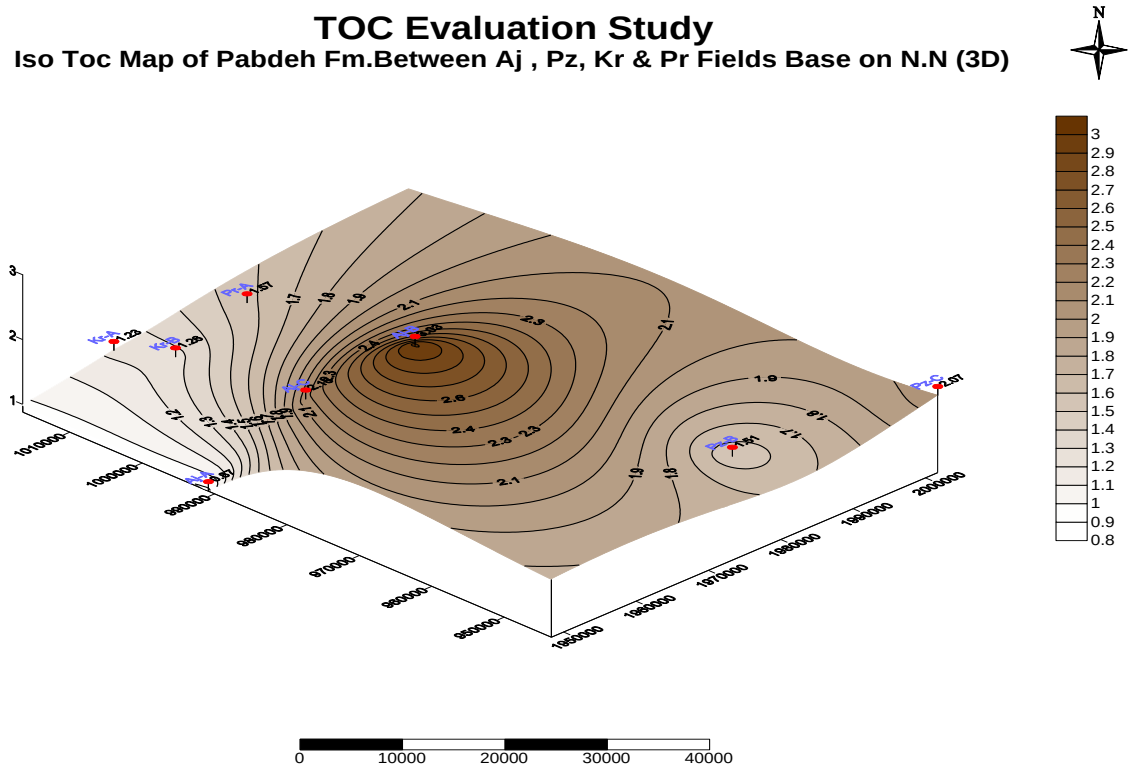
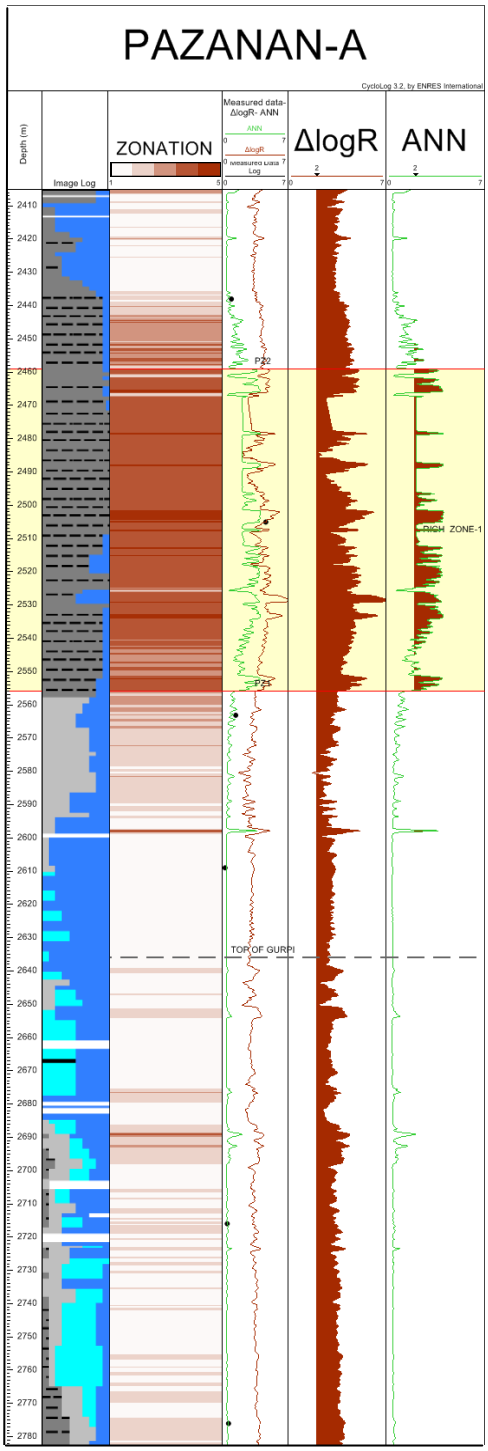

TOC Evaluation Study
Iso Toc Map of Pabdeh Fm.Between Aj , Pz, Kr & Pr Fields Base on N.N (3D)
N
0
10000
20000
30000
40000
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8

FIG-2



LEGEND

LITHOLOGY

ARGILLACEOUS LIMESTONE	BITUMEN SHALE	LIMESTONE	SANDSTONE
ANHYDRITE	BROWN SHALE	MARL	SHALE
ASPHALT	CHERT	RED MARL	NO SAMPLE

S.R GEOCHEMICAL EVALUATION: POOR | FAIR | GOOD | VERY GOOD | EXCELLENT