NEW APPLICATION FOR THE TOTAL ORGANIC CARBON ESTIMATION BASED ON WELL LOGS

Paulina KRAKOWSKA[1], Sebastian WASZKIEWICZ[1], Jerzy KARCZEWSKI[1], Jadwiga JARZYNA[1], Edyta PUSKARCZYK[1], Kamila WAWRZYNIA-GUZ[1], Stanisław BAUDZIS[2]

[1]*AGH University of Science and Technology, Faculty of Geology Geophysics and Environmental Protection, Department of Geophysics, al. Mickiewicza 30, 30-059 Krakow, Poland; krakow@agh.edu.pl*
[2]*Geofizyka Toruń S.A., ul. Chrobrego 50, 87-100 Toruń, Poland*

Introduction

Total organic carbon is a key parameter in the proper estimation of the petroleum potential of rocks. Nowadays, several methods are available to estimate TOC. Moreover, most of them are based on well logs, especially taking into consideration resistivity, sonic and density logs. The paper presents the developed application, called TOC, for determining TOC content based on well logs and comparison with laboratory measurement results. All methods, included in TOC application, were applied to estimate TOC in the perspective Silurian shale interval. The goal of the research was to develop TOC application and the best method for TOC estimation for data within Peri-Baltic Syneclise.

Samples and methods

Data from the well located in the Peri-Baltic syneclise were used in total organic carbon calculations. Well logs, such as: resistivity, sonic, density, neutron were an input data for all calculations. Three methods were under investigations: 1) based on combination of resistivity and/or sonic, neutron, density logs (Passey et al., 1990); 2) based on density log (Schmoker & Hester, 1983); 3) based on combination of resistivity and sonic logs (Carpentier et al., 1991). Estimated TOC values were compared with laboratory measurement results from Rock-Eval pyrolysis.

Results

The TOC application is a new tool included in the Geowin 2.0 software package developed at the Department of Geophysics, at the Faculty of Geology Geophysics and Environmental Protection of the AGH University of Science and Technology. The Geowin system consists of a set of a dozen applications developed for the processing and interpretation of well logging data (Jarzyna et al., 2002; Jarzyna and Twaróg, 2003).

All system applications use a single uniform Geophysical Data Base – GBD containing well logging data imported from LAS files (in versions 1.2 and 2.0) and LIS files. This database stores logs with mnemonics grouped into wells and well sections. In recent years, the system has been thoroughly redesigned and adapted to 64-bit architecture. The TOC application was written in C ++, compiled using the Embarcadero Berlin 10.1 compiler (this product is the successor of the C ++ Builder compiler, very popular in Poland in previous years). Thanks to the transition to 64-bit architecture, much more efficient operating memory support was provided, also some modern C ++ constructions were used. Moreover, security of applications and GBD was increased.

The TOC application allows to calculate the total organic carbon content using three different methods: Passey, Schmocker and method based on combination of sonic and resistivity logs. The results are saved in GBD (it is also possible to export the results to text files). It is possible to correlate TOC values calculated in various ways with laboratory measurement results.

All mentioned methods were used to calculate TOC content in the well and compared with laboratory results from Rock-Eval pyrolysis. High correlation was observed between values of TOC derived from Passey method and laboratory results.

Conclusions

TOC application is the newly developed tool for the total organic carbon estimation from well logging. It contains the well-known methods, which were updated and adapted to calculate the TOC with the high accuracy. Smart visualization of results makes easier comparison of outcomes among themselves and relationship with laboratory results enables easy evaluation of correctness of the obtained results.

Acknowledgements

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