8th. World Congress on Computational Mechanics (WCCM8)
5th. European Congress on Computational Methods in Applied Sciences and Engineering (ECCOMAS 2008)
June 30 – July 5, 2008
Venice, Italy

COMPUTATIONAL SYSTEM TO HELP THE STRESS ANALYSIS AROUND BOREHOLES IN PETROLEUM INDUSTRY

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Key Words: *Stress Analysis, Borehole, Geophysics, Computer modelling.*

ABSTRACT

To evaluate an oil and gas reservoir it is necessary to considerer its perforation cost, it will be useful in the evaluation of its economical and technical viability. Borehole perforation planning is fundamental. To reach the plan objectives according to the compatible norms of security, Geologists, Reservoirs Engineers and Petroleum Production Engineers do not analyses only the reservoir production optimisation. They must consider the project operational risk and expense. When the hole is perforated and a part of the structure is removed, we observe a nonequilibrium surface tension [3]. This is one of the most important stages of the borehole project. Its study may guarantee the borehole stability, and to reach this objective it is necessary to evaluate the following factors: perforation fluid weight, rock strength, temperature variations, mechanical drilling trajectory inclination and orientation, tension and strength anisotropy, perforation column vibration and hole geometry. Several researches were developed discussing those data [2][4][5][6][7].

The stability of an oil reservoir is a challenge for specialists of the petroleum industry; therefore, a correct analysis of this question can reduce the perforation cost significantly. According to Aadnoy (1999), 10 to 15 % of the time expense to perforate a hole is related to the analysis of its stability, which means billions of dollars cost annually.

The study of boreholes stability requires, besides the causes understanding, its correct identification and modeling. In this context, the present work presents a computational tool to contribute in the evaluation and analysis of holes stability, to be used in petroleum industry. The developed system gives a detailed study of borehole geometry.

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conducted inside the boreholes. This device uses electric sensors that measure and register the resistivity patterns in electrical borehole wall images. It generates graphical images considering the borehole wall distances from the calliper centre.

Knowing those distances and the rock properties, it is possible the to identify the regions where tensions can cause a borehole wall collapse. Mathematical models then can be created to estimate tension values, considering adjacent sections and the analysis of the tension distribution in the area where the hole is placed. The generation of 3D models from the collected information is developed in the presented system. Using the 3D model it is possible to integrate the data from the diverse borehole sections. It is also possible to provide a confident visualization of breakouts and other problematic regions. The system allows the several calculations as section angle and diameters rates. The system was developed in C++ and its interface is user friendly (Figure 2).

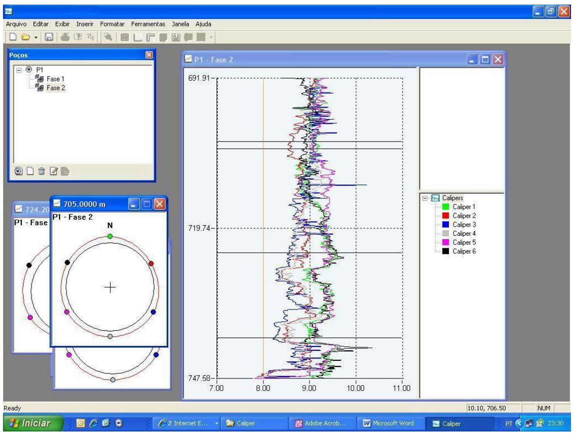

Figure 1 – Software interface.

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