Ain Shams University

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PHYSICAL AND MECHANICAL PROPERTIES OF THE CRETACEOUS LIMESTONE, PYRAMIDS HEIGHTS, EL-HASANA DOME, EGYPT.

A thesis submitted for partial fulfillment for the requirements of Master degree of Science in Applied Geophysics

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Note

The present thesis is submitted to faculty of Science, Ain Shams University in partial fulfillment for the requirements of the Master degree of Science in Geophysics.

Beside the research work materialized in this thesis, the candidate has attended ten postgraduate courses for one year in the following topics:

1. Geophysical field measurements
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4. Advanced Well Logging
5. Formation Evaluation
6. Reservoir Evaluation
7. Subsurface Geology
8. Geophysical Prospecting
9. Sedimentary Basin Analysis
10. Fluid Dynamics

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ABSTRACT

The master thesis compacts with the influence of petrographical aspects on the petrophysical properties of Turonian carbonate rocks, which are represented by Abu Roash formation in El-Hassana Dome, Giza, Egypt. The petrophysical behavior of the studied facies has been delineated by determining rock porosity, density, permeability, electrical resistivity and thermal conductivity. The reservoir quality index (RQI) exposes that, the petrophysical features of the studied facies are consistent with the petrographical characteristics representing fairly reservoir properties for Turonian carbonates and there flow zone indicator (FZI) in the nearby subsurface extensions. Studying the petrophysical behavior indicates that, both permeability and formation resistivity factor are mostly dependent on the effective porosity and to some extent on the electric tortuosity.

The methodology of petrophysical study the determination of the quantity, the ability to locate, or to determine whether all recoverable are important factors. In general review of essential properties used in the evaluation of limestone series in Turonian. This is followed by the main of this thesis, interpretation of Turonian rocks, and all done by measurements of intact plug cylindrical sample by preparing to measurements, in summary to evaluate the physical behavior of Turonian carbonate rocks in study area from laboratory measurements, and the correlation between petrographical and petrophysical study give high indication for all samples properties and their behaviors.

The second part of the master thesis used to define subsurface rock quality for construction purposes. The physical and the mechanical properties digest the mathematical relationships where used to calculate the geotechnical parameters from elastic moduli values. These relationships are applied by

using physical and mechanical methods. Results from these parameters are compared to detect the subsurface rock quality and locate zones that should be avoided during construction. The locations of mechanical tests are maintained at the exactly same location where borehole data is available. A competence scale of geotechnical parameters such as Concentration Index, Material Index and Stress Ratio, Bearing capacity represented by ultimate bearing capacity and allowable bearing capacity were estimated to evaluate the subsurface foundation from a geophysical and engineering prospective. Subsurface information (rock quality) is constructed using strength parameters.

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