



## **Impacts of dolomitization on the petrophysical properties of the Cenomanian El-Halal Formation in its type section, north Sinai, Egypt**

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The Cenomanian marine sequence in north Sinai is mostly represented by El-Halal Formation. It is composed mainly, in its type section Gebel El-Halal, of greyish white hard dolomitic limestone and dolostones with minor clastic intercalations. Petrographically, four microfacies could be assigned, namely; 1) dolomitic mudstone microfacies (dolomitic micrite), 2) micritic dolomudstone (dolomicrite), 3) clayey to sandy dolomudstone (clayey to sandy dolomicrite), and 4) sparitic dolomudstone (dolosparite). From the petrophysical investigation, porosity in the range of 15 to 30 % could be assigned. Different pore shapes could be distinguished, e.g. micro intercrystalline pore spaces, micro to meso vugs, micro pore channels. The present pore spaces are frequently reduced by drusy and/xenotopic dolosparite and micro sparite.

The Cenomanian marine sediments of El-Halal Formation have been deposited in restricted marine platform (SMF-23, FZ-8) with a progressive shallowing of the sea level upward. The diagenetic history has been controlled by cementation, dolomitization, aggrading neomorphism, and creation of authigenic illite.

Petrophysically, the studied samples could be grouped into three petrophysical facies: 1) dolomitic micrite/dolomicrite facies, 2) clayey to sandy dolomicrite, and 3) dolosparite. The bulk density (av. 2.01, 1.89 and 2.49 for the different microfacies, respectively) is dependent mainly on porosity (av. 27.6, 31.0 and 20.9, respectively), whereas the permeability values (av. 3.36, 1154 and 0.27, respectively) are dependant upon porosity, the pore channel radius (av. 0.79, 1.62 and 0.19, respectively) and could be related to the electric tortuosity (av. 3.66, 1.54 and 7.34, respectively).

In a trial to detect the mounce potential, the formation resistivity factors were measured at five consequent saline saturation of 6, 30, 60, 90 and 120 kppm. The mounce potential dishanced the electric resistivity for the different petrophysical facies. The electric resistivity values are also affected by the effective porosity and electric tortuosity. The Cenomanian El-Halal marine sediments have fair to good petrophysical properties, which could be attributed mostly to the dolomitization process. Though the dolomization has enhancing effect on the studied petrophysical features, it had a dishancing effect in its first stages of invasion and in the last stages due to the aggrading neomorphism.