

The Relationship between Lithological and Geomechanical Properties of Carbonate Rocks. Case study: Arab-D Reservoir Outcrop Carbonate, Central Saudi Arabia

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Abstract : Upper Jurassic Arab-D Reservoir is considered as the largest oil reservoir in Saudi Arabia. The equivalent outcrop is exposed near Riyadh. The study investigates the relationships between lithofacies properties changes and geomechanical properties of Arab-D Reservoir in the outcrop scale. The methods used included integrated field observations and laboratory measurements. Schmidt Hammer Rebound Hardness, Point Load Index tests were carried out to estimate the strength of the samples, ultrasonic wave velocity test also was applied to measure P-wave, S-wave, and dynamic Poisson's ratio. Thin sections have been analyzed and described. The results show that there is a variation in geomechanical properties between the Arab-D member and Upper Jubaila Formation at outcrop scale, the change in texture or grain size has no or little effect on these properties. This is because of the clear effect of diagenesis which changes the strength of the samples. The result also shows the negative or inverse correlation between porosity and geomechanical properties. As for the strength, dolomitic mudstone and wackestone within Upper Jubaila Formation has higher Schmidt hammer values, wavy rippled sandy grainstone which is rich in quarts has the greater point load index values. While laminated mudstone and breccias, facies has lower strength. This emphasizes the role of mineral content in the geomechanical properties of Arab-D reservoir lithofacies.

Keywords : geomechanical properties, Arab-D reservoir, lithofacies changes, Poisson's ratio, diagenesis

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