DERIVING COHESION AND ANGLE OF FRICTION FROM WELL LOGS

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Cohesion and angle of friction are the parameters that define the Mohr-Coulomb rock failure criterion, that is the most worldwide used criterion for wellbore stability analysis. A multivariate regression model, based on simultaneously static and dynamic rock mechanics tests, was defined to evaluate these parameters from well logs, being this model applicable to sandstone, limestone and shale, each of these rock types having different coefficients. The model defines the rock strength as a function of effective confining pressure and the dynamic shear modulus, being this last a function of shear wave velocity and bulk density, both well logging acquired, while the in situ confining pressure may be evaluated through bulk density log integration.The dynamic shear modulus varies with effective confining pressure and such dependency should be taken into account for rock strength evaluation. Purely dynamic (non-destructive) tests yield the function that describes this dependency, being this kind of test done over standard core plugs. The found results show, in general, higher values of angle of friction and lower values of cohesion for a sandstone case in comparison with a limestone case. This may be explained as a result of texture type and cementing material presence. Non flat grain-grain contacts, very common in sandstones, are essential for high angle of friction, while cementing material content, from which limestones are done, increases the values of cohesion.