

In-situ rock strength calculated from drilling parameters. Comparison of results from various sites.

*Adam Wspanialy¹, Yasuhiro Yamada¹, Saneatsu Saito¹, KYAW MOE¹

1. Japan Agency for Marine-Earth Science and Technology

Drilling parameters are excellent datasets to understand in-situ physical properties of the rock. Continuous core samples along with parameters such as Torque, RPM, WOB and ROP have been collected during drilling operations. The borehole data acquisition was complemented with full LWD/MWD and wireline logging. After core delivery to surface core scratch tests have been carried out to measure Unconfined Compressive Strength (UCS). Our comprehensive approach enabled us to integrate all data and conduct detailed analysis of the in-situ subsurface physical and mechanical properties of a rock cut by a drill bit.

Here we present some results from offshore and onshore drilling experiments carried out in Japan, Oman and Australia. Methods such as Specific Energy (SE) and Equivalent Strength (EST) have been used to estimate in-situ rock properties, namely UCS and analyse drilling process.

Our results demonstrate that the calculated in-situ rock strength based on SE/EST methods correlates well with sonic derived UCS and core scratch derived UCS. Utilised methods also successfully detect fractures in the formation, show developing drilling dysfunctions such as vibration, and bit balling.

Keywords: rock strength, drilling parameters, Specific Energy