Maximize Value with Rock Mechanics Testing

Overview

Rock mechanics data are fundamental to reservoir characterization and optimization. From exploration and well planning through abandonment, a thorough and relevant understanding of the reservoir environment allows operators the opportunity to make appropriate decisions to enhance economic and operational productivity.

The professionals at Premier have decades of experience in rock mechanics testing, analysis, and application. Our comprehensive process combines observed rock mechanics data with other results from routine and special core analysis; an example would be correlating Young's modulus to high-frequency XRF mineralogy. The Young's modulus and XRF data can then be used with fracturing simulations to optimize completions strategies.

Premier views rock mechanics testing as a bridge between theoretical and practical application. We take an integrated approach utilizing engineering mechanics and geology principles, coupled with our extensive experience working across the key shale basins in North America, to better assist clients in economically realizing their prescribed goals while significantly reducing operating risks and uncertainty.

Rock mechanics is a critical technology capable of minimizing risk and increasing efficiencies in nearly all phases of the reservoir lifecycle.

Customer Need

The requirement for rock mechanics testing encompasses the entire lifecycle of field development:

◦ **Planning -** *qualifying exploration operations, well placement, reduce exploration risk*
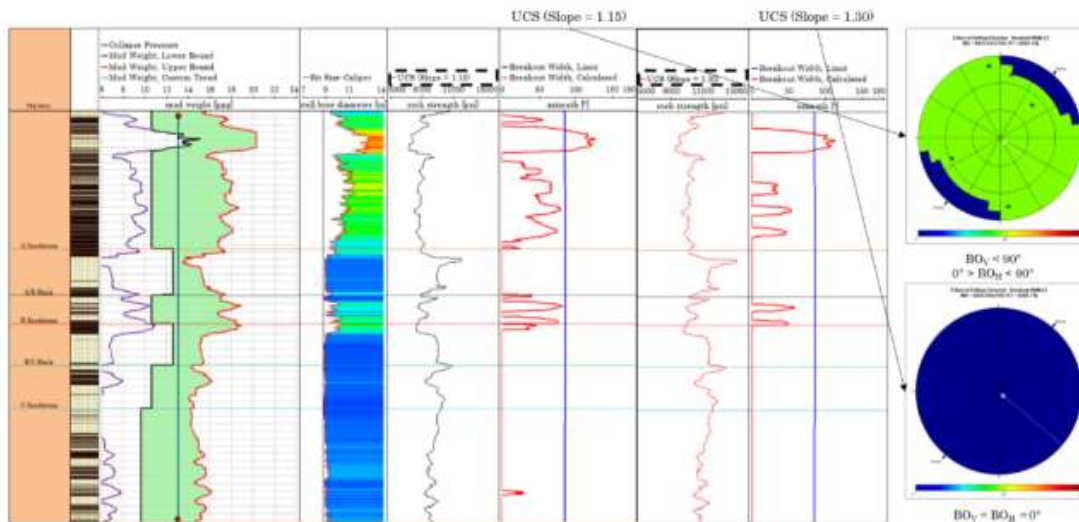

Figure 1: Wellbore stability mud weight design

◦ **Drilling -** *bit selection, stuck pipe, casing shear, improve high-angle, deep-water and horizontal drilling, cementing, wellbore integrity*

◦ **Completions -** *increase stimulated volume, hydraulic fracturing, proppant and fluid selection, zone selection*

◦ **Production** - *sanding control, subsidence, borehole stability, improved production, refrac and enhanced recovery*

◦ **Abandonment** - *cap stability*

Determination of rock mechanical properties requires varied laboratory tests. The reliability of these tests is paramount to success in the field.

Rock Mechanic Testing Services

Premier has state-of-the-art Rock Mechanics testing facilities. The following are some tests available and the information they provide:

◦ **Triaxial Testing** - *peak strength, Young's modulus, and Poisson ratio at reservoir conditions*

◦ **Unconfined Compressive Strength** - *peak strength, Young's modulus, and Poisson ratio at ambient conditions*

◦ **Uniaxial Testing** - *grain/pore compressibility and Biot's coefficient*

◦ **Failure Envelopes/Mohr's Coulomb** - *peak strength, Young's modulus, Poisson ratio, and friction angle at multiple stress conditions*

◦ **Thick Walled Cylinder Testing** - *sanding prediction and borehole stability*

◦ **Pore Pressure Depletion Testing** - *sanding prediction and borehole stability*

◦ **Hydrostatic Testing** - *bulk modulus and peak hydrostatic failure*

◦ **Brazil & Tensile Testing** - *tensile strength*

◦ ***In-Situ* Fracture Toughness Testing** - *in-situ tensile strength, borehole stability, and fracture prediction*

◦ **Fluid Sensitivity & Creep Tests** – *rock sensitivity to various fluids at temperature and pressure*

◦ **Scratch Testing** – *continuous unconfined compressive strength profile measurement on core interval*

◦ **API & Whole Core Fracture Conductivity Testing** - *effectiveness of proppant selection, rock resistance to proppant embedment at temperature and pressure*

◦ **Concurrent Anisotropic Static & Dynamic Strain Measurements** - *ultrasonic and physical measurement of material under various stress conditions*

Additional to these tests, Premier also has the sample preparation capabilities to replicate hydraulic fractures for conductivity testing and extract intact vertical core plugs from fragile core.

Premier also performs customized testing for our clients. One such example is the determination of fracture face fluid sensitivity in unpropped fractures.