Oilfield Geomechanics
Consultancy Services to Exploration and Development

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In Situ Stress Assessment

Characterisation of the three-dimensional state of stress helps you to optimise your field development strategy, predict wellbore instability, fracture permeability, fluid anisotropy and reservoir compressibility.

GeoScience can assess the stress field in the reservoir by integrating data from drilling, logging, testing and production, working at both wellbore scale and field scale. We have proven the validity of our approach over many years, carrying out assessments for fields in the North Sea and around the world, in applications such as wellbore stability, sand production and hydraulic fracturing performance.

Horizontal stresses are neither isotropic nor a simple function of the vertical stress, but our methodology provides a cost-effective means of accurately assessing the state of stress, enabling you to:

- Reduce formation and borehole damage
- Minimise wells lost to solids production
- Minimise wells lost to water breakthrough
- Optimise field development strategies
- Understand zones of influence of CRU/PWR operations
- Optimise well placement in fractured reservoirs
- Understand the impact on fracture permeability (critical shear)

Sanding Production Assessment

Aggressive production strategies, poor hole conditions while drilling, severe depletion and inadequate completion designs can all lead to compressive failure of near wellbore reservoir rock during production. This can give rise to excessive wear and erosion of equipment on the platform and downtime together with significant handling and disposal of dirty sand. In severe cases this can even lead to the abandonment of the well or casing collapse.

So whether it’s pre-drill risk assessment, or mitigation of a current problem, our Sand Production Assessment will help you maximise the productivity of your resource. Based on your data and calibrated to real observations our sand model will:

- Target core testing programmes to maximise integration with offset log data
- Establish reservoir intervals prone to failure
- Model the effects of planned likely drawdown and depletion to determine critical reservoir pressure
- Determine whether stability may be achieved by alterations of well design
- Provide options and advice for completion strategies
- Estimate the conditions at both the beginning and termination of the well
- Approximate the effects of pressure transients due to well shut-in, water hammer and cross flow on sand face stability

Pore Pressure Prediction

We offer pore pressure prediction to identify abnormal pressures through your geological sequence. We take your log data (density, resistivity, gamma and sonic) to estimate a compaction trend. Non lithological anomalies in this compared to a normal trend can be further investigated noting relevant geological and tectonic history. Verification is made against known pore pressure gradients from your MDT, RFT, and drilling gas data.

Safer Boreholes

A Wellbore Stability Assessment should be on the check list of all well design requirements. Concluding an offset review to derive the required mud weight is part of the solution. As different inclinations and azimuths change the effective stress on the wellbore wall the onset of failure can easily be induced. If you can identify two or more of the problems listed you will probably need a WBS.

- Design Issues
  - Weak formations
  - Low / high stresses / high anisotropy
  - Elevated pore pressures
  - Depleted reservoir
  - HP or HT or both
  - Fractures
  - Coal
  - Severe turning geometries
  - Extended-reach drilling
  - Deep water

- Hoie Problems
  - More than 4% hole problem related NPT
  - AFE overruns due to hole problems
  - Unable to achieve all the subsurface objectives
  - Unable to meet technical limit targets
  - Evidence of breakout in vertical / low inclination wells (caliper only)
  - Routine overpull exceeding 20k
  - Evidence of pack-offs
  - ‘Waves’ of cavings
  - Backreaming and short trips required

Hydraulic Fracturing

Many offset operations require the deliberate generation of hydraulically induced fractures, such as cutting injection and produced water injection as well as reservoir stimulation in both conventional and unconventional pays where reliance on natural matrix permeability is insufficient to achieve the well objectives. Whether in shale gas development or in conventional scenarios, induced fracture extent and orientation is key in determining successful injection or production goals as well as determining hydraulic fracturing pressures, pump rates and equipment.

We also offer short awareness presentations suitable for “lunch and learn” events.

Support While Drilling

When unexpected problems occur while drilling a well, it is essential that solutions are provided quickly. Our bespoke geomechanical support service gives you access as required to the knowledge and experience of our team of experts for monitoring and problem mitigation when you need it most.

GeoScience has the house capability and experience to integrate data from various drilling parameters (e.g., hydraulics, mud chemistry, PWD, rotary stearable systems) to make realistic operational recommendations to ensure that the adverse effects of wellbore geomechanical problems are minimised.

Geomechanical assessments can be provided by arrangement during the drilling of hole sections with challenging issues.

Training

We deliver short courses in Wellbore Stability Assessment Awareness to provide our clients and potential clients with an understanding of the processes and effects of rock stress and the consequences of failing to plan accordingly.

We train staff to spot trouble quickly and to identify and solve a range of stability-related problems.

- Lower drilling and operating costs by reducing Non-Productive Time (NPT)
- Reduce risk and uncertainty
- Increase productivity
- Optimise field development strategies
- Aid well planning
- Improve safety

GeoScience Limited is fully independent and has been improving productivity and saving money for our clients for more than 25 years.