Production in Natural Fractured Reservoirs:
A new tool for fracture characterization

Understanding fractured reservoirs is a complex and widespread issue, however identifying different types of fractures and evaluating their contribution to production requires further research to achieve significant improvements.

High-resolution real-time monitoring of mud losses while drilling can reveal important information regarding fracture presence and hydraulic behavior. GEOLOG has acquired extensive experience in installing different flow IN/ Flow out meters to obtain high quality data, capturing reliable and accurate delta flow information. This can be utilised in an innovative, proprietary work-flow utilising advanced in-house developed software to identify fractures and evaluate their properties.

For fracture identification, GEOLOG has created a highly integrated methodology combining delta flow measurements with multiple data sets including drilling parameters, gas analyses and geological information. In particular, Helium analysis in mud gas, and trace elements in cuttings provide additional insights supporting delta flow data interpretation. Helium migrates from deep levels to surface primarily through fractures and faults whilst trace element mineralisation records the fluid flows through these pathways.

This novel approach based on Delta mud flow, can be extended by using high frequency recorded data, integrated with additional information such as mud rheology to evaluate fracture apertures. GEOLOG, in collaboration with Politecnico di Milano Civil Engineering Department, has created a mathematical model simulating mud flow in fractures, which has been used to replicate experimental behavior of delta flow measurements as a function of time. An inverse modelling exercise allows the adjustment of fracture apertures input to the model, enabling reproduction of the recorded experimental delta flow data.

Utilising this new, targeted approach, it is possible to obtain a complete dataset of fracture locations and their permeability in real time, providing key information for completion process and production optimisation.