Non-Destructive Automated Scanning of Fine-Scale Geological, Petrophysical, and Geomechanical Rock Properties and its Value in Reservoir Characterization

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ABSTRACT

The integration of plug and log scale characterization is key to generating representative geological, petrophysical and geomechanical models at all stages from exploration and development to production. The importance of plug measurements is especially vital in finely laminated rocks where well-log scale measurements miss geological and mechanical heterogeneities that are required for realistic geomodels. The presence of heterogeneity and anisotropy below the well log resolution is commonplace in both conventional and unconventional depositional environments and can deeply impact geological, petrophysical and geomechanical assessments ranging from fine-bed resolution, mechanical stratigraphy, reservoir quality, wellbore integrity, horizontal stress estimates, and a number of related issues. Yet, in order to fully realize the value of lab-based reservoir characterization, it appears critical that laboratory workflows be optimized in terms of both outputs and turnaround times. In this paper, we present an in-house automatic core scanner for fast and non-destructive physical measurements (not simply scanning) of elastic, transport and compositional properties of rocks at a very fine-scale (down to mm) as well as a set of workflows to incorporate aforementioned properties in conventional and unconventional reservoir characterization with examples from deepwater Gulf of Mexico, Permian Basin, and Argentina.