

## **Systematic work flow for characterizing Frac sand: An integrated approach**

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### **ABSTRACT**

Unconventional and tight reservoir exploration and development activities in the Middle East region have increased and are expected to grow further. Developing such reservoirs has led to increased hydraulic fracturing activities and, as a consequence, increased demand for hydraulic fracturing sand. Hydraulic fracturing uses specially engineered fracturing fluids containing micrometer to millimeter sized grains of propping agent or silica sand to overcome stresses and keep induced fractures open to help ensure optimum hydrocarbon production. Sand used in hydraulic fracturing must be aligned with quality standards outlined by the International Organization for Standardization (ISO) and the American Petroleum Institute (API). The objective of this study is to develop a systematic work flow to characterize fracturing sand for hydraulic fracturing applications.

This approach requires covering the following aspects of sand used as proppants: 1) understanding of the mineralogical and elemental properties of sand, 2) analysis of geomechanical strength, and 3) determination of a sand's capability to be used in fracturing applications. The ISO parameters testing is performed using X-ray diffraction (XRD) for mineralogical analysis, X-ray fluorescence (XRF) for elemental composition, bulk density, acid solubility, and turbidity. Sphericity and roundness of the particles are determined using a microscope. Also, crush tests are conducted for geomechanical characterization. In addition to these qualifying tests, often it is necessary to test the selected sand for proppant bed conductivity at reservoir conditions and the compatibility of the selected fracturing fluid with sand. Both evaluations are performed at laboratory scale and are discussed in this paper. Existing dissimilarities in reservoir properties require an understanding of reservoir geomechanical and geochemical properties and hence a fit-for-purpose characterization approach for using a sand as a proppant. Planning is essential in unconventional reservoirs because the properties of each reservoir are unique and require individualized approaches to design and develop a proper fracturing and proppant solution. This workflow should help well operators and service companies determine the type of proppants that suits the targeted reservoir formation, which should help optimize reservoir productivity.