Application of the Wellsite Mass Spectrometer and Fluid Inclusion Stratigraphy in 3D Resource Development of Rocky Mountain assets

Maria N. Slack, David A. Wavrek, and Scott Field

The benefit of understanding the reasons for relative success and failure across zones in well bores cannot be understated. One timely method of accomplishing this utilizes the wellsite mass spectrometer to identify both sweet and sour aspects to a well when raw data is suitably utilized in comprehensive interpretive schemes. This is accomplished in data analytic deconvolution of the collective mass spectra signal to determine hydrocarbon and non-hydrocarbon composition during real time in the drilling mud system. Critical bittersweet components include the influx of water, inorganic dilutant (e.g., hydrogen sulfide, carbon dioxide), leaky top seals, and the potential for depleted compartments. The individual wellbore mass spec data is post-processed to provide visualization of the key parameters that are particularly insightful when the full gambit of well bores in a given area are viewed simultaneously in 3D. This includes the systematic influx to the wellbore of a particular bittersweet component, such as water via fractures and/or faults. The method is likewise extended to the predictive realm as prior wells can be used to build a predictive 3D model by taking advantage of the interchangeable format of data manipulation from fluid inclusion stratigraphic (i.e., FIS) analysis. By incorporating additional data from production samples (e.g., isotubes) hydrocarbons can be chemically typed to understand their relationship to the overall petroleum system. This approach is effective at resolving the under-utilized field data conundrum by providing a platform for the proper alignment of people, processes, and technologies to provide the answers to issues like well spacing in asset management.