Real time measurement of gas composition from live well fluids at drilling site

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Determining gas compositions from live well fluids during a drilling operation is critical for real time formation evaluation, and early gas detection. Reservoir fluid and formation evaluation are important to delineate pay zones (economically viable hydrocarbon zones) as well as for early detection of gas in the wellbores, which can lead to safety hazards (example gas kicks). However, development and utilization of a reliable mass spectrometric method to accurately characterize these live well fluids is always a challenging job. It is primarily due to the lack of robust, quick and effectively selective instrumentation and proper method for such live fluids analysis. In this study, 46 quadrupole mass spectrometers (MS) were optimized and utilized to detect geological formation fluids in the gas phase at drilling rigs, during drilling operations. Both hydrocarbons and non-hydrocarbons (C1 to C10 compounds and other elemental gases with *m/z* ranging from 2 to 200) were identified and quantified. However, the measurements using those MS were not consistent and varied among drilling locations and concentration levels of the gas analytes in the drilling fluids. The MS worked well and had good spectrometric resolutions/detection for samples with higher concentrations of the target gas analytes, but, the MS had issues with detection, spectrum deconvolution, and quantification of analytes at lower concentrations (<20 ppm) for other samples, particularly for the lighter (<30 *m/z*) hydrocarbons. The objectives of the present study are to understand the reasons of such discrepancies, identify the detection issues, calibrate and QA/QC the instruments, and analyze the results in lab settings. This is a collaborative project between Louisiana State University and the Oilfield Service Company 'Halliburton' to develop a more selective and precise method in mass spectrometers to quantitatively analyze low level lighter analytes in live well fluids. The results showed that a proper mass selection and optimization significantly increase the detection limits of the MS for live fluid analysis. This optimized method will increase the accuracy of fluid analyses and may prevent any potential drilling accidents.