Detection of Sodium Signatures in North Dakota Flare Flames

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Abstract

During well completion, injected liquids, trapped natural gas, oil, and formation water are hydrostatically driven towards the surface via conduits held open by fracking solution proppants. At the surface, separators are tasked with segregating these produced fluids. Typically oil and condensate are sent to production tanks or into a pipeline; water or brine are held in tanks for further treatment and disposal; and gasses are directed to a flare system. However, there are limited to no data in the literature on typical efficiencies of this separation under field conditions. Current regulatory guidelines on separation efficiency are limited to specifying that “droplets larger than 300-600 microns” should be removed (API 521/AER D60) from flare gas streams. The lack of field data is important since the few available field (Strosher, 2000) and lab experiments (Jefferson et al., 2015) suggest liquid aerosols in the flare stream can affect flare performance. In particular, preliminary research under FlareNet has shown that salt-water aerosols can affect combustion completion and augment carbon monoxide and particulate emissions. The objective of this work was to investigate whether non-hydrocarbon liquids are likely being entrained in flares during flowback through remote field measurements performed in North Dakota. A portable atomic emission spectroscopy system was developed and deployed in an attempt to remotely detect the presence of sodium in flare flames. Based on a literature review of typical Bakken formation water showing high concentrations of dissolved salts, sodium was expected to be a dominant cation. This poster presents initial analysis of field measurement data. Detectable sodium signals were apparent at several sites confirming that some amount of non-hydrocarbon aerosols can indeed be carried through to flare systems during flowback.