Surface Imaging of Bakken Stimulation Projects Supported by ND Oil and Gas Research Council

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Three surface fracture stimulation monitoring projects were performed on Bakken wells by Marathon under the North Dakota Oil and Gas Research Program. These wells are in Dunn County, North Dakota, and utilize either a variation of the monitoring methods or stimulation methods. A tiltmeter survey was performed on the Marathon Klatt 31-14H well. This survey gathered data from two different fracture stimulation events due to mechanical difficulties of the first stimulation job. The results from the two data sets depict a complex fracture-stimulation pattern and a change of the fracture orientation between the two completions. The second monitoring project used surface microseismic around the Marathon Kevin Buehner 11-18H well. The recorded data set also yielded events in a complex stimulation pattern of longitudinal and transverse fracture sets associated with the fracture job in the open-hole horizontal completion. The final project mapped a simultaneous fracture stimulation of two Bakken horizontal wells, Marathon Grant Carlson 14-34H and Grant Carlson 24-34H. The resultant data sets recorded events along and away from the open-hole horizontal completions that were designed to take advantage of the combined stress of the two stimulation jobs. Each technology delivered expected results that are used in the map view analysis of the stimulation; however, vertical resolution of the stimulation has been each technology's limitation. The ultimate goal of the projects to map Bakken stimulations has been achieved, and the results are used in stimulation design.

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