

Support Systems for Beam Pumping Units in Adverse Ground Conditions

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ABSTRACT

Polished rod wear, bearing life, fatigue, and other factors affecting long-term performance of beam pumping units depend to large extent on maintained base levelness, stability, and position relative to the well head. Settlement of fill, expansive soils, collapsing soils, frost heave, and thaw softening are adverse ground conditions that affect base stability. Oil producers spend \$ millions each year adjusting and re-setting beam pumping units to combat ground shifting. Down time from soil shifting is a significant factor in lost oil production. In worst cases, severe out-of-levelness causes major damage to beam pumping units and even collapse.

A five-year study has been conducted in the Bakken region by an independent consulting group who periodically measured several hundred different beam pumping units on a variety of foundations including precast concrete slabs on grade, precast slabs on piles with and without nose pads, and steel platforms on piles. Measurements included strain gage readings, dynamic dial gage readings, elevation surveys, and levelness computations. Strain gage readings were used to evaluate stresses in tie-down rods, Sampson posts, main beams, and t-beams to help evaluate effect of different support conditions and also as a direct means to judge beam pumping unit base reactions. Results of these measurements will be presented and discussed. The presentation will conclude with a number of new base support technologies derived as a result of this study. Advantages and disadvantages of pre-cast concrete and steel platforms on driven and helical piles will be presented.

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