Abstract Submission: ALRDC Sucker Rod Pumping Workshop, August 28th to 31st, 2023

Title: Tubing Anchor Catchers have been limiting production for too long, it's time for change!

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Abstract:

Objectives / Scope

Sucker rod pumping commonly requires the tubing string assembly to be secured to the casing downhole near the pump to prevent tubing movement. Tubing movement can undesirably reduce downhole pump efficiency and result in premature failure of the tubing string, casing or sucker rods due to mechanical wear/fatigue. Downhole tubing anchors are used for this purpose, but they can bring about risks that can increase operating expense and limit production.

For example, production can be limited if the annular flowby cross sectional area of a tubing anchor is restricting. Placement of a tubing anchor immediate above or below a downhole separator can also limit production.

Engineering application and operational use of a tubing anchor should consider the following risk controls:

1. it must be a catcher type (Tubing Anchor Catcher or TAC) to avoid the risk of a portion of a tubing string from falling uncontrollably down the wellbore in the event the tubing loses integrity (i.e., becomes parted),
2. it must have adequate tensile loading retainment and mechanical fatigue capacity for all possible tubing movement scenarios to avoid the risk of compressional tubing loadings and cyclical loading failures,
3. it must have adequate annular flow-by cross sectional area clearance or a large enough annular cross-sectional area with the wellbore casing to avoid the risk of excessive gas velocities limiting liquid fallback,
4. its mandrel must have full drift internal diameter equivalent to 2-7/8" EUE tubing to allow for placement of a mechanical and flow path engineered distance away from the separator,
5. it must offer low operational complexities and uncertainties for running (setting) and retrieving (unsetting), to avoid the risk of excessive workover costs or a loss of wellbore, and
6. it must be cost effective.

An extensive and comprehensive review of existing tubing anchors revealed that none of them effectively address such risks collectively. A new tubing anchor was then designed, built, trialed and implemented to address the risks. This new mechanical design uses eccentric flow paths and does not require rotation to set or unset. Case histories demonstrate this new tubing anchor successfully lowers operational risk and avoids limiting production.