EVALUATING CASING PLUNGER CUP DESIGN

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After decades of casing plungers using “pear-shaped” tapered elastomer sealing cups, PAAL, LLC has introduced a patented casing plunger known as the PAL. Older methods employed an elastomer cup with the major outside diameter larger than the casing inside diameter. This design provided the necessary sealing contact surface with the casing wall, but it also increased the premature wear of the cups and often created a condition in which the casing plunger could become wedged against the casing wall and fail to fall to bottom for correct operation.

After five years of intensive research, design, and field testing, the PAL has been granted one patent with others pending. PAL improves reservoir operations by reducing operating pressures in many stripper gas wells. This reduction extends the length of the productive life, increasing total reserves recovered. In other stripper gas wells, rod pump units have been replaced with PAL casing plungers, successfully removing the accumulations of fluid in the well bore that seriously restrict gas production.

Since the novel cup design of the PAL, incorporated into a totally revolutionary mechanical design, is smaller than the casing inside diameter, the cups do not experience unnecessary wear during descent. The cups are mechanically and pneumatically expanded and sealed at the bottom of the well. This has enabled the effective production of wells with tapered casing strings, as well as those previously excluded due to squeeze cement casing leak repairs.

In spite of these significant accomplishments, much remains to be determined to further advance optimal reservoir operations. This request for funding seeks to determine actual well bore testing and diagnostic evaluations of various aspects of the elastomer sealing cups. Still to be determined are the specific responses of any number of elastomer choices for sealing cups. This proposal offers to modify an existing PAL casing plunger to provide test chambers in which to suspend various samples of elastomers to be exposed to bottom hole and well bore conditions to determine the best choice of cup materials. This will eliminate many costly and unsuccessful “trial and error” attempts to guess the best choice. After exposure to actual well conditions, which vary greatly from well to well and reservoir to reservoir, cups can be manufactured for specific well conditions. Skilled professionals will supervise and obtain the field data, providing useful data for the industry.

This proposal permits the inclusion of BHP/BHT (bottom hole pressure and bottom hole temperature) data collection, both above and below the sealing cups simultaneously. This data will be acquired in the well bore under actual conditions and can be correlated to depth to determine the actual hydrostatic differentials across the sealing contact surfaces. Empirical data has been observed that indicates substantially different wear rates exist between the upper and lower cups. This data will provide the industry with the information necessary to best design casing plunger cups. This proposal, if approved, will contribute significantly to the state of the art in casing plunger cup design.