SPE SAMPLE Paper Proposal

TITLE: Dynamic Model for Stiff String Torque and Drag

1. **OBJECTIVES/SCOPE: Please list the objectives and scope of the proposed paper. (25-75 words)**

A stiff string torque and drag model is presented that uses steady state dynamic equilibrium of the drillstring as its basis for calculations. Results are compared to previously published T&D models that are based on static equilibrium.

2. **METHODS PROCEDURES, PROCESS: Briefly explain your overall approach, including your methods, procedures and process. (75-100 words)**

The new approach is based on a 3D transient dynamic model of drillstring and BHA in an elastic borehole. It considers bending stiffness, torsional stiffness, contact forces and friction with localization of contact points. A numerical method description is provided that has proven to have high stability. Complete governing equations are provided and the method is described in detail to permit readers to replicate all results.

3. **RESULTS, OBSERVATIONS, CONCLUSIONS: Please describe the results, observations and conclusions of the proposed paper. (100-200 words)**

The dynamics model is compared to three static stiff string models that are published or commercially available. Comparisons are also provided for three conventional soft string models including the Lubinski-Paslay-Cernocky bending stress magnification factor. Four field case studies are presented for horizontal wells. Two wells are short radius with dogleg severity over 50 deg per 100 ft and two wells are shale gas wells with doglegs up to 15 deg per 100 ft. Contact forces and bending moments for the new dynamics model are compared to static stiff and soft string models. The most significant new finding is that local contact forces and bending moments can be two to three times higher than static models – even stiff string. This is important because higher contact forces affect critical cross sections of the drillstring; prediction of casing wear; effective operation of downhole tools such as RSS or motors; and running drillstrings or completion strings in the hole. Higher bending moments are important because they cause increased fatigue damage in drillstrings.

4. **Please explain how this paper will present novel (new) or additive information to the existing body of literature that can be of benefit to a practicing engineer. (25-75 words)**

The novelty of the new dynamics model is in the ability to solve T&D operations of the entire drillstring in reasonable time using standard engineering computers.