

# **Coupled Torsional Vibrations In Drilling Systems**

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## **Summary**

The contact between the drilling bit and formation is known to excite severe torsional and axial vibrations in the drillstring. A dynamic model of the drillstring including both drillpipe and drillcollars is formulated. The equation of motion of the rotating drillstring is derived using Lagrangean approach together with the finite element method. The model accounts for the gyroscopic effect, the torsional/bending inertia coupling, the axial/bending geometric nonlinear coupling, and the stiffening effect due to the gravitational force field. Reduced order modal form of the dynamic equations is obtained using complex modal transformation. The developed model is integrated into a computational scheme to calculate time-response of the drillstring due to torsional excitations.

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