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New Transient 3-Dimensional Torque and Drag Model for ERD Wellbores

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This paper describes a three dimensional torque and drag model for elastic drill string in a drilling wellbore with any trajectory profile. The following forces are taken into account in the transient T&D model with take into account;

- Inertia forces on drill string during acceleration/deccelaration of pipe when drill string will start moving from a stationary position and when it stops from movement.
- Hydrodynamic viscous drag force
- Pressure (or Pressure-Area) forces; forces acting on drill string due to change in cross-sectional area of pipe/BHA elements)
- Dynamic Buoyancy forces (i.e. buoyancy effect based on dynamic pressure in the well)
- Frictional forces – drag in 3D based on Coloumb friction
- Weight force in 3D profile

The drill string dynamic model is coupled with transient ROP model. The ROP will change based on formation hardness, Bit rotational RPM and pump flow rate. Weight-on-Bit and Torque-on-Bit will be calculated based on drill pipe stretching/compression and drill string tortuosity (i.e. twisting angle) respectively. The model was used for real-time simulation of drill string to understand the mechanical behaviour of a drill string in exploratory wells in a field in UK sector of North Sea. The torque and drag data then was compared with real field data and the deviation was in a negligible order of magnitude.

Biography:

Ahmad Mirhaj is currently working as a Drilling & Well Modelling Specialist in the department of New Services and Drilling Systems at MHWirth company.