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Hydrodynamic analysis of field data acquired during well drilling with aerated fluid. RUBEN LOPEZ, Instituto Mexicano del Petroleo, ANTONIO LOPEZ, Petroleos Mexicanos, MARIA HERRERA, Instituto Mexicano del Petroleo — During conventional well drilling the circulating system consists as follow, the drilling fluid is pumped downward into the drilling pipe until the bottom of the open hole then it flows through the drill bit, and at this point formation cuttings are incorporated to the circulating fluid and carried upward to the surface. The mixture returns up to the surface by an annular flow area. However, throughout drilling operations with aerated fluid, the drilling fluid used is composed by gas and an oil-based mud. In consequence, it involves a multiphase flow hydrodynamic analysis. For achieving this, it is necessary a better understood of the flow mechanisms in drilling rig and the operational technique. Therefore, it was carried out a multiphase conservative model that includes three mass equations and a momentum equation. The mathematical model is solved by numerical conservative schemes. The real operational conditions are fed to conservative model and the results are matched up to field measurements in several oil wells. Mainly, flow rates, drilling rate, well and tool geometries are data to estimate the profiles of pressure, mixture density, equivalent circulating density, gas fraction and solid carrying capacity. Even though the problem is very complex, the model describes, properly, the hydrodynamics of drilling techniques applied at oil fields. It is supported by the field data acquired and study cases.

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