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A Particle Image Velocimetric (PIV) Experiment on Simplified Bottom Hole Flow Field

Authors : Heqian Zhao, Huaizhong Shi, Zhongwei Huang, Zhengliang Chen, Ziang Gu, Fei Gao

Abstract : Hydraulics mechanics is significantly important in the drilling process of oil or gas exploration, especially for the drill bit. The fluid flows through the nozzles on the bit and generates a water jet to remove the cutting at the bottom hole. In this paper, a simplified bottom hole model is established. The Particle Image Velocimetric (PIV) is used to capture the flow field of the single nozzle. Due to the limitation of the bottom and wellbore, the potential core is shorter than that of the free water jet. The velocity magnitude rapidly attenuates when fluid close to the bottom is lower than about 5 mm. Besides, a vortex zone appears near the middle of the bottom beside the water jet zone. A modified exponential function can be used to fit the centerline velocity well. On the one hand, the results of this paper can provide verification for the numerical simulation of the bottom hole flow field. On the other hand, it also can provide an experimental basis for the hydraulic design of the drill bit.

Keywords : oil and gas, hydraulic mechanic of drilling, PIV, bottom hole
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