World Academy of Science, Engineering and Technology
International Journal of Energy and Environmental Engineering
Vol:16, No:05, 2022

A Novel Rapid Well Control Technique Modelled in Computational Fluid Dynamics Software

Authors : Michael Williams

Abstract : The ability to control a flowing well is of the utmost important. During the kill phase, heavy weight kill mud is circulated around the well. While increasing bottom hole pressure near wellbore formation, the damage is increased. The addition of high density spherical objects has the potential to minimise this near wellbore damage, increase bottom hole pressure and reduce operational time to kill the well. This operational time saving is seen in the rapid deployment of high density spherical objects instead of building high density drilling fluid. The research aims to model the well kill process using a Computational Fluid Dynamics software. A model has been created as a proof of concept to analyse the flow of micron sized spherical objects in the drilling fluid. Initial results show that this new methodology of spherical objects in drilling fluid agrees with traditional stream lines seen in non-particle flow. Additional models have been created to demonstrate that areas of higher flow rate around the bit can lead to increased probability of wash out of formations but do not affect the flow of micron sized spherical objects. Interestingly, areas that experience dimensional changes such as tool joints and various BHA components do not appear at this initial stage to experience increased velocity or create areas of turbulent flow, which could lead to further borehole stability. In conclusion, the initial models of this novel well control methodology have not demonstrated any adverse flow patterns, which would conclude that this model may be viable under field conditions.

Keywords : well control, fluid mechanics, safety, environment
Conference Title : ICOIGI 2022 : International Conference on Offshore Oil and Gas Industry
Conference Location : Amsterdam, Netherlands
Conference Dates : May 16-17, 2022