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Studies on the impacts from different activators and inorganic components of curing agents on performance of solidifiable plugging fluid

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A new inorganic gel plugging fluid system that is solidifiable as plug in loss zone has been developed, so as to treat the following problems occurring in malignant lost circulation. Blocking material in mud liable to accumulating on the wellbore where channels causing circulation loss are existed (Door Sealed Phenomenon), the weak gel fails to improve the stratum bearing capacity substantially, cement plug is susceptible to erosion which results in strength loss in later period and other problems reducing plugging success rate. Unlike adding various conventional chemical treatment agents to plugging fluid system to adjust the mud performance, we studied the impact on the system of sedimentation stability, rheology, compressive strength, etc., by changing the percentage of the component substances, such as bentonite, CaO, MgO, and Al_2O_3, and analyzing the test samples and microstructure via X-Ray Diffractometer (XRD) and Scanning Electron Microscope (SEM). The analysis indicates that: a) bentonite can effectively adjust the sedimentation stability and shear thinning behavior; b) components of the curing agent like CaO and MgO can increase the compression resistance of the sample; c) such activators as NaOH, Na_2CO_3 and Na_2SiO_3 adjusts the rheology by changing the hydration film thickness of the charged particles; d) alkaline environment causes the vitreum of the curing agent disperse, dissolve and form the structure of solidifying working fluid to plug. The field case of Well MX001-X proves that the system can be applied in different wells by adjusting the additives in case loss occurs to oil/gas wells.

Biography

Zhizhong Deng is a student at the State Key Laboratory of Oil and Gas Reservoir Geology and Exploitation, Southwest Petroleum University, Chengdu, PR China working along with Prof. Xiaoyang Guo, academic leader of State Key Laboratory of Oil and Gas Reservoir Geologyand Exploitation, vice director of Cementing group of Chinese Petroleum Society (CPS), senior expert of Drilling Engineering Standardization Technical Committees of CNPC, member of Society of Petroleum Engineers (SPE). Prof. Guo's research group focus on the operation safety and integrity of deep and ultra-deep well.

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