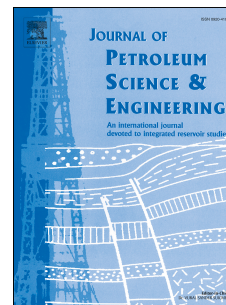


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Experimental and numerical investigation on repairing process of cement-casing repaired by rolling reshaper

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Abstract

In oil field, the bit weight (repairing force) and torque are determined frequently by experience when the rolling reshaper is used to repair the deformed casing. However, the unreasonable repairing force and torque give rise to the secondary damage of deformed casing and surrounding cement sheath as well as pipe sticking easily. Hence, based on the elastic-plastic theory, the three-dimensional finite element model which can simulate the repairing process of cement-casing repaired by rolling reshaper has been presented in this paper by adopting the finite element method. Based on this model, the whole repairing process of cement-casing with elliptic section has been simulated, by which the deformation law of cement-casing, the repairing force and torque required to repair the cement-casing have been obtained in the repairing process. Meanwhile, based on self-developed testing equipment, the full-scale repairing experiment of cement-casing has been conducted by using rolling reshaper, and the correlations between deformation laws of cement-casing and repairing force, torque have been analyzed emphatically. The test results are in agreement with the simulation results, which indicates that the finite element model is accurate and reliable so that the research results can provide important reference for design and optimization of technological parameters.

Key word: Rolling reshaper; Repairing process; Experiment; Finite element model; Cement-casing; Repairing force

Introduction

Casing plays a paramount importance role in protecting borehole, isolating oil, gas, water and restricting different types of complicated stratum during drilling and production. Many factors (such as fracturing acidizing, creep of plastic rock salt and corrosion.) can cause casing deformation and collapse failure, which has a great impact on the implementation of exploration measures in the late stage of production, and causes enormous economic loss to the oil fields [1-4]. The failure data shows that the casings of the well Long-gang-001-1, Long-gang-001-2, Long-gang-39, Puguang-204-2H in Sichuan and Chongqing gas fields and the well TK1127 in Tahe oilfield in Xinjiang were deformed to some extent due to non-uniform load [5]. In addition, up to now, the number of casing damage well has reached up to ten thousand in China. Hence, in order to resume safe production of oil field, the casing repair technology becomes more and more important.

Certainly, based on the detection technology of casing failure [6], the deformation and failure mechanism of casing [7-10], many scholars in the world have presented lots of corresponding preventing measures [11], and developed many kinds of casing repair tools (such as pear-shaped casing swage, solid expandable tubular and

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