Multi-Dimensional CFD Analysis for the Prediction of Transient Wellbore Circulating Temperature Profile to Guide……

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**Abstract**

This study investigates how temperature profile changes with time during fluid circulation through the wellbore and annulus by using ANSYS Fluent, to help designing offshore cementing job in the petroleum industry.

 **Keywords**: keywords (no more than 5)

**1. Introduction**

The American Petroleum institute (API) has developed temperature correlations to estimate circulating temperatures for cementing job. Those correlations (API RP10B) are somewhat simplified and based on true vertical depth (TVD) and geothermal temperature gradient. While the correlations, originally intended for on-shore wells, provide useful and reasonable guidelines, its applicability for offshore wells is still challenging, especially for some wells drilled in deep water (Chen and Xie, 2015).

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For example, Calvert and Griffin (1998) utilized two simulators: the first is a one-dimensional simulator that is first introduced by Guillot *et al.* (1993) and Bittleston (1990), and the second is an improved two-dimensional model to compare the circulating temperature profile with API prediction. The results from the simulation of offshore wells

**2. Main subject**

Chen and Novotny (2003) developed a one-dimensional in-house numerical simulator by using a finite difference method (FDM) to predict temperature profile in wellbore during fluid circulation in onshore and offshore wells. When compared with their own field test measurements (temperature as a function of time at three different locations) during the circulation of seawater, the study showed that the offshore wells are much more difficult to predict than the onshore wells.

**3. Main subject**

The partial differential equation for mass conservation equation for 2D axisymmetric geometries can be written as follows:

$\frac{∂ρ}{∂t}+\frac{∂}{∂x}\left(ρv\_{x}\right)+\frac{∂}{∂r}\left(ρv\_{r}\right)+\frac{ρv\_{r}}{r}=S\_{m}$ (1)

**4. Figures.** Letters, signs, and captions in figures shall be indicated in English. Captions shall be provided below the figures.

e.g. Fig. 1. Schematic of the editorial review process.

**5. Tables.** Any content in tables shall be indicated in English, and table captions shall be provided above the tables in English.

e.g. Table 1. Comparison between U.S. and Korean editorial review committees

**6. Conclusions**

**7. Acknowledgments**

**8. References**