Geophysical Research Abstracts, Vol. 7, 06883, 2005
SRef-ID: 1607-7962/gra/EGU05-A-06883

Wellbore heat transfer in multiphase fluid flow

V.Tertychnyi (1), **M.Nukhaev** (1) and A.Shandrygin(1)
(1) Schlumberger Oilfield Services

Heat transfer seriously impacts all aspects of well operations - drilling, sampling, casing, logging, production and injection. Detailed knowledge of the temperature distribution can be vital for correct job design and execution for production log analysts, production and reservoir engineers. Usually temperature is a frequently measuring property that is rarely used for qualitative data interpretation. Recently a number of different models for simulating wellbore heat transfer - from simple analytical to enhanced numerical were developed. Unfortunately lack of the detail analysis and feasibility of the model application makes use of the model rather unjustified. Current work is aimed to investigate impact of different production parameters - flow rates, phase content, completion details on wellbore temperature. A detailed comparison of analytical model and commercial reservoir simulator was carried out. Despite of good agreement for temperature of single-phase fluid or gas flow, there is a difference for multiphase oil-gas flow in a wellbore. A unified multiphase fluid model is developed and evaluated for temperature measured with Distributed Temperature Sensors (DTS). It is shown that wellbore temperature could be efficiently used for evaluating distribution of geothermal gradients and relaxation parameters. Being the function of production and over-all heat transfer coefficient relaxation parameter could be used as an independent factor for thermal diagnosis of wellbore flow and completion integrity. A robust procedure for estimation the relaxation parameter was developed. A sensitivity study of influence of different parameters on the determination of over-all heat transfer coefficient was conducted. It was concluded that analytical solutions could be used for modeling wellbore heat transfer and obtaining temperature distribution along wellbore with certain accuracy in the thermal simulators instead of using time-consuming complex numerical procedure.