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## **Field Case Histories Demonstrating the Critical Roles Played by Multiphase Flow Models in Appropriate Production Log Interpretation**

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### **Abstract**

Production logging (PLT) has been routinely practiced in oil and gas industry to estimate oil, water, and/or gas production profile, determine fluid entry or exit location and amount along perforation interval(s), and detect major oil/gas/water producing layers. Through successful PLT surveys and appropriate interpretation, we may also identify thief zones and high perm channels, locate injected fluid breakthrough, monitor fluid front movements, detect crossflow and fluid migration, assist in reservoir simulation studies, etc.

After a PLT is run, subsequent workover is routinely performed aiming at reducing water production while maintain or even increase oil and/or gas production from the well. Unfortunately, mixing results have been obtained through workover operations designed based on PLT, due to poor logging procedure, unreasonable PL tool selection, poorly executed surveys, inappropriate interpretation, etc.

With the existence of two or three phase flow in a well, the interpretation of production logs becomes critical for achieving successful assessment of major oil, water and gas entries and thus a successful workover operation. Under most circumstances, an appropriate interpretation of production logs relies heavily on the selection of a reasonable multiphase flow model to correctly capture complex multiphase flow features in the wellbore.

In this paper, major flow characteristics of multiphase flow in a wellbore will first be described. Different correlations and mechanistic models to describe multiphase fluid flow will then be introduced; the pros and cons of correlation/model will be highlighted. Impacts of multiphase flow models on interpretation results of production logs will be investigated.

Several field case histories will be discussed in detail to illustrate the critical roles played by multiphase flow models in production log interpretation. For each field case history, the background information of well production, reservoir sands, production logging survey and interpretation, workover efforts and results, and so on, will be included. PLT interpretation based on selected multiphase flow models will be shown and compared with workover results.

### **1. Introduction**

Production logging (PLT) has been routinely practiced in oil and gas industry to estimate oil, water, and/or gas production profile, determine fluid entry or exit location and amount along perforation interval(s), and detect major oil/gas/water producing layers. Through successful PLT surveys and appropriate interpretation, we may also identify thief zones and high perm channels, locate injected fluid breakthrough, monitor fluid front movements, detect crossflow and fluid migration, assist in reservoir simulation studies, etc.

After a PLT is run, subsequent workover is normally performed aiming at reducing water production while maintain or even increase oil and/or gas production from a well. Unfortunately, actual field workover operations have led to mixing results – success for some wells coupled with failure for other wells. The failure is typically tied to poor logging procedure, unreasonable PL tool selection, poorly executed surveys, inappropriate interpretation, etc.