Field Testing a Deep Penetrating Radar System

Paul Harness[2], David Barnes[1], Colin Stove[3], and Gordon Stove[3]

[1]Chevron North America Exploration and Producing, Inc, Chevron, Bakersfield, CA, United States.
[2]Chevron, Bakersfield, CA, United States.
[3]ADROK LTD, Edinburgh, United Kingdom.

ABSTRACT

A database of over 10,000 wells with open hole logs, of which over 600 wells are dedicated surveillance wells with whole core, time lapse Carbon/Oxygen, Neutron, and Temperature data is being used for evaluating a deep penetrating radar system. The database is from the thermally operated Kern River Super Giant oilfield in Kern County California, USA. The technology being tested is ADROK, LTD's deep penetrating radar system. The Kern River field and dataset thru-out its history has provided a robust environment for training and blind testing of various technologies (time lapse Carbon Oxygen*, EM, cross well tomography**, to name a few). Kern River is on its way to recovering 90% of its OOIP and surveillance is playing a significant role in achieving such a world class milestone. Future growth for develop of the field and surveillance technologies still exist as well. To that end, we are looking at the possibly of surface only acquisition for our surveillance needs. Significant time and effort was spent on dielectric logging in the 70's – 80's by operators and service companies alike. ADROK's Dielectric Resonance (ADR) claims to interact with the subsurface in the same region of the electromagnetic spectrum as dielectric logging, but from surface measurement. First Principles predicts change in dielectric constant as temperature changes. An experiment was conducted in 2014 to acquire ADR data and compare the results to Kern River's surveillance wells. The surveys were divided up into two groups, one for training (full access to database) and one for blind testing (no access to database). Surprisingly, the test could detect the presence or absence of a single zone steamchests. Multi-zone steamchests presented a bit more challenging for the current state of the technology. All in all, currently, one could argue the technology can detect hot/cold with a reliability of 16/23. . In addition to the field study results, laboratory results, and technology overview the paper will illustrate how we used an equation from black body radiation known as the Stephan-Boltzmann equation, deriving P and emissivity terms from the ADR data and solved for temperature. In addition, a neural net was able to resolve temperature from ADR/log correlations that are not as of this writing thoroughly understood. Comparing ADR derived temperature with known readings from Kern River's extensive database of wireline temperature surveys is the basis of this report.