In-situ Permeability Test in a Salt Formation at Marboz, France

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Abstract

Permeability tests were performed in a 1698-m deep wellbore drilled from the Bresse salt formation at Marboz. During Phase 1, the wellbore was filled with brine, and the wellhead pressure was increased to 18 bars (260 psi) and 37 bars (536 psi), successively. Pressure evolution was recorded over 19 days and 28 days, respectively. It is governed by creep closure and permeation through the open hole, the casing shoe and the steel casing. Back-calculations prove that wellbore permeability is around 6 x 10^{-21} m^2. During Phase 2, diesel was injected to develop a brine-diesel interface in the external annulus, and wellhead pressure was kept constant using a pressure regulator. Diesel permeation to the rock formation can be considered negligible; permeation is through the open hole. The interface first was set below the casing shoe over a 17-day period, then at three deeper locations in the open hole for shorter periods. This procedure allows assessing the average permeability of various parts of the well. The average permeability of the open hole proved to be 4 x 10^{-21} m^2, a very low value. The testing method was not accurate enough to allow estimation of the average permeability of smaller intervals in the open hole. Longer testing periods and more accurate pressure sensors might allow such an estimation.