

BGP-T6: Processes in the near wellbore reservoir matrix during formation water re-injection - measurements and simulation

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Depth and Time based temperature measurements with Fibre Optic cable, often referred to as Distributed Temperature Sensing DTS, were used during re-injection of formation water to confirm wellbore and storage reservoir integrity. Formation water, a by-product of oil and gas production, is processed at surface and re-injected through disposal wells into high porosity and high permeability layers in the subsurface. Verification of the sealing properties of over-lying layers is of importance to avoid contaminating fresh water supplies.

A study was carried out during re-injection on a formation water disposal well consisting of a high porosity, permeability Kalkarenite storage reservoir overlain by impermeable Palaeocene shales. Depth and time based temperature measurements

during periods of shut-in, warm and cold water re-injection and relaxation, were used to model the 2D distribution of temperature in the wellbore. A so-called "extended-cold-water-injection test" proved to be the best method. The resulting temperature profiles were compared to the temperature profiles generated by a thermal model of the near-wellbore region. The results showed re-injection into the high porosity permeability layers and confirmed the hydraulic isolation of the storage reservoir.

The results show the success of using Fibre Optic Temperature measurements and 2D (Depth and Time) Temperature distribution modelling in quantifying storage reservoir integrity.