

Chemical and biological process of groundwater near screen section of wells /clogging process

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Groundwater wells are often clogged by incrustation, which has a negative impact on well specific capacity. Chemical and biological incrustation formed by precipitation of minerals in the well reduces the open area of slots in the screen section, which leads to an efficiency reduction in wells. Incrustation conditions are observed in the geothermal energy wells located at Oslo airport, Gardermoen. Well yield capacity has declined since they were installed in 1997. There are eighteen energy wells; 9 wells on the cold side and 9 wells on the warm side. The ground source of heat pump, which is an open system, extracts heat from the ground by pumping ground water from production well to the heat pump. After the circulation in the system, the ground water used is injected into the injection well and flows through the aquifer again. Recently, one well from the cold wells was totally abandoned and it has been replaced by a new pilot well. A quantitative calculation with PHREEQC of saturation indices for formation- and borehole water has aided in the evaluation of several minerals. These results have been compared with formation mineralogy and crust samples from within the borehole. The results from geochemical modelling indicates that carbonate minerals such as calcite (CaCO_3), aragonite (CaCO_3), dolomite ($\text{CaMg}(\text{CO}_3)_2$), dolomite-ord ($\text{CaMg}(\text{CO}_3)_2$), and rhodochrosite (MnCO_3), have the potential to precipitate in the wells. However, the crust analyses showed that only calcium carbonates were found. Furthermore, the elevated percentage of inorganic carbon in the crust samples supports evidence of carbonate mineral precipitation. In addition, the reduction of ferrous iron (Fe^{++}) concentration, as the flow of formation water approaches production wells, as well as the relatively high percentage of iron in the crust samples are all indicative of Fe (III) oxide minerals precipitation. An increased content of organic carbon in the crust samples compared with aquifer material indicates microbiological activity in the formation of the crust. The disturbance of chemical equilibrium due to pumping, which leads to pressure reduction allows the release of gases from the formation water, resulting in precipitation of calcium carbonate in the wells.

Biography

Abeya Olana Woyessa has completed his bachelor degree at Mekelle University, northern Ethiopia, since 2006 .He employed in firm called Hard Rock Drilling and Engineering PLC. He was working as site geologist for three years. He got an Opportunity to pursue his study from Oslo University, Norway and earned master degree in environmental geology and geohazards in Jan 2012.

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