The influence of facies heterogeneity on the doublet performance in low-enthalpy geothermal sedimentary reservoirs - DTU Orbit (17/01/2019)

The influence of facies heterogeneity on the doublet performance in low-enthalpy geothermal sedimentary reservoirs

A three-dimensional model is used to study the influence of facies heterogeneity on energy production under different operational conditions of low-enthalpy geothermal doublet systems. Process-based facies modelling is utilised for the Nieuwerkerk sedimentary formation in the West Netherlands Basin to construct realistic reservoir models honouring geological heterogeneity. A finite element based reservoir simulator is used to model the fluid flow and heat transfer over time. A series of simulations is carried out to examine the effects of reservoir heterogeneity (Net-to-Gross ratio, N/G) on the life time and the energy recovery rate for different discharge rates and the production temperature (Tmin) above which the doublet is working. With respect to the results, we propose a design model to estimate the life time and energy recovery rate of the geothermal doublet. The life time is estimated as a function of N/G, Tmin and discharge rate, while the design model for the energy recovery rate is only a function of N/G and Tmin. Both life time and recovery show a positive relation with an increasing N/G. Further our results suggest that neglecting details of process-based facies modelling may lead to significant errors in predicting the life time of low-enthalpy geothermal systems for N/G values below 70%.

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