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A study of memory-retention in variable-rate pressure transient tests for injection wells in non-homogeneous injection zone with formation damage

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The monitoring of the formation damage in Class I deep injection wells is conventionally carried out by transient pressure fall-off tests. This implies that the injection operation has to be closed down for a number of days in order to restore ambient pressure condition around the well and then the fall-off test is performed. In this paper we investigate the appropriate time for operation shutdown before the pressure transient test can be performed. The goal should be to minimize the non-operation time in order to reduce the costs, while ensuring insignificant interference from proceeding injection operations. In this study, a finite element model is constructed of a realistic waste injection operation in a non-homogenous formation with well damage. Different scenarios of injection operation are simulated including conventional shutdowns for maintenance and fall-off tests. Transient pressures during both post-shutdown injection and fall-off periods are analyzed to evaluate changes in formation properties. Studies will be made for a number of non-homogeneous geometries of the injection zone to investigate the optimal conditions for effective monitoring of formation damage.

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