

The trigger-tube: A new apparatus and method for mixing solutes for injection tests in boreholes

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Abstract

The trigger-tube apparatus and method was developed for mixing solutes and tracers for injection tests. The apparatus is a cap-trigger tube segment and the technique mixes solutes in boreholes in 2 min. Trigger-tube with solute/tracer is introduced into the well, the trigger is released, the tube is withdrawn and the solute/tracer mixes with well water instantaneously to give a homogeneous mixture. Field tests using this method and apparatus for point dilution tests gave a Darcy velocity of 4.06 m/d, seepage velocity of 122.89 m/d and effective porosity of 0.33. Natural gradient tests gave a Darcy velocity of 4.06 m/d and natural velocity of 123 m/d, using tracer, for the same fracture at 21 m in borehole UO5, University of the Free State campus test site. The apparatus enables a comparatively shorter time for carrying out SWIW tests than is possible using the pump mixing method. Field tests gave results of 13 min for the trigger-tube method and 25 min for the pump mixing method, for a point dilution test using NaCl as a conservative tracer. The trigger-tube apparatus can be used for any borehole test that requires the introduction of a homogenous mixture.

Keywords: Field tracer test apparatus, Single-well test method, point dilution test apparatus, homogeneous solute mixer