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A Well in a 'Target' Stratum of a Two-Layered Formation: The Muskat–Riesenkampf Solution Revisited

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Abstract Explicit analytical solutions are obtained in terms of hydraulic head (pressure) and Darcian velocity for a steady Darcian flow to a point/line sink and array of sinks with refraction of streamlines on a horizontal interface between two layers of constant hydraulic conductivities. The sinks are placed in a 'target' layer between a constant potential plane and interface. An equipotential surface, encompassing the sink represents a horizontal or vertical well, is reconstructed as a quasi-cylinder or quasi-sphere. The method of electrostatic images and theory of holomorphic functions are employed for obtaining series expansion solutions of two conjugated Laplace equations. If the conductivity of the 'target' layer is less than that of the super/sub-stratum, then there is a minimum of the flow rate into the well of a given size. Applications to agricultural drainage and surface DC-electrical resistivity surveying are discussed.

Keywords Analytical solution · Complex potential · Darcian velocity · Refraction

"Form, geometrically and also philosophically speaking, is contour: it is the appearance of the LIMIT"
Matgioi (1952) La voie metaphysique. Editions Traditionnelles, Paris.

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