ELECTRIC ANALOG STUDIES OF FRESH-WATER SKIMMING

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ABSTRACT

Skimming well is an important tool for augmenting surface water supplies by pumping from shallow fresh groundwater layer overlying saline groundwater. In this study two dimensional electric analog models of skimming well under different aquifer environments were developed to simulate the upconing of brine water in the unconfined/semi-confined transient groundwater flow by using Muskat Technique (1949). The study was conducted on Teledeltas paper (conductive sheet).

The lower boundry of the models was adjusted to simulate the highest stable position of the brine cone. The steady-state axisymetrical flow to well was taken into consideration. The isotropic homogeneous aquifer conditions were maintained in most of the experiments. The flow domain was divided into ten equal segments both vertically and horizontally. The study was conducted to determine the effect on brine upconing of (a) well screen with different penetrations (b) canal lining, (c) impervious layer (d) intermediate tubewell, and (e) compound well.

The results have been expressed in dimensionless functions involving drawdown, specific capacity and discharge of the well at the occurrence of the highest stable brine cone. The flownets for the final models has been drawn. The main conclusions of the study are, (a) the well having screen top at $Z/h_o = 0.95$

and screen bottom at Z/ho = 0.85 provides maximum discharge of fresh water over a stable brine cone, (b) the partial lining of canal (bed or banks) showed useful results. The bed lining save more seepage losses as compared to banks lining, (c) the impervious layer introduced below screen bottom helped very significantly to reduce the rise of brine cone under the wells, (d) for compound well the discharge of both fresh and saline wells must be equal to maintain the interface in its original position.

The results of this study indicate that good prospects exist for the development of skimming wells capable of yielding fresh water at a stable interface of the underlying brakish water.