

Application of hydrostatic equilibrium in leachate flow control in landfills

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Surface waste dump is generally associated with various environmental and health problems, hence landfill method of waste disposal was necessary. Leachate from landfills contaminates aquifer and renders underground water unfit for consumption. This work focuses on how to strategically locate landfills in regions where there will be hydrostatic equilibrium; i.e where there is zero underground water flow. A modeled experiment was set up using five different porous sand samples of different porosities, packed into a cylindrical pipe inclined between $0^\circ \leq \theta \leq 25^\circ$ through which water was made to flow with a known piezometric height. Values of hydrostatic angles were determined for each sample at volume flux $V = 0$. The graph of porosity Φ against hydrostatic angle θ shows that both are linearly related with a relation $\Phi = 0.148656 * \theta + 0.139473$ with coefficient of determination of 0.991637. It was also observed that there exist, a critical point where at a particular angle all the samples has the same volume flux and vi-a-vis the same volume rate of flow.

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