

Threshold pressure gradient (TPG)

A quantity (usually denoted as G) representing the minimum pressure gradient required to initiate the reservoir flow:

$$(1) \quad \begin{cases} \mathbf{u} = -\frac{k}{\mu}(\nabla p - G \mathbf{e}_{\nabla p}), & |\nabla p| > G, \\ \mathbf{u} = 0, & |\nabla p| \leq G. \end{cases}$$

where $\mathbf{e}_{\nabla p} = \frac{\nabla p}{|\nabla p|}$ – unit vector along the pressure gradient.

At high flow velocities and pressure gradients the model is reducing to [Darcy equation](#).

This model can be reformulated in terms of non-linear permeability model:

$$(2) \quad \mathbf{u} = -\frac{k(|\nabla p|)}{\mu} \nabla p$$

where $k(|\nabla p|)$ is defined as:

$$(3) \quad \begin{cases} k(|\nabla p|) = k_0 \left(1 - \frac{G}{|\nabla p|}\right), & |\nabla p| > G, \\ k(|\nabla p|) = 0, & |\nabla p| \leq G. \end{cases}$$