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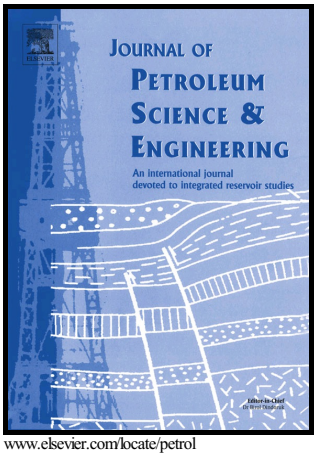

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A new production predicting model of fractured horizontal wells in dual-porosity gas reservoirs on non-Darcy flow conditions

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Abstract

Dual-porosity is a common method to model natural fractured reservoirs or complex fracture network after volume hydraulic fracturing. To analyze the productivity of fractured horizontal gas wells, a new volumetric source model with high velocity non-Darcy flow in hydraulic fractures is developed. The basic volumetric source function is solved by utilizing orthogonal transformation in real space, which solves the problem that the non-linear equation (indicating non-Darcy effect) cannot adopt Laplace transformation. The volumetric source model is verified by the tri-linear flow model and a field example. Results shows increasing width of hydraulic fractures and enlarging size of proppant have significant effect on weaken non-Darcy flow. The volumetric source model is a fast and accurate method to predict the productivity. In addition, this model can provide a more reasonable method to optimize hydraulic fracturing considering non-Darcy flow effect.

Keywords: high velocity non-Darcy flow; dual-porosity gas reservoir; fractured horizontal well; volumetric source model

Nomenclature

x_e	Length of reservoir	m
y_e	Width of reservoir	m
z_e	Height of reservoir	m
L_H	Length of horizontal well	m
r_w	Radius of horizontal well	m
k_m	Bulk permeability of matrix	μm^2
ϕ_m	Bulk porosity of matrix	dimensionless
k_f	Bulk permeability of natural fractures	μm^2
ϕ_f	Bulk porosity of natural fractures	dimensionless
α	Shape factor	m^{-2}
y_F	Length of hydraulic fracture	m
z_F	Height of hydraulic fracture	m
w_F	Width of hydraulic fracture	m