1063-76-138   **Lidia Bloshanskaya*** (`lidia.bloshanskaya@ttu.edu`), Texas Tech University, Department of Mathemathematics & Statistics, Broadway and Boston, Lubbock, TX 79409. *Longterm dynamics for well Productivity Index for nonlinear flows in porous media.*

Motivated by the reservoir engineering concept of the well Productivity Index (PI) we study a time dependent functional for general non-linear Forchheimer equation. This equation is widely used by physicists and engineers for modeling of non-Darcy flows in porous media. PI of the well characterizes the well capacity with respect to drainage areas of the well. Unlike the linear case for which this concept is well developed, there are only a few recent publications dedicated to non-linear PI. In this paper non-linear PI is comprehensively studied from mathematical point of view. The impact of the non-linearity on the value of the PI for Forchheimer flows is analyzed. In particular, an explicit estimate of the difference between PI for linear and non-linear case is obtained. For quasi-1D model exact formula for so called "skin factor" case is derived. This formula enables calculation of the nonlinear PI provided information on linear PI and geometrical parameters ! only. Longterm dynamics of the PI with arbitrary initial pressure is studied for the certain class of boundary data. Its convergence to the specific value of steady state PI is justified. (Received August 15, 2010)

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