A STUDY OF INSTABILITY PHENOMENON IN HOMOGENOUS POROUS MEDIA DURING SECONDARY OIL RECOVERY PROCESS

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Abstract— The approximate solution of instability phenomenon governed by non-linear partial differential equation is discus in the present paper. Primary oil recovery process due to natural soil pressure, but in the secondary oil recovery process water flooding plays an important role. When water is injected in the production well for recovering the reaming oil after primary oil recovery process, it comes to contact with the native oil and at that time the instability phenomenon occurs due to different viscosity and force of injected water. For the mathematical modeling we consider the homogeneous porous medium and we use optimal homotopy analysis method to solve the governing partial differential equation. The graphical representation of the solution is given by MATHEMATICA and physically interpreted.
The governing partial differential equation is

$$\frac{\partial S_i}{\partial T}+\frac{\partial}{\partial X}\left(S_i\frac{\partial S_i}{\partial X}\right)=0$$

Subject to initial and boundary conditions

$$S_i\left(X,0\right)=\begin{cases}S_{ic}\left(1-e^{-X}\right);0<X\le 1\\ S_{ic};X=0\end{cases}$$

$$S_i\left(0,\mathrm{T}\right)=S_{ic};X=0\,\&\,T>0$$

$$S_i\left(1,\mathrm{T}\right)=f\left(T\right);X=1\,\&\,T>0$$

Keywords— Instability, Homogeneous Porous Media, Optimal Homotopy Analysis Method, Oil Recovery Process.

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