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开发及开采

低速非达西渗流理论方法在DST试井中的应用

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摘要：

文章从低渗透油气藏中流体低渗流速度特征入手，通过引入启动压差概念，建立了能描述低渗透油气藏中流体低速非达西渗流的渗流微分方程和考虑井筒储集、表皮效应的低速非达西渗流DST段塞流试井模型，并结合适当的地质模型、内（外）边界条件，构成了低速非达西渗流定解问题。通过对其求解，从试井解释的角度上得出新型样板曲线，这进一步丰富了对低渗透油气藏的认识。在进行DST测试时，启动压差的影响将会导致续流时间延长，增加解释的难度；其试井导数曲线后期上翘，不能简单认为是边界反映，要结合地质及生产实际情况做细致分析才能得出结论，这有效地解决了过去遇到的压力导数曲线上翘而解释边界距离太近的疑难问题。此外，采用低速非达西渗流模型可解释为何在低渗层中刚开井投产时无产量，而经过一段时间后才有产量的现象。

关键词： 低渗透油气藏 非达西流 低速 试井解释 启动压力

APPLICATION OF LOW VELOCITY NON DARCY PERCOLATION MODEL IN DST [1)]

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Abstract:

According to the features of low velocity percolation in low permeable reservoirs, introducing the concept of starting pressure difference, the percolation differential equation is derived to describe the low velocity non Darcy percolation in low permeable reservoirs, and the well testing model of DST slug flow is developed for low velocity non Darcy percolation considering the borehole accumulation and the skin effect, and the definite solution is obtained for low velocity non Darcy percolation combining the proper geological model and the inner/outer boundary conditions. With the solution, according to the well testing interpretation, the new type curves are derived, which improve the knowledge on low permeable reservoirs further more. When DST is conducted, the effect of the starting pressure difference will make the flow continued time expanding and interpretation more difficult. The testing derivative curve going up at the late stage can’t be regarded as the boundary reaction simply. The conclusion can’t be made until careful analysis is conducted combining the real situation of geology and production. It effectively solves the problem, i.e. the pressure derivative curve going up was only interpreted as the boundary too near in the past. With the model of low velocity non Darcy percolation, it can be explained the reason why no production appears when a well in low permeable reservoirs is put into operation at very beginning and sometimes later production appears.

Keywords: Low permeable reservoir, Non Darcy flow, Low velocity, Well testing interpretation, Starting pressure

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