

论文

分支参数对煤层气羽状水平井产能的影响规律

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摘要:

根据煤储层中三维气-水两相流动特性, 考虑主井眼与分支井眼井眼内变质量管流, 建立了煤层气羽状水平井产能预测模型, 利用C++计算机语言编制相应计算软件, 并通过与现场监测值进行对比验证本文模型计算结果的正确性。分析了分支对称性、分支点位置、分支与主井眼夹角、分支长度与数量等参数对煤层气羽状水平井单位长度产能分布的影响规律。计算结果表明: 笔者建立的计算模型具有较高精度, 可以满足现场实际工程需要。主井眼单位长度产能整体呈现两端高、中间低的特征; 在主支与分支交汇点处, 主井眼单位长度产能出现局部下降。分支井单位长度产能沿程分布呈现跟端低、指端高, 中间逐渐增大的特点。分支沿主井眼对称分布时, 分支位置处主井眼单位长度产能与非对称分布时相比下降的更快; 分支节点由主支跟端向指端移动, 主井眼单位长度产能峰值点从指端向跟端发生转变; 分支与主支夹角对主井眼单位长度产能影响较小; 主井眼单位长度产能随着分支长度与数量的增加而降低。分支节点距离主井眼跟端越远, 分支井单位长度产能越大; 分支井单位长度产能随着分支与主井眼夹角角度、分支长度的增加而增加, 随着分支数量的增加而逐渐降低。

关键词: 煤层气; 羽状水平井; 分支参数; 数学模型; 径向入流剖面

Influences of branch parameters on productivity of CBM pinnate horizontal well

Abstract:

Considering the variable mass pipe flow of the main and branch boreholes, the CBM pinnate horizontal well productivity prediction model was proposed based on 3D gas water two phase flow characteristics in the coal seam. The corresponding calculation program is written based on C++ programming language. At the same time, an actual CBM well is simulated as an example. The simulated results are verified by the monitoring data from the actual site. This paper studies the effects of branch symmetry, the locations of branch points, the angle between main and branch boreholes, branch length, and branch number on gas production per unit length of the CBM well. The comprehensive results demonstrate the high accuracy of the computation model, and its ability to meet the actual needs of the project. The characteristics of gas production per unit length along the main borehole is high on both ends and low in the middle, with local decline at the branch point locations, while the characteristic of gas production per unit length along the branch borehole is high at heel, low at toe and increases gradually in the middle. Gas production per unit length at branch locations along main borehole declines faster when branches are symmetrical than asymmetrical. As branch node moves from heel to toe along the main borehole, peak gas production per unit length also transforms from toe to heel. The angles of the main and branch boreholes have no effect on gas production. At the same time, gas production per unit length reduces as the branch length along main borehole increases. Gas production per unit length increases with the distance from branch node to heel end. Gas production per unit length increases with the increase of branch length and the angle between main and branch boreholes. However, it declines as the number of branches increase.

Keywords: coalbed methane; pinnate horizontal well; branch parameter; mathematical model; radial inflow profile

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