

Reserve estimation of tight gas reservoirs by flowing material balance equation and dynamic material balance equation; a comparative case study

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Abstract

Gas material balance equation (MBE) in conventional, volumetric reservoirs is described by a linear relationship between p/z and cumulative production. This study focuses on the reserve estimation in TGR by MBE which inherits very low permeability. Reserve estimation in tight gas reservoir by conventional MBE is not possible because less permeability of the reservoir does not allow measuring the average reservoir pressure due to the uneconomically long shut in times. This reason led us to develop a “flowing” material balance. It assumes the pseudo steady state flow prevails in the reservoir causing the change in average reservoir pressure which is equal to the change in the sandface flowing pressure and constant rate history is available. Flaw of this method is that constant rate is hardly maintained. This was covered by extending flowing MBE as “dynamic” MBE which is applicable to either constant flow rate or variable flow rate. After discussing the concept of reserve estimation by conventional, flowing and dynamic MBE a case study is presented that compares the results of both the new methods. Analysis was made using the “RTA” module of software FAST™ by Fekete Associates Inc. It was concluded that the flowing pressure can be converted to the average reservoir pressure and p/z plot can easily be generated without shutting-in the well to give reserves. But it is recommended that dynamic material balance should not be viewed as a replacement to buildup tests for pressure measurements, but as a very inexpensive supplement to them.