

Better Results Using Integrated Production Models for Gas Wells L. K. Harms, SPE, ConocoPhillips

This paper demonstrates how each engineering discipline approached problem, solving and determined better solutions by using an integrated system. Any company is typically made up of 3 disciplines; reservoir, production and facilities/process engineers. Optimum results are achieved when working together. Even when multi-discipline teams were created in the 1990s to improve communication between departments, the tools being used to obtain optimised results were still specific to each discipline. Examples are presented in this paper to show how IPM can be used for gas wells to provide better solutions than those from discipline specific or 'serial discipline to discipline' tools.

The standard (non-IPM) modelling approaches taken by each of the three disciplines are:

- Reservoir Engineers

Decline curve analysis or material balance is generally used to determine the remaining reserves and analyse the options for optimal depletion. Adequate results are obtained assuming that the correct economic limit or minimum flowrate is applied to the decline curves and that the relevant recovery assumption or abandonment pressure has been applied to material balance. In reality, the economic limit is dependent on the surface pressure and associated compression costs which means that the surface pressure, tubing size and well productivity will all impact.

- Production Engineers

Nodal analysis, liquid load up rates and rules of thumb are generally used to analyse well performance and available options for optimal depletion. Generally, a better VLP match is achieved with these tools but fixed surface rates and reservoir pressures are in place, so life cycle results or economics over time are obtained by extrapolating results using rule of thumb.

- Facilities Engineer

The main approach taken when modelling is also based on nodal analysis but these tools are usually developed by a different vendor and many contain more sophisticated compositional models. The results at this stage also refer to a single point in time and require the well fixed rates or simplified well performance curves as inputs.



The IPM approach allows for the same data to feed the reservoir, wellbore and facilities model by linking them up and allowing production forecasts to be reliably run while including all of the different disciplines so that communication is increased as well as resulting in better understanding between the departments being on the 'same page' due to their access to the same model. The IPM model calculates the production flow streams over time, the necessary compressor horsepower and water production values.

Conclusion

IPM provides an integrated multi-discipline solutions for everyday gas well problems which are better than the typical single discipline or integrated single point in time approach as life cycle economic comparisons can be made.