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Fast and Accurate Evaluation of Production Performance from a Hydraulically Fractured Well

Hydraulic fracturing (fracking), a multi-billion dollar U.S. industry, is the process of drilling and injecting pressurized fluid into the ground to crack deep rock formations and extract trapped natural gas. The high costs associated with the fracking due to the lack of proper modeling has prompted scientists to develop methods of approximating the recoverable amount of underground resources. Previous, exact solutions exist to model fractures with infinite conductivity (no resistance to incoming flow). However, initial assumptions of the infinite conductivity model produce unreliable results as fracking uses finite conductivity cracks. Thus, scientists are now aiming to derive an analytical solution to model flow behavior between natural gas reservoirs and finite conductivity fractures.

Researchers at ASU have developed an exact analytical solution describing the behavior of fluid production from a well that is intersected by an elliptically-shaped finite conductivity fracture. The solution provides a simplified, yet accurate, depiction of flow behavior, improving the reliability for simulations. Additionally, the solution can help build designs for evaluating reservoirs of different shapes. In summary, the analytical solution is a reliable tool to model, evaluate, and increase production performance of hydraulically-fractured wells with various reservoir types.

Potential Applications

- Geothermal Energy and Natural Gas Production
- Water Well Production Enhancement
- Hard Rock Mining and Rock Burst Mitigation
- Carbon Sequestration
- Coal Mine Methane Development and Drainage

Benefits and Advantages

- Effective – The solution can be adopted for use in numerous production models and fracking simulators to estimate reservoirs of different shapes
- Simplified and Accurate – The analytical and exact nature of the solution eliminates the need for time-intensive numerical simulations, reducing the computing time
- Innovative – The solution can be used as a benchmark to measure the precision and/or recalibrate present simulators

For more information about the inventor(s) and their research, please see:

Dr. Kangping Chen's directory webpage