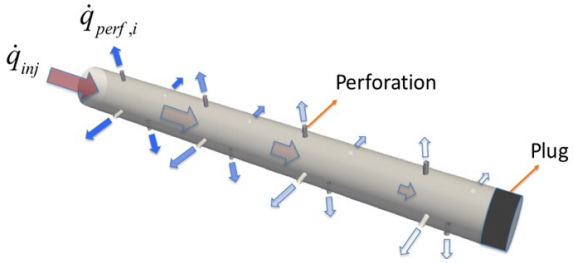


Perf Cluster Designer

A Multi-Cluster Frac Simulator For Uniform Proppant Placement

What is Perf Cluster Designer?

Perf Cluster Designer is an efficient (PC-based) simulator for estimating and optimizing proppant placement in plug-and-perf stimulation stages. It integrates numerically obtained proppant transport behavior with an efficient multi-cluster hydraulic fracturing simulator to quantitatively estimate and optimize fluid and proppant distribution among multiple clusters in plug-and-perf stages.



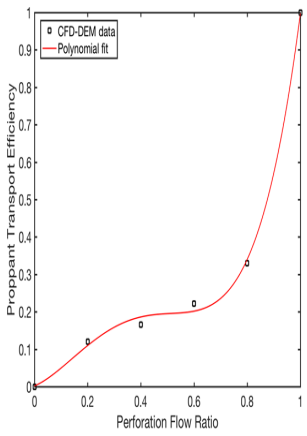
Motivation for Perf Cluster Designer

In plug-and-perf stages, production diagnostics show that only about 40% of the perforated clusters are producing. Leaving 60% clusters not stimulated efficiently. Recent wellbore diagnostics (DAS, DTS) show a strong heel-biased proppant placement in plug-and-perf stages. None of the available multi-cluster models are able to capture the observed phenomenon and quantitatively estimate the proppant distribution among multiple clusters. This is because almost all models assume proppant follows the fluid distribution flowing into the perforations, which is not true.

Unique Capabilities

Some major capabilities of Perf Cluster Designer are:

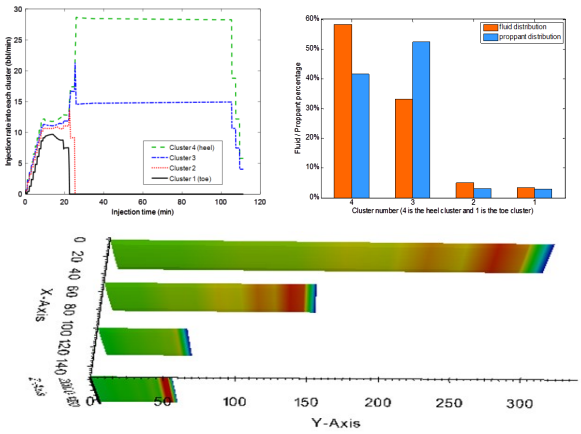
- ◊ Proppant transport efficiency (PTE) correlations are developed from hundreds of CFD-DEM simulations
- ◊ Pseudo-3D fracture model incorporated with moving mesh algorithm enables efficient and accurate fracture propagation simulation
- ◊ Implicit coupling between dynamic proppant distribution and multiple fracture propagation calculation
- ◊ Stress shadow effects due to both the previous stage and current stimulation stage
- ◊ Quantitatively calculate proppant and fluid distribution for any given carrier fluid (gel, slickwater) and proppant type (sand, ceramic), proppant size, cluster/perforation geometry and injection schedule



- ◊ Efficiently optimize a plug-and-perf completion design in the parallel mode to achieve a more uniform treatment distribution and maximize propped fracture surface area within the user-specified parameter range

Simulation Results

The simulation results of Perf Cluster Designer consist of



graphs, charts, value tables and animation videos that show:

- ◊ Fracture propagation
- ◊ Fluid and proppant distribution
- ◊ Treating pressure
- ◊ Comparison of different designs

Simple, Intuitive Use Experience

The Perf Cluster Designer user interface was designed to offer the simplest user experience.

①**INPUTS** – Entering various inputs has been simplified and user can switch between various systems of units.

②**RESULTS** – A standout feature with Perf Cluster Designer interface is its emphasis on results – both their interpretation and visualization. Our interface offers an integrative comparative analysis.

Consulting Services

Perf Cluster Designer empowers the user with quick analysis and design of plug-and-perf stages. You can also take advantage of our experience and get targeted answers to your projects. We can customize the output results based on the requirements of the projects hence granting you more flexibility with visualization and analysis of the project results.

About us

Perf Cluster Designer has been developed by Min Zhang, Sophie Yi, Chu-Hsiang Wu, Ajeetha Kamila, and Prof. Mukul M. Sharma.

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