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**PROCEEDINGS**

# Numerical Simulation of Diverter Materials in Hydraulic Fractures During Refracturing

**Daobing Wang[1,*], Cheng Zheng[1], Bo Yu[1], Dongliang Sun[1], Dingwei Weng[2], Chunming He[2] and Meng Wang[2]**

[1] School of Mechanical Engineering, Beijing Institute of Petrochemical Technology, 19 Qingyuan Road, Daxing District, Beijing, 102617, China

[2] Fracture & Acidizing Technical Center, Research Institute of Petroleum Exploration and Development, PetroChina, 20 Xueyuan Road, Haidian District, Beijing, 100083, China

[*]Corresponding Author: Daobing Wang. Email: upcwdb@bipt.edu.cn

**ABSTRACT**

Refracturing has become an important technique for increasing hydrocarbon production due to the low oil prices. During refracturing, the granular diverter materials are injected to temporarily seal old fractures in subsurface. These diverter materials are usually carried by the fracturing fluid, which is a typical solid-fluid flow in the fracture [1-3]. Therefore, we need to thoroughly understand the flow mechanism of diverter materials in hydraulic fractures, which is the key to the success of refracturing treatment.

Using the Euler-Lagrange method, this paper presents a multiphase model to numerically simulate the flow process of diverter materials in hydraulic fracturing [4-6]. Two-way coupling algorithm is adopted to solve the particle flow and fluid flow in fractures. The fracture geometry is constructed by CT scanning technique, which can represent fracture roughness in our model. Key factors such as fracture roughness, injection rate, reservoir temperature are analyzed in detail. Our numerical results are as follows:

1. Particle velocity is not the main factor affecting the migration process of diverter materials in fractures, but the particle diameter, particle volume fraction and viscosity of carrier fluid have great influence on the migration process of diverter materials in both smooth fractures and rough fractures.

2. Changing the particle diameter can control the particle migration velocity in the fracture to a certain extent. A high particle volume fraction leads to a decrease in the average force on the particles. The rough fracture surface is the main factor affecting the average force on the particles. The high viscosity fluid causes the average force on the particles increase. The particle velocity and average force in rough fractures are higher than those in smooth fractures.

3. When the fracture wall temperature rises by 300 K, the average movement velocity of particles in the hydraulic fractures increases by nearly 60%, and the interaction force between particles increases by more than 19.2 times; with the increase of mass concentration of diverter materials, the interaction force between particles also becomes larger; when turbulent flow occurs in the fracture, the velocity and interaction force of particles increase sharply.

**KEYWORDS**

diverter; refracturing; multiphase flow model; fracture flow

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