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## Determination Of The Optimal Fluid Pulses For Enhancement Of Reservoir Permeability And Productivity

Tech ID: 32760 / UC Case 2015-657-0

### BACKGROUND

Oil and natural gas extraction techniques commonly rely on hydraulic fracturing to induce and/or improve fluid flow in low permeability rocks. Hydraulic fracturing can be environmentally costly though as it uses a variety of materials, including chemicals and solids, injected into the ground to mechanically fracture and artificially maintain cracks in the subsurface. A UC Santa Cruz researcher has developed a method that uses site-specific reservoir properties to determine the best frequency of forcing to clear fractures and increase fluid flow with pressure oscillations.

### TECHNOLOGY DESCRIPTION

A UC Santa Cruz researcher has designed an algorithm to solve for the optimal frequency of fluid pulses to enhance reservoir permeability. Hydraulic diffusivity is first estimated from standard borehole injection tests. Using a computer program, pressure fields are then calculated from field measurements of forced oscillations to determine flow in the immediate vicinity of the well. Using volumetrically averaged flow rates, the algorithm generates the value of an angular frequency that maximizes flow. This angular frequency can be used to inform the field operation of a pump at a second forced oscillation that will result in permeability increases, and thus fluid flow, around the borehole. This method can also be used to stimulate fracture corridors and clear blockages.

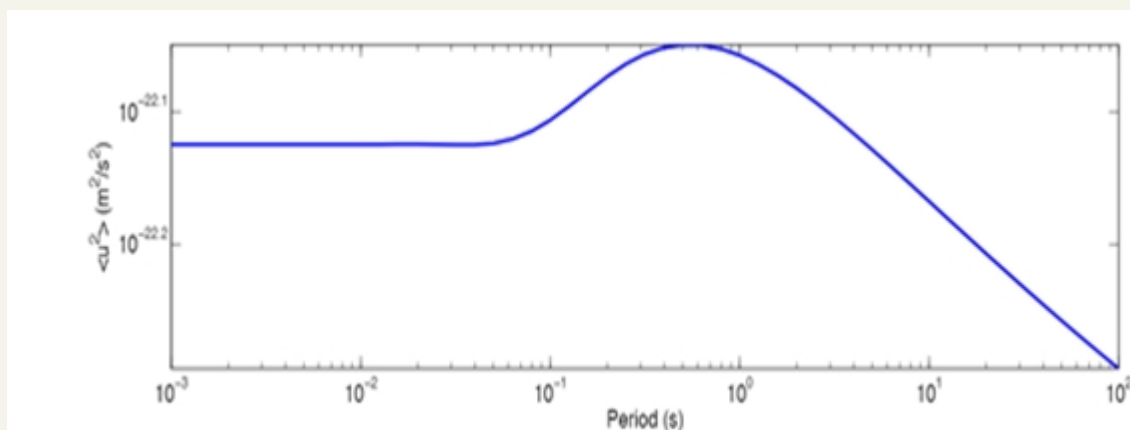


Figure 1: Prediction of the average flow rate over the volume as a function of oscillation period. .

### APPLICATIONS

- ▶ Geothermal power production
- ▶ Oil, water, and gas extraction
- ▶ Environmental remediation
- ▶ Blockage and fracture clearing

### CONTACT

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### INVENTORS

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### OTHER INFORMATION

#### KEYWORDS

Extraction, Injection, Fractures, Blockages, Chemical Free Hydraulic Fracturing, Safer Hydraulic Fracturing, Geothermal Energy

#### CATEGORIZED AS

- ▶ **Energy**
  - ▶ Hydrocarbon
  - ▶ Other
- ▶ **Environment**
  - ▶ Remediation

#### RELATED CASES

2015-657-0

## ADVANTAGES

- ▶ Chemical and proppant free
- ▶ Reduced seismicity risk
- ▶ Lower injection rates needed

## INTELLECTUAL PROPERTY INFORMATION

Country	Type	Number	Dated	Case
United States Of America	Issued Patent	11,149,526	10/19/2021	2015-657
Canada	Issued Patent	2986777	03/09/2021	2015-657
United States Of America	Issued Patent	10,513,909	12/24/2019	2015-657

## RELATED MATERIALS

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