

# Maximizing Production by Optimizing the Placement of Hydraulic Fracture Stages Using Weighted Petrophysical and Geomechanical Attributes

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## Summary

In a horizontal well, placing hydraulic fracture stages based on a constant spacing (geometric) fails to take into account differences in reservoir quality and geomechanical properties of the formation. An optimized completion design established utilizing a fracability index will result in the placement of stages based on similar geologic attributes, improving on the traditional geometrically spaced stage design. The automation of the staging will allow wells to be consistently staged based on the optimal parameters in an efficient manner.

## Introduction

Traditionally, horizontal wells are completed with geometrically spaced hydraulic fracture stages. The use of this method may result in a number of stages or perforation clusters that do not contribute to production. Combining petrophysical and geomechanical attributes to create a fracability index will allow stages to be placed based on comparable geologic properties, thus increasing the percentage of stages contributing to production.

## Theory and/or Method

Petrophysical attributes including porosity, water saturation, and clay volume are used to assess reservoir quality. Geomechanical attributes including elastic moduli, brittleness, and closure stress gradient are used to assess the mechanical behavior of the formation. The reservoir quality and mechanical behavior can be combined to establish fracability indices, which can be used to automatically generate an optimized stage design for the well.

Once the optimal attributes have been established for a given play, the automation routine will allow for the consistent and efficient placement of stages and improve the chances of attaining flow from a higher percentage of the stages.