

RESERVOIR CHARACTERIZATION

Strategic Placement of Infill Wells in the Midland Basin: Addressing Stress Depletion From Parent Well Production

This study reveals how production-induced depletion and geomechanical stress changes influence child-well performance in the Midland Basin, combining coupled simulations and machine learning to guide optimal well spacing, timing, and placement for infill development.

February 18, 2026 By **SPE Journal**
Journal of Petroleum Technology



Source: Jasmin Pawlowicz/Getty Images.

The growing interest in closely spaced drilling units highlights the need to understand well performance under interference conditions in shale oil reservoirs, particularly in the [Permian Basin](#). Over time, studies of the effect of well-completion optimization on production performance, along with studies on parent/child interference, have become more mature. The [geomechanical](#) effects of stress reduction from pressure depletion and its influence on child-well placement remain underexplored, however, and could play an important role in well planning.

This study examined this effect in the Midland Basin to demonstrate the geomechanical effects of production-induced pressure depletion on child wells at representative spacings, derived from basinwide [well-spacing](#) statistics. Additionally, the authors consider the relationship between depletion and production performance as a key factor in both early- and late-stage evaluations. They began with hydraulic-fracture-propagation simulations for two representative horizontal wells as parent wells in the Wolfcamp A (WCA) and Wolfcamp B (WCB) formations. This was followed by coupled flow and geomechanical simulations, yielding insights into changes in the principal stresses during production.

To examine whether well spacing and parent-well depletion play essential roles in the productivity of nearby new wells (child wells) over time, the authors used [machine-learning](#) methods, specifically extreme gradient boosting (XGBoost) and SHapley Additive exPlanations (SHAP), to identify critical factors across two representative time periods, using the field data and in-house geological model data.

With the knowledge of basinwide well-spacing patterns, the authors evaluated potential child-well placement strategies at various horizontal spacings and stacked placement scenarios at different times during the parent well's production life (1 year and 5 years). Asymmetric growth behavior was quantified to indicate the effectiveness of infill-well stimulation.

The machine-learning analysis shows that, for wells completed from 2018 onward, productivity is primarily driven by well spacing and depletion, in addition to well-known productivity drivers (e.g., completion parameters and reservoir pressure). This highlights the importance of spacing and depletion effects in optimizing stimulation performance for recent tightly spaced drilling-unit development.

In addition, the coupled simulation results indicate that, for both WCA and WCB wells, fracture asymmetric growth is not obvious at 1 year of their parent wells' production. WCA child wells show more obvious asymmetric growth characters at later time (5 years) of their parent wells' production,

This abstract is taken from paper SPE 223524 by Yiwen Gong and Timothy P. McMahon, Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin. The paper has been peer-reviewed and is available as Open Access in SPE Journal on OnePetro.

TOPICS

RESERVOIR CHARACTERIZATION

UNCONVENTIONAL/COMPLEX RESERVOIRS

TAGS

Permian Basin, well spacing, geomechanics, machine learning, Midland Basin, well interference, Wolfcamp formation, simulation

SPE Journal

SPE Journal

See More Stories by SPE Journal

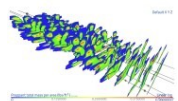
RELATED CONTENT



WELL INTERVENTION

AI-Enhanced Multiphysics Imaging Advances Perforation-Erosion Analysis

April 1, 2026 • Journal of Petroleum Technology



GEOHERMAL ENERGY

Record-Breaking Enhanced Geothermal System Designed for Project Cape, Utah

March 1, 2026 • Journal of Petroleum Technology



BUSINESS/ECONOMICS

Market Oversupply, Geopolitical Risks Could Add Price Premium

February 26, 2026 • Jennifer Pallanich • Journal of Petroleum Technology



BUSINESS/ECONOMICS

UNCONVENTIONAL/COMPLEX RESERVOIRS

Integrated Approach Schedules, Validates Steady-State Production-Well Tests

February 1, 2026 • Journal of Petroleum Technology

Get JPT articles in your LinkedIn feed and stay current with oil and gas news and technology.



The *Journal of Petroleum Technology*, the Society of Petroleum Engineers' flagship magazine, presents authoritative briefs and features on technology advancements in exploration and production, oil and gas industry issues, and news about SPE and its members.

ISSN: 1944-978X (Online)

ISSN: 0149-2136 (Print)

MEMBERS

SPE



Contact Us

PetroWiki

The Way Ahead

SPE Privacy Policy

JPT

About JPT

Editorial Board

Advertise

EXPLORE CONTENT BY DISCIPLINE

Completions

Data & Analytics

Drilling

HSE & Sustainability

Asset Management

Onshore/Offshore Facilities

Production

Reservoir

©2003-2026 Society of Petroleum Engineers
All Rights Reserved.