LINQX

Case Study

Data-Driven Circulation Optimization for ECD Control and Hole Cleaning in an Alaska Extended-Reach (ERD) Well

Challenges

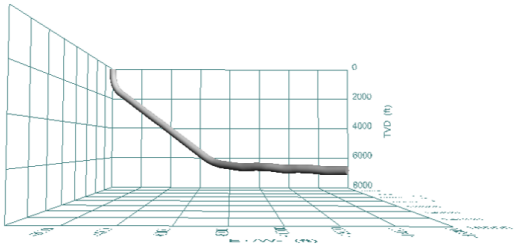
Maintaining adequate ECD without exceeding fracture pressure while achieving effective hole cleaning was critical to the well's success.

Solution

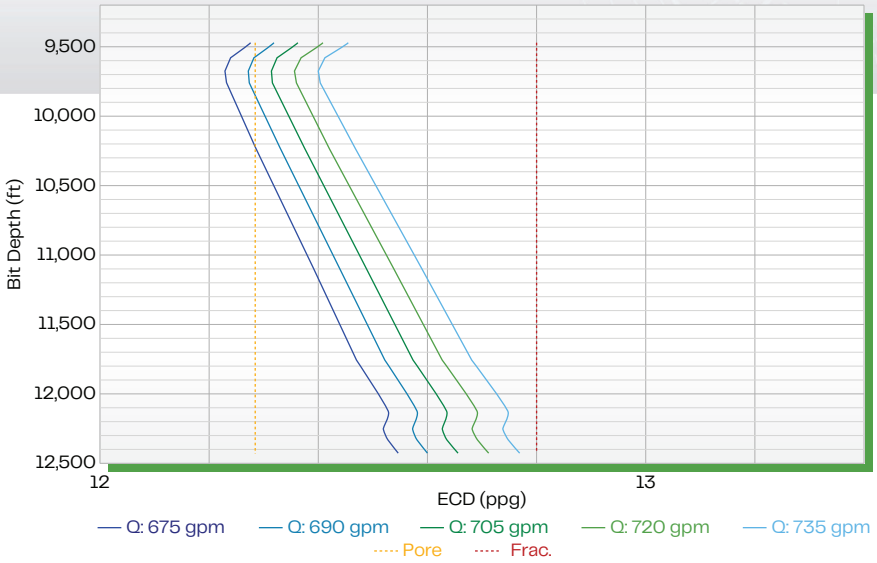
Used HYDPRO to perform a complete hydraulic analysis using sensitivity and optimization tools plus field-data comparison to assess how pumping conditions affected hydraulics and hole-cleaning effectiveness.

Results

HYDPRO identified a pumping-rate window that balanced hole-cleaning efficiency and ECD control. The optimized parameters improved cuttings transport and stabilized annular pressures throughout the lateral.



ERD Well Trajectory



ECD @ TD of different pumping rates analyzed in the sensitivity analysis

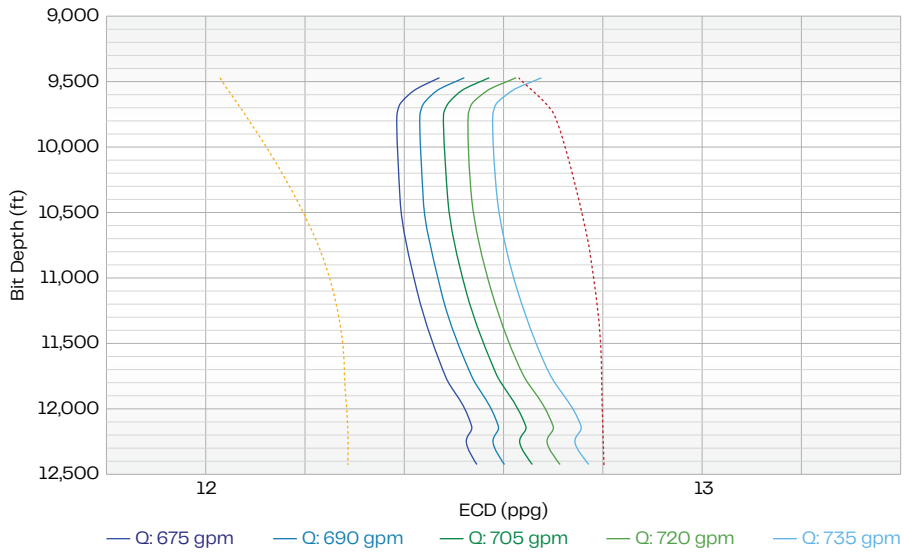
A land-based extended-reach (ERD) well in Alaska (MD/TVD > 3) faced a narrow formation pressure window and inefficient hole cleaning along its long lateral. A circulating design was required to keep equivalent circulating density (ECD) within formation limits without exceeding fracture pressure, while keeping surface pump pressures within operational ranges.

HYDPRO was used to run a full hydraulic study — sensitivity analysis, cuttings bed profiling, optimization, and field-data comparison — to evaluate how different pumping rates affected ECD and hole cleaning. Inputs included well geometry, pore and fracture pressures, and the optimized mud properties. Outputs focused on ECD at the bit and TD, cuttings bed height, and surface pressure trends.

HYDPRO narrowed the safe pumping window to 700–720 gpm and validated 720 gpm as the optimal rate, improving cuttings transport and reducing cuttings-bed height while keeping ECD and surface pressures within limits. Model predictions closely matched field data, enabling data-driven circulation decisions that reduced fracture risk and increased operational confidence.

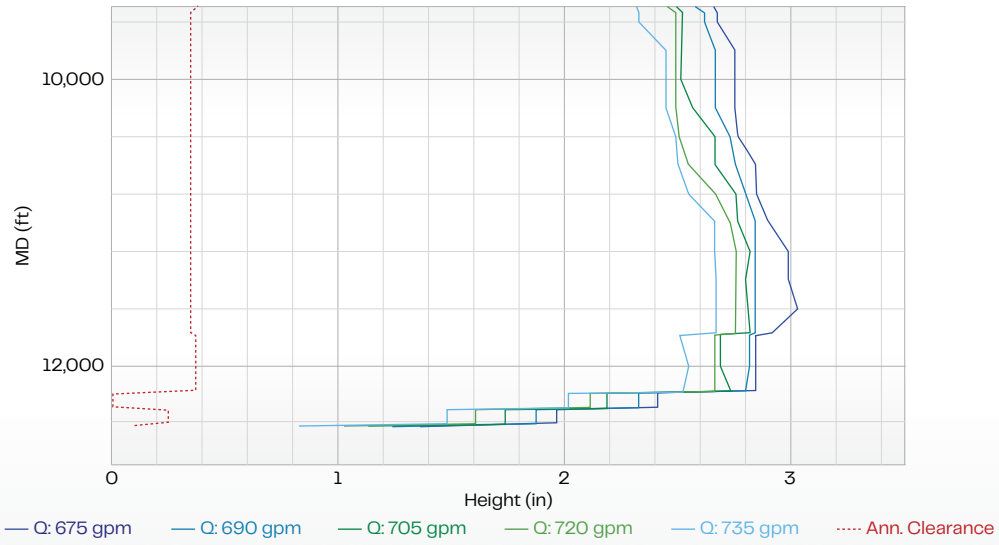
History of ECD @ bit depth of different pumping rates analyzed in the sensitivity analysis

Based on the open hole pore pressure and fracture pressure window, a range of circulating rates was evaluated using the Sensitivity Analysis feature. The acceptable operational window was progressively narrowed to 700–720 gpm by analyzing the resulting ECD at total depth (TD) and ECD at the bit, to ensure circulation remained within formation pressure limits.



Cuttings bed profiles of different pumping rates analyzed in the sensitivity analysis

The same circulation rates were then assessed for hole cleaning performance and cuttings bed development. Results showed that, within the identified operational range, higher flow rates consistently improved hole cleaning efficiency. The optimal cuttings bed height in the open hole was achieved at the highest evaluated rate of 720 gpm, providing the best balance between effective cuttings transport and pressure management.



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Get In Touch

