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Reservoir Characterization for Energy Security

Enhancing Thermal Development with Time-Lapse Monitoring and Innovative Design

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ABSTRACT

Time-lapse monitoring tools, such as 4D seismic and reservoir saturation logging, are extremely helpful in optimizing design and target elevation of infill production wells for Steam-Assisted Gravity Drainage (SAGD) developments. This is a story about how timing, innovation, and multidisciplinary teamwork can elevate the development of a depleting asset.

The main reservoir unit at Strathcona's Meota East project is a channel sand in the Colony Formation of the Cretaceous Mannville Group. The lithology of the reservoir in the Pad 303 area is generally characterized by massive, high-quality unconsolidated quartzose sand with intervals of matrix-supported breccia distributed primarily at the top of reservoir. Where present, bottom-water is thin at Pad 303 and reveals a flat oil-water contact.

Over three years of operation, the team collected time-lapse data at Pad 303 to understand steam chamber development. Density difference volumes inverted from 4D seismic monitors delineate steam chamber evolution. Repeated reservoir saturation logs on vertical monitoring wells corroborate steam chamber growth interpreted from 4D seismic and reveal enhanced oil saturation beneath the steam chamber. This data, along with temperature observation, production history, and in consideration of economic models, inform the timing and target elevation of infill production wells.

To improve the economics of the Pad 303 infill development program, the team explored opportunities to both reduce capital requirements and increase recoverable barrels. The infills implemented a slim-hole design for the associated cost savings. Value-driven design choices included a reduction in wellbore diameter as well as the elimination of guide string and Distributed Temperature Sensing (DTS) optical fibers. These changes reduced drilling and completions costs but are not expected to limit the production rate. Furthermore, a reduced standoff to base of pay was utilized to increase the expected ultimate recovery of the infills and drainage area.

These infill production wells were successfully drilled in Q1 2025 and turned on in Q3 2025. The initial start-up has proven promising and Pad 303 production has increased as expected. The infill development program at Pad 303 is an example where integration of multidisciplinary data, innovation, and collaboration among subsurface, engineering, drilling, and completions teams allowed Strathcona Resources to optimize resource recovery in a thermal play.