

Case study: Geothermal development, Texas

Geothermal closed-loop rapid screening tool efficiently determines power output potential for faster development decisions

Producing power from geothermal energy requires drilling wells into deep underground reservoirs to access high-temperature fluids. As these fluids are brought back to surface, they produce steam that is used to drive turbines that generate electricity.

Geothermal energy systems promise continuous, resilient, and renewable electricity generation from a nearly inexhaustible underground thermal resource. But by some estimates, only 2% of the global geothermal resources are present in regions with the required permeability to bring fluids to surface by conventional geothermal processes like hydrothermal. As a result, the vast majority of geothermal energy remains untapped.

Producing more heat in more places

Closed-loop geothermal (CLG) avoids permeability issues by circulating a working fluid through a sealed, downhole heat exchanger to absorb and transport heat to surface. CLG can be applied in a wide variety of well pipe configurations using various working fluids like water and supercritical CO₂ to optimize site-specific costs and performance. As a result, CLG projects are possible in many more places around the globe, without the need for a hydrothermal source downhole.

A key consideration in the initial exploration phase of any CLG prospect is being able to accurately determine

the power generation potential of the play. CLG projects have a substantial upfront investment and long return-on-investment (ROI) windows. Therefore, without faster and more accurate reservoir characterization methods, investors will remain hesitant to proceed with these high-risk projects.

Quickly assessing a CLG project's power potential

The Baker Hughes Closed-Loop Rapid Screening Tool offers a solution. This rapid screening tool accurately models closed-loop technology, and with minimal variable inputs from the client, determines the potential power output of a geothermal prospect within a 24-hour period. Other analysis tools often require more data inputs and take far longer to generate similar outputs—often with greater uncertainty.

The rapid screening tool provides clients valuable decision-making insights into:

- Energy potential optimization
- Assessing techno-economic feasibility
- Reducing development risks
- Increasing ROI

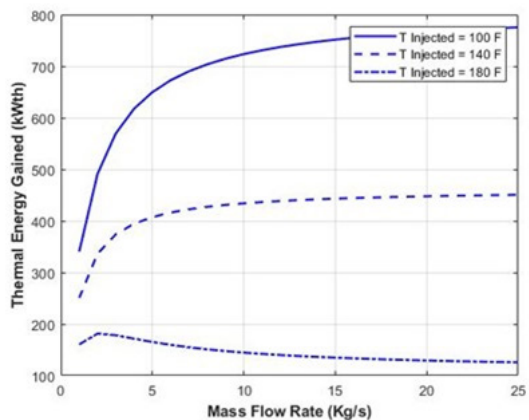
With the rapid screening tool, clients gain actionable insights in far less time and can screen a larger number of CLG prospects at a lower cost-per-unit basis.

Challenges

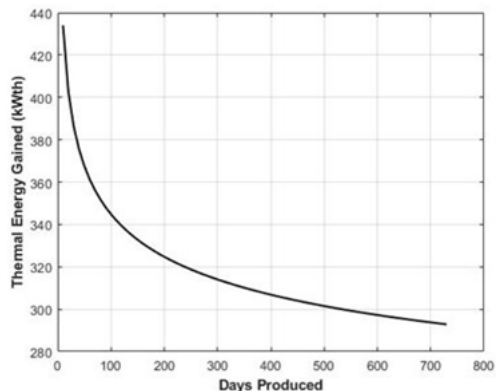
- Quickly determine the potential power output from geothermal closed-loop technology for a given field site
- Reduce exploration risks and increase return on investment with early, accurate assessments of geothermal plays
- Screen a larger number of well opportunities at a lower cost-per-well analysis

Results

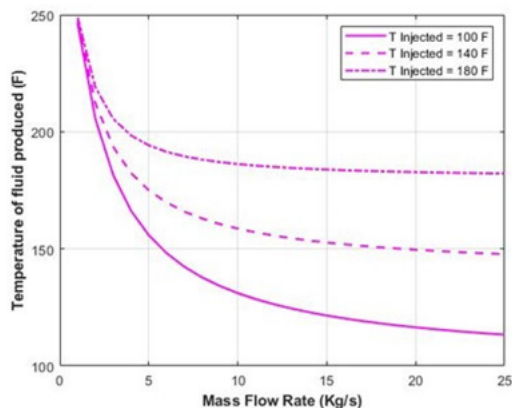
- Provided results on a candidate geothermal project's power output potential within 24 hours
- Delivered actionable insights, from 80 hours to 24 hours, for faster go/no-go decisions on a project
- Saved time and money by 70% with a faster screening process that accurately assessed a larger number of candidate wells



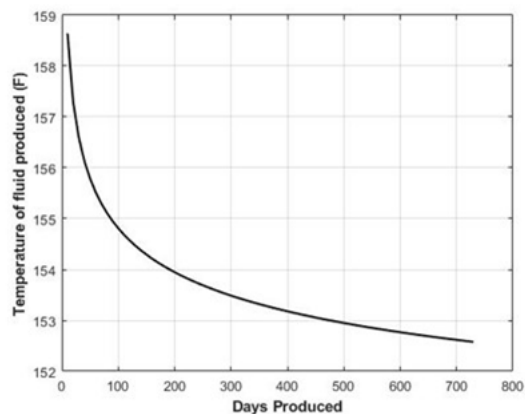
Thermal power gained (based on the temperature of the injected fluid) versus closed-loop flow rate



Thermal power gained (based on the temperature of the injected fluid) versus the production time (from the start of production, injection rate 10 kg/s, injected fluid temperature 140°F)



Temperature of fluid produced at the wellhead versus closed-loop flow rate



Temperature of fluid produced at the wellhead versus the production time (from the start of production, injection rate 10 kg/s, injected fluid temperature 140°F)