

Case study: Japan

# Vulcanix geothermal hybrid drill bits saved \$2 million USD, enabled second well in tight seasonal drilling window

A customer operating a geothermal project in Japan had a five to six month drilling window to complete two directional wells ahead of the heavy snowfall during the winter season. In addition, due to extreme travel restrictions resulting from the COVID-19 pandemic, the spud date required a delay of three months, further tightening the schedule to a two to three month drilling window.

Based on offset traditional tricone drill bit performance, the customer planned 82 days per well. The well count was reduced from two to one because of the delay of the spud.

The Baker Hughes drill bit team worked closely with the customer's drilling engineering team for a solution to improve drilling performance in the tough volcanic igneous rock formation and drill the well within the tight drilling window. Baker Hughes recommended Vulcanix™ geothermal Kymera™ hybrid drill bits for the 17½-in. surface, 12¼-in. intermediate, and 8½-in. production hole sections.

The Vulcanix Kymera's unique hybrid polycrystalline diamond compact (PDC) and roller cone cutting structure delivered increased ROP compared to traditional tricone bits in the top hole sections and maintained excellent toolface control as they built inclination to 40°-50° in the intermediate section.

Both the surface and intermediate section were completed with the Vulcanix Kymera drill bit, which provided excellent durability, while delivering aggressive bit performance to achieve higher ROP compared to offsets. The Vulcanix Kymera

used in the 17½-in. surface section featured the tapered roller bearing package to optimize bearing loads, minimize bearing play, and improve performance for extended seal life.

Baker Hughes recommended the Vulcanix Kymera drill bit with its extended cone cutting structure for the critical production section. The Vulcanix Kymera has the latest premium PDC cutters that maximize performance in the harshest drilling environments with high thermal stability, low wear rate, and excellent durability.

Each section only required a single bit to total depth (TD) while providing faster ROP and superior steerability with a motor compared to previous tricone performance. The dull condition of each bit was excellent, despite the severe volcanic drilling environment with temperatures reaching above 446°F (230°C).

The outstanding drilling performance of the Vulcanix Kymera drill bits allowed completion of the first well in only 36 days, 46 days ahead of schedule. This exceptional performance provided the customer with the opportunity to achieve the original plan of two wells in the seasonal drilling window.

The exceptional dull conditions of the Vulcanix Kymera drill bits from the first well surface and intermediate sections allowed them to be rerun in the second well. The Vulcanix Kymera drill bits also delivered excellent performance in the second well. It was drilled in 27 days, 55 days ahead of plan.

The durability and cutting efficiency of the Vulcanix Kymera drill bits allowed

## Challenges

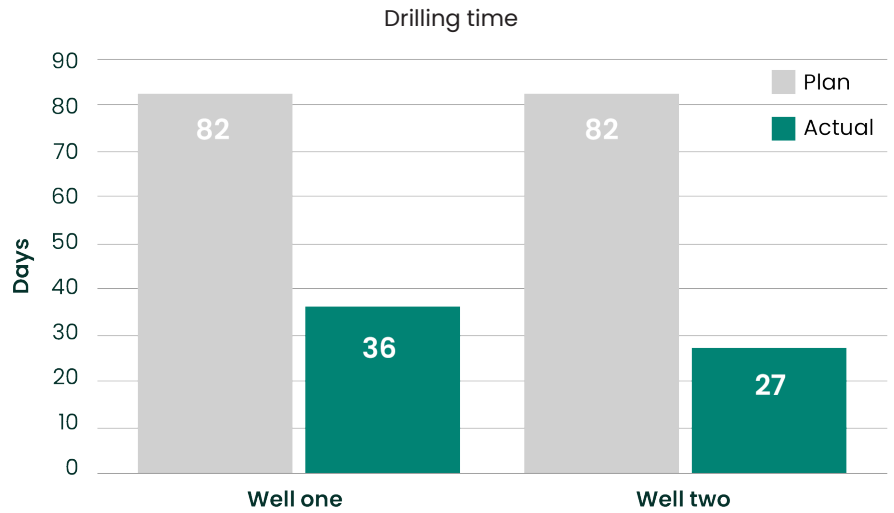
- Improve drilling performance
- Drill one well in a narrow drilling window
- Overcome well count reduction due to delays
- Reduce drilling costs

## Results

- Doubled ROP and reduced bit trips
- Reduced operations by 101 days
- Completed two wells
- Saved \$2 million USD

the customer to complete both wells in only 63 days. This saved 101 days and reduced the authorization for expenditures (AFE) by half, equivalent to approximately \$2 million USD.

This first successful Vulcanix geothermal Kymera hybrid drill bit application in Japan is a result of excellent collaboration with the customer and the application of the best available drill bit technology to over-achieve performance targets.



1 7/8-in. surface section dull  
(well one and two)



1 1/4-in. intermediate section dull  
(well one and two)



8 1/2-in. production section dull  
(well one)



8 1/2-in. production section dull  
(well two)