

GeoFORM XTreme system stopped sand in methane hydrate well

A customer that had drilled a new test well in methane hydrate off the east coast of Japan was in quest of a viable sand control solution following a 2013 production test that was terminated after only six days. The 2013 test well, which had been completed using the most widely relied on sand control method—gravel-packing—had quickly succumbed to sand production. In early 2014 a collaboration began between the customer and Baker Hughes, a GE company (BHGE), to identify a solution that could enable sustained sand-free production from the challenging reservoir type.

The new project began with a close evaluation of the 2013 production test. The teams found that when the well was brought online, the wellbore enlarged from 8.5 to 12 in. (21.6 to 30.5 cm) as the formation depressurized. This caused the gravel in the annulus to shift, exposing the underlying sand control screen which quickly began to erode. Sand particles smaller than 100 μm entered the production string through the compromised screen, ultimately resulting in equipment failure.

Based on the anticipated downhole conditions, the BHGE team recommended its **GeoFORM XTreme conformable sand management system**, which leverages patented shape memory polymer (SMP) material to reliably fill the

entire annular space with a permanent filtration media. As an added layer of defense against sand, the GeoFORM XTreme system contains **BeadScreen™ flowback control cartridges** installed directly into the holes in the production liner. Constructed of metal beads fused together using a proprietary bonding process, the BeadScreen cartridges offer increased burst and collapse ratings and improved erosion and plugging resistance compared to conventional sand screens.

After the customer reviewed the proposed solution in detail and agreed that it was a viable option, the teams conducted a series of tests. The customer wanted to ensure the SMP material would expand as planned and the sand control packer would seal properly in the well, which had low bottomhole temperatures (BHT)—ranging from 32 to 54°F (0 to 12°C)—that could affect elastomer performance.

The GeoFORM system qualification involved two expansion simulations. Each test used a full-size, 5.5-ft (1.7-m) GeoFORM SMP cartridge, which expanded as expected after soaking in activation fluid for 48 hours. The **SC-2R™ packer** that would be used in the well was outfitted with an elastomer suitable for low-BHT applications. The teams also confirmed its compatibility with the SMP activation fluid.

Challenges

- Extremely unconsolidated methane hydrate formation
- Broad range of particle sizes from 20 to 200 μm
- Ongoing wellbore subsidence
- Low BHT of 32 to 54°F
- Test well located in water depths in excess of 3,300 ft
- Conventional sand control methods had failed in previous tests

Results

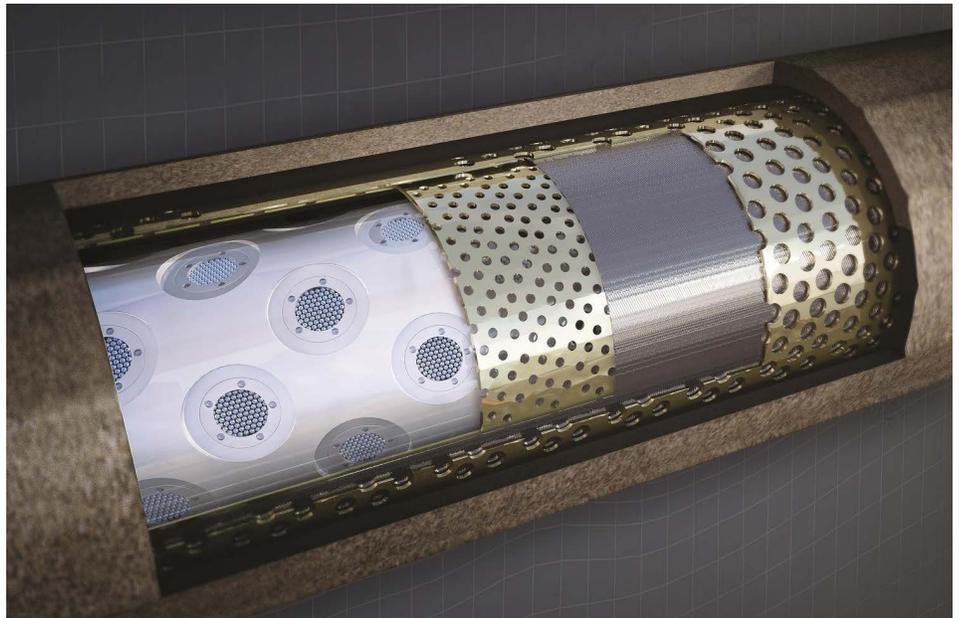
- Enabled longest-ever sand-free production test in methane hydrate
- Produced up to 0.5 MMSCFD of gas and 3,100 BPD of water
- Avoided known failure risks associated with conventional sand control methods
- Eliminated gravel packing logistics and risks

The new test well, which had been drilled into the same shallow reservoir as the 2013 test well, was drilled approximately 900 ft (270 m) below the mudline and in more than 3,300 ft (900 m) of water. Using a riserless rig, the completion was deployed into the 197-ft (60-m) openhole interval using the field-proven **CS-AP™ openhole gravel-pack system**. At depth, the SC-2R packer was set inside the 9⁵/₈-in. casing and isolation was confirmed via a pressure test. A seal stack was run to isolate the shoe track section and prevent leakage. The activation fluid was then pumped into the openhole section and circulated around the compressed GeoFORM SMP cartridges, which soaked for 51 days as the teams prepared to bring the well online.

The well was put on production and flowed sand-free for a total of 24 days. Gas and water production rates reached 0.5 million standard cubic feet per day (scf/D) and 3,100 barrels per day (B/D), respectively, while the GeoFORM system effectively prevented any sand from entering the production string. The test ran two weeks longer than planned, and production remained constant until its conclusion.

By using the GeoFORM XTreme conformable sand management system with BeadScreen flowback control cartridges, the customer was able to achieve the longest-ever sand-free production test ever recorded in methane hydrate. The success of the

job is a testament of the hard work and collaboration between the customer and the BHGE teams. Pleased with the results, the customer is conducting additional research and tests, and is considering using the GeoFORM XTreme system in another well.



Leveraging unique SMP material and BeadScreen flowback control cartridges, the GeoFORM XTreme system provided consistent, in-depth filtration in the challenging methane hydrate well.