Baker Hughes

Case study: Oklahoma

CENesis PHASE with velocity configuration restored production

A major operator was having problems keeping production steady in an unconventional well in Oklahoma. Low reservoir pressure and increasing gas slugging events prevented continual operation of the electrical submersible pumping (ESP) system.

The problem well had been constructed as a "high-liner" extended-reach type where the wellbore was reduced to 4.5 in casing prior to the kick-off point (KOP). Typically, well construction of this type provides a tangent (straight spot) in the wellbore below the KOP, which allows the ESP system to be installed much lower than the KOP. Because this well had a smaller casing from the KOP and below, it would not accommodate an ESP system below the KOP.

A new ESP configuration

When this particular well no longer produced, it was taken offline. The operator contacted Baker Hughes to help find a solution.

An Artificial Lift applications engineering team proposed a modification of the successful **CENesis™ PHASE multiphase encapsulated production solution**. The new configuration incorporated a flow velocity-increasing path into the pump intake.

How the system works

The CENesis PHASE solution uses an encapsulating shroud to separate gas from the production stream near the ESP system, helping stabilize production.

In wells prone to extreme gas slugging—such as this one—the velocity configuration can be added to the PHASE production solution to lower the gradient of the production stream, effectively using reservoir gas to provide additional lift for fluids, resulting in lower flowing reservoir pressure.

The velocity configuration uses an extended tailpipe to create a tight annular flow path, thereby increasing the velocity of the multiphase fluid up the wellbore to the pump intake. This increased velocity keeps gas entrained in the fluid, helping lift more liquid to the shroud intake.

This lift is similar to gas lift techniques, but uses naturally occurring gas in the reservoir to help lift more fluid to the ESP. At the shroud intake, fluids and solids fall into the shroud while gas flows up the annulus. Once in the shroud, solids fall out of the fluid stream and migrate down the extended tailpipe, and consistent liquid is supplied to the pump resulting in stable production cooler running ESP.

After collaborating with the customer to determine the velocity sizing, on August 3, 2017, Baker Hughes installed the first CENesis PHASE/velocity configuration in a well.

Production restored, increased

Installed at 4,200 ft (1280 m), the velocity feature prompted the well's own gas to assist in lifting liquids to the CENesis PHASE intake and, at the same time, stabilize the flow to the ESP.

After being offline for four months, production was not only restored; it increased. Three months after installation, gas production stabilized

Challenges

Low/no production in extended-reach well with 4-5 in casing prior to kickoff point

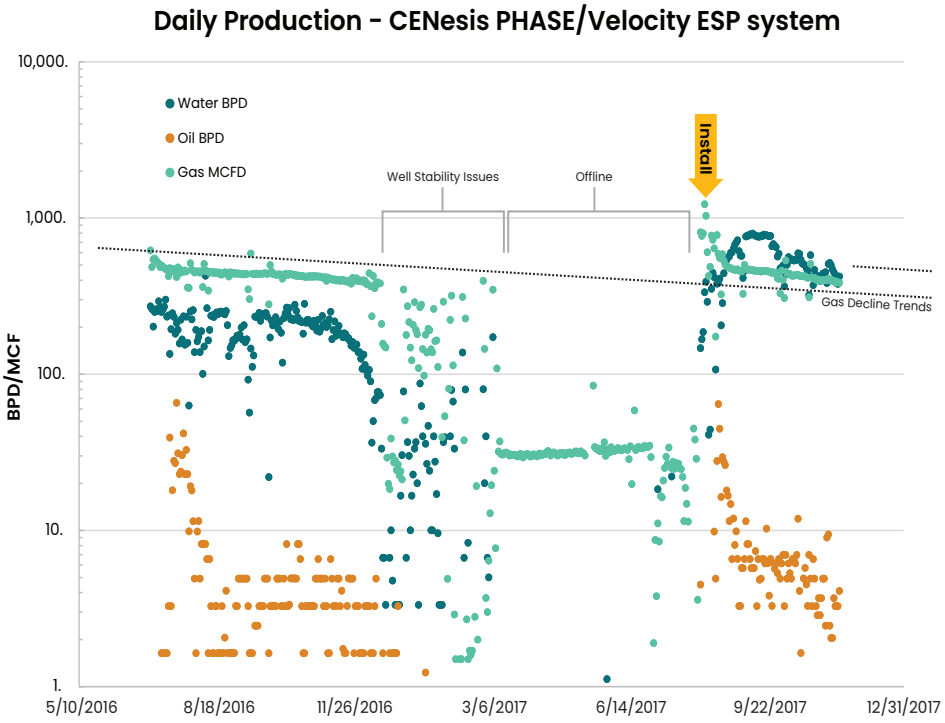
Results

- Restored, then increased production in a well that had been offline for four months
- Stabilized gas produciton to 400 MCFD, slightly more than with the previous artificial lift system
- Reduced nonproductive time to almost zero

at 400 MCFD, slightly higher than with the previous artificial lift system.

There have been hundreds of CENesis PHASE multiphase encapsulated production solutions installations, but this is the first with velocity configuration.

Since installation, nonproductive time has essentially been eliminated.



After installation of the CENEsis PHASE system with velocity configuration, hydrocarbon production was restored and continues to trend slightly higher than with the previous artificial lift system.

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