Baker Hughes

CENesis PHASE multiphase encapsulated production solution

Keep gas out. Keep production flowing.

Long horizontal laterals deliver higher initial production rates. But when production declines, gas in the well can cause serious problems for artificial lift technologies.

What if you could get efficient performance from an artificial lift system without having to worry about gas-related production interruptions?

Horizontal laterals are getting longer

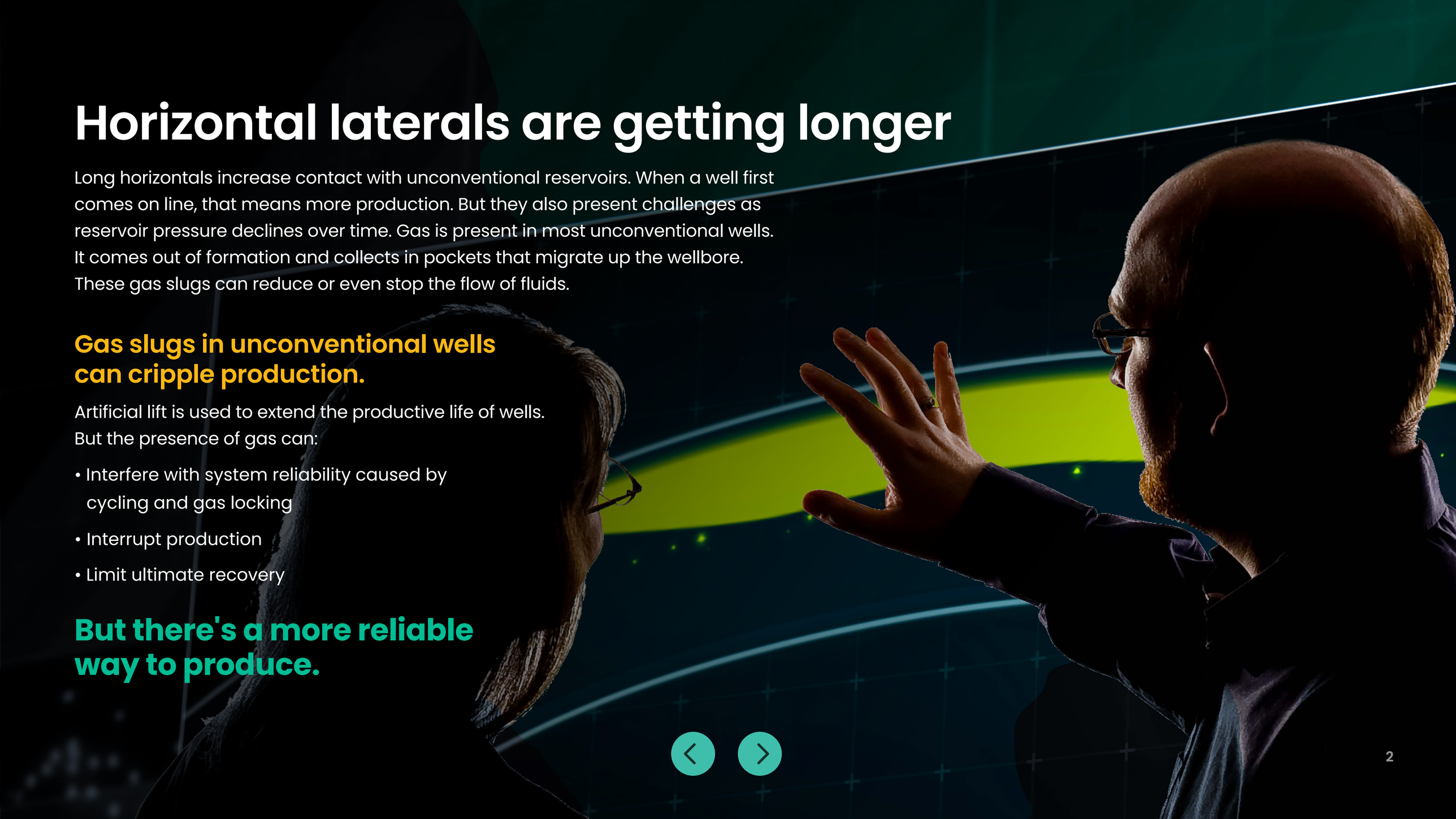
Long horizontals increase contact with unconventional reservoirs. When a well first comes on line, that means more production. But they also present challenges as reservoir pressure declines over time. Gas is present in most unconventional wells. It comes out of formation and collects in pockets that migrate up the wellbore. These gas slugs can reduce or even stop the flow of fluids.

Gas slugs in unconventional wells can cripple production.

Artificial lift is used to extend the productive life of wells. But the presence of gas can:

- Interfere with system reliability caused by cycling and gas locking
- Interrupt production
- Limit ultimate recovery

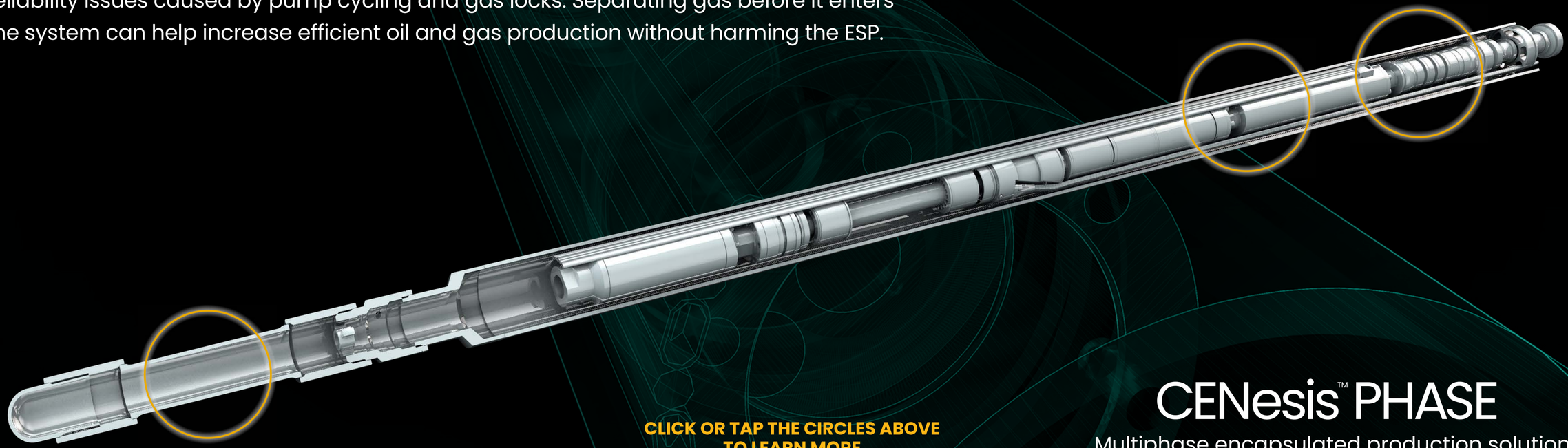
But there's a more reliable way to produce.



ESPs set the standard in artificial lift

Using an electrical submersible pumping (ESP) system is one of the most efficient, reliable methods for lifting oil to the surface in wells with declining production. But gas slugs can cause ESPs to cycle or burn out prematurely.

The patented **CENesis™ PHASE multiphase encapsulated production solution** separates gas from the production stream, which stabilizes production and eliminates reliability issues caused by pump cycling and gas locks. Separating gas before it enters the system can help increase efficient oil and gas production without harming the ESP.



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CENesis™ PHASE

Multiphase encapsulated production solution

Separate the gas.
Eliminate production interruptions.
Let the fluid flow.

Now you can get all the efficiency and flexibility offered by an ESP in a system that neutralizes the effect of gas slugs. Improve run life and your return on investment with a multiphase production solution that encapsulates the ESP in a shroud. The shroud lets fluid enter the system while separating gas and allowing it to escape up the annulus.

ENCAPSULATION SYSTEM
Fluid falls into the shroud and gas is allowed to escape up the annulus.

RESET

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CENesis™ PHASE

Multiphase encapsulated production solution

Enhance reliability and reduce OPEX

Separating gas from the fluid stream reduces wear and tear caused by cycling, gas locking, and overheating, dramatically improving ESP reliability.

The shroud protects the motor lead extension during installation, and houses the recirculation system that uses downhole fluids to constantly cool the motor. The system maintains a reservoir of fluid so the ESP can keep pumping as gas escapes, enabling continued pumping in high gas environments.

RECIRCULATION SYSTEM
A patented recirculation system cools the motor for greater reliability.

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CENesis™ PHASE

Multiphase encapsulated production solution

Improve production and ultimate recovery

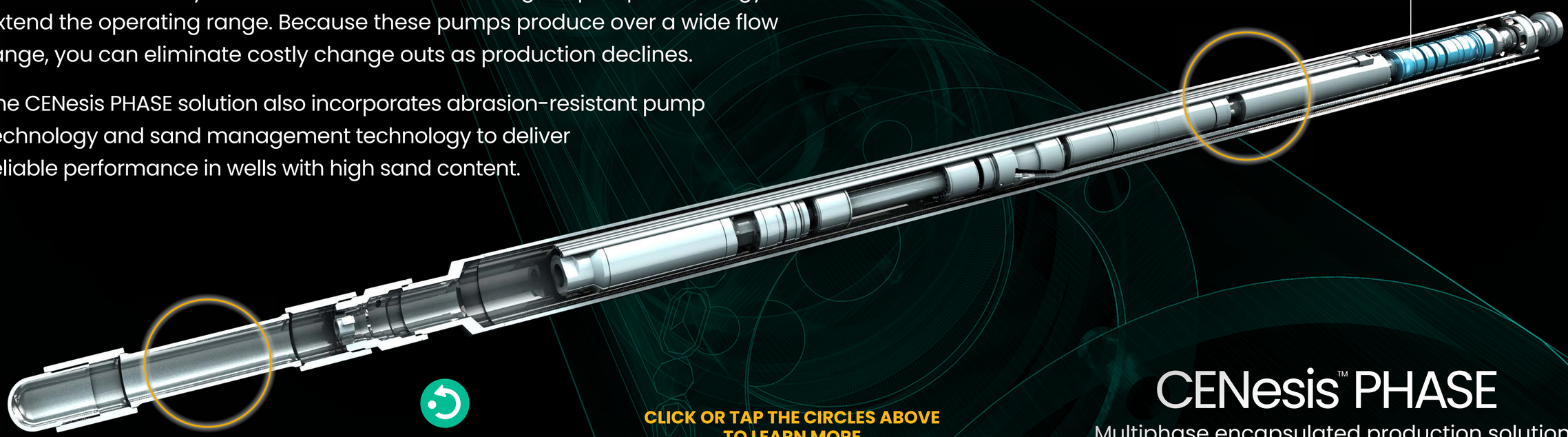
Eliminating the effect of gas slugs stabilizes production rates, improves efficiency, and eliminates downtime from system cycling and gas locking.

Continuous, uninterrupted production releases additional hydrocarbons from the reservoir by more effectively drawing down reservoir pressure.

The CENesis PHASE system uses advanced Baker Hughes pump technology to extend the operating range. Because these pumps produce over a wide flow range, you can eliminate costly change outs as production declines.

The CENesis PHASE solution also incorporates abrasion-resistant pump technology and sand management technology to deliver reliable performance in wells with high sand content.

BAKER HUGHES ADVANCED PUMP TECHNOLOGY
A broad operating range means fewer change outs, improved gas handling, and increased reliability.



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CENesis™ PHASE

Multiphase encapsulated production solution

Alternate CENesis PHASE system configurations

The standard CENesis PHASE configuration is applicable for most wells. There are additional useful configurations for a broad range of applications. Custom configurations are available.

DESCRIPTION	CONFIGURATION	CHALLENGES	FEATURES	BENEFITS
Encapsulated ESP with dip tube flow below motor	With dip shroud	Low flowing pressure, cycling due to gas slugging/surging	Dip-tube gas anchor below can; flush joint can; custom length	Keeps a reservoir of fluid around the pump to prevent gas locking
Standard PHASE system with dip tube flow below motor	Recirculation cooled with dip shroud	Low flowing pressure, cycling due to gas slugging/surging, motor cooling issues likely	Flush joint can; custom length; motor cooling is aided by recirculation system	Prevents overheating and gas locking
Standard PHASE system with sand control	With sand control	Extremely sandy wells, cycling due to large gas slugs/surging	Sand separation below the PHASE system; flush joint can; custom length; motor cooling is aided by recirculation system	Filters out sand before it enters the pump, and prevents overheating and gas locking
Standard PHASE system with annular velocity assisted lift	Recirculation cooled with annular velocity assisted lift	High set pumps; cycling due to large gas slugs/surging; sandy wells	High pump set with velocity string extension through curve; flush joint can; custom length; motor cooling is aided by recirculation system	Amplifies downhole gas pressure to improve lift, separates and captures sand, and prevents overheating and gas locking
Standard PHASE system with tubular velocity assisted lift	With velocity string assisted lift	High set pumps; cycling due to large gas slugs/surging	High pump set with velocity string pipe through curve; flush joint can; custom length; motor cooling is aided by recirculation system	Increases pressure and circulation in the wellbore to improve lift, separates and captures sand, and prevents overheating and gas locking
Inverted shroud	Pump-only encapsulation	Cycling due to gas slugs/surging	Can over pump only; motor passes below can	Maintains fluid reservoir around the pump only, as opposed to maintaining it to cover the entire ESP system

Baker Hughes was awarded U.S. Patents 9,631,472 and 9,638.014 related to inverted shroud configurations on April 25, 2017 and May 2, 2017 respectively.

READ THE FULL CASE STUDY

Case study: New Mexico

CENesis PHASE system performs in Bone Springs reservoir

A horizontal well in the Delaware basin's Bone Spring reservoir was experiencing continual gas slugging. The operator had been using an electrical submersible pumping (ESP) system with a tapered pump design to handle the gas into the pump, but this system configuration did not sufficiently draw down the wells. The operator wanted to improve the well's performance and increase its oil production by increasing the drawdown.

48%
increase in oil production

176F to 168F
reduction in motor temperature

Reduced
free gas in the pump

40%
increase in drawdown from 336 psi to 200 psi

Improved
natural gas separation

Keep gas out.
Keep production flowing.

Contact your Baker Hughes representative today to learn more about how the CENesis PHASE multiphase encapsulated production solution can help you get more return on your unconventional wells.

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