HALLIBURTON

GAS SEPARATOR

Slugger™ 400 series gas separator

Superior separation efficiency in extreme gas applications

FEATURES

- Optimized intake provides maximum and streamlined intake of fluids
- Expanded internal liquid reservoirs deliver continuous stream of liquid to the pump
- Extended length and downstream directed gas exit ports reduce gas recirculation
- Stationary helix inducer creates two-phase vortex separation that increases efficiency with increased flow rate
- Erosion Buster® protection design reduces erosion and wear
- Exclusive XRange® bearing system on every stage widens the operating range
- Engineered DuraHard® coatings offer enhanced abrasion protection
- Enhanced internal flow design mitigates erosive wear

BENEFITS

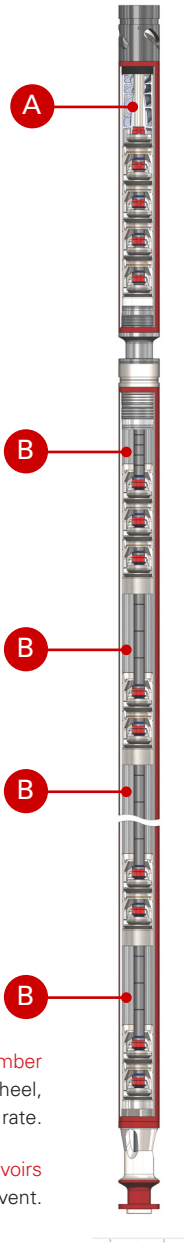
- Improves oil and gas recovery
- Smooth amperage is easier on equipment for extended run life
- Erosion Buster® protection provides greater reliability

Overview

The Slugger gas separator is an innovative technology that mitigates the effect of gas slugs in an electric submersible pump (ESP) system. In addition to the advanced capabilities of the Hydro-Helical® gas separator, the Slugger gas separator provides a liquid reservoir to be processed during an extended gas slug event, similar to the concept of an inverted shroud. This technology has proven to smooth out amp and pump intake pressure swings in wells with extreme gas slugging events, allowing for the extended use of higher production ESP systems.

When operators anticipate high gas rates, some start production on gas lift before converting to ESPs. This can be complicated and costly and delay payback times.

With the Slugger gas separator system, operators now have the option to eliminate gas lift and immediately begin producing with an ESP, increasing their return on investment.



A. Stationary helix separation chamber
Creates a vortex without a spinning paddle wheel, enabling separation efficiency that increases with flow rate.

B. Slugger gas separator internal reservoirs
Store excess liquid for a gas slug event.

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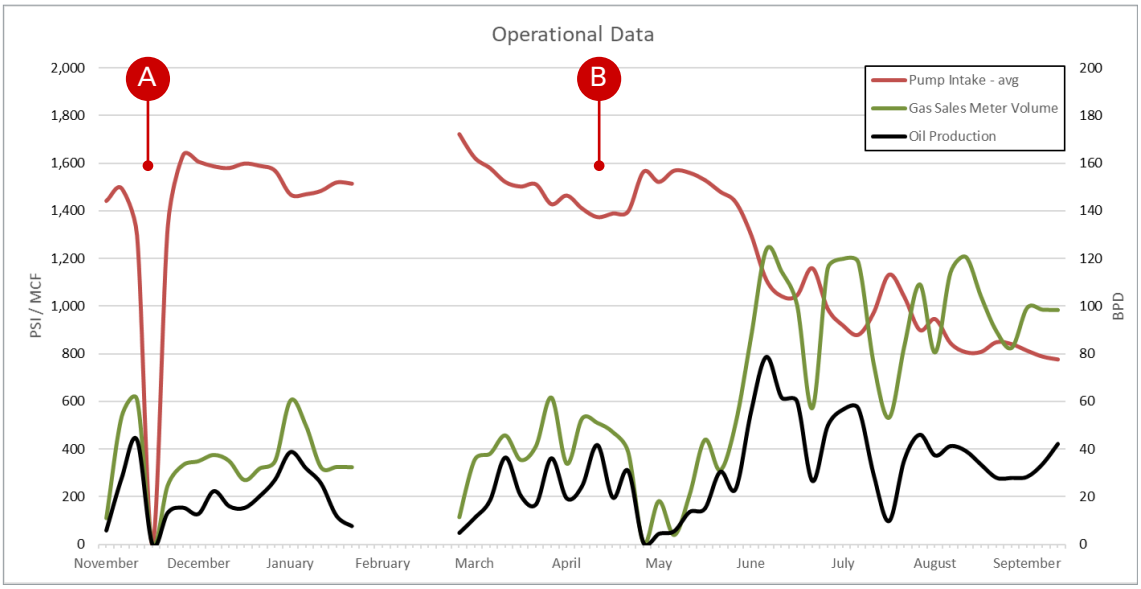
The Slugger™ gas separator difference

A challenging unconventional Permian Basin well with a toe-up horizontal well profile was initially produced for years on gas lift with 30 BOPD or less production. The first ESP installation increased production but had long periods of time with little to no flow, resulting in overheating conditions for the pump. A Slugger gas separator was installed with a Tiger Shark® pump and with the Intelevate™ digital platform in place, the right balance of optimized operating conditions was found. The well stabilized, and there was little to no slugging at the pump. Over five months of operation, oil and gas production doubled.

The graph below shows performance before and after installing the Slugger gas separator system.



A. Before Slugger gas separator
Unable to drawdown due to erratic performance

B. Utilizing Slugger gas separator
Smooth performance with achievable drawdown

DATA SHEET

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Slugger™ gas separator research

Summit ESP® innovated a transparent testing system to provide a visual understanding of different flow regimes. Findings were combined with high-speed photography, computational fluid dynamics (CFD) validation, and state-of-the-art instrumentation to develop every Slugger gas separator system component.

A transparent testing system enhanced the Slugger gas separator design.

Slugger gas separator development

During the development process, designers prioritized fluids throughput, erosion protection, and separation efficiency. The lower chambers were designed with maximum liquid reservoir volumes to replicate inverted shroud technology. The design also included exclusive XRange® bearings and engineered DuraHard® coatings for extended run life.

Field tests were run in unconventional wells with extreme gas slugging (due to toe-up profiles or undulations in the horizontal). Summit ESP technicians worked closely with customers to guide them on the new system's operation. The trials demonstrated that the Slugger gas separator enabled smoother operation during slugging events, higher production, and extended ESP run time.

Technical specifications

Outer-diameter size	4.00 inches
Flow range (BPD)	1,400 - up to 12,000
Abrasion resistant (AR) bearings	316L SST
Length	23 feet
Shaft size	.88
Standard housing pressue	6,000 psi
High-strength shaft limit	467 hp

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