



Hydro-Helical[®] 400 series gas separator

For more oil production in higher-gas applications

FEATURES AND BENEFITS

- Optimizes intake to provide consistent operations at higher gas volume fractions
- Includes a fluid mover that delivers up to 2x greater flow capacity
- Provides 20% additional capacity through integral tandem separators
- Anti-gas-lock technology results in "zero" gas lock and improved gas slug ride-through
- Separates fluids consistently, regardless of flow velocities and gas volume fractions
- Eliminates erosion in traditional paddle wheel, rotary, or vortex separators
- Handles up to 98% total volume free gas
- Reduces overheating of equipment
- Ability to handle up to 98% total volume free gas

Overview

The gas separation process is like a black box to most producers, with little understanding of how it operate. An experienced Halliburton Summit ESP® research team studied the operation of gas separators around the world. This accumulated knowledge, together with extensive testing (in both the lab and field), has resulted in the first new technology advancement in 35 years - the Hydro-Helical gas separator.

The innovative Hydro-Helical gas separator delivers superior overall performance, with 2x greater fluid volume and about 40% greater gas handling capability than the industry standard. This is accomplished via a unique configuration of proprietary components and multiple stages, which are designed to maximize throughput efficiency of rotating fluids and to also reduce erosion and wear - thus greatly improving gas separation consistency and reliability.

The numerous features, benefits, and capabilities of the Hydro-Helical gas separator help operators maximize asset value by increasing oil production in conventional and unconventional wells that are encountering very high gas concentrations.

Proprietary features include:

- Thrust protection enables a flow range increase of up to 12,000 barrels per day
- Stationary helical design influences 100% of the fluid, creating greater than 98% separation efficiency
- Aerospace influenced crossover technology allows for maximum throughput while maintaining maximum kinetic energy, and optimum directional transfer of liquid to the pump
- Fluid mover Erosion Buster® protection reduces erosion and wear throughout, and provides greater reliability
- XRange® Xtreme (XRX) advanced bearing system provides upthrust protection

Top-tier technology

Vortex inducer

The stationary helix inducer creates a vortex without a spinning paddle wheel, enabling separation efficiency that increases with flow rate. Its entry and exit angles, tapering cross-section, and pitch minimize erosion, and also direct flow for significantly improved separation.

Intake, crossover, and exit ports

These individually optimized key components in the separation chamber help minimize flow losses and reduce erosion. The enlarged intake creates flow paths for the ingestion of large volumes of fluid, with minimal deviation in flow direction. Precisely directed fluid-phase streams from the separation chamber into the crossover gyratory pathways minimize recirculation and erosion, while reducing the ingestion of fluid through the gas exit ports. The crossover port also redirects fluid at the pump's intake in order to reduce pre-rotation for enhanced pump performance.

Fluid moving stages

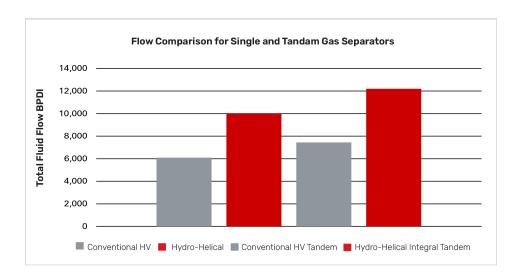
The special stage design avoids pressure differentials that could cause gas locking. Modular stages support adjustable flow rates and feature abrasion-resistant (AR) bearings with patented thrust protection technology. This bearing system increases reliability through greater torsional rigidity and shaft support.

Proven performance

The comparative bar graph below illustrates higher flow, and thus better separation ability, using the 4-inch 400 Series 400 model Hydro-Helical® gas separator versus conventional high-volume (HV) gas separators.







HYDRO-HELICAL™ GAS SEPARATOR SPECIFICATIONS	
Outer-Diameter Size	4 inches and 5.38 inches
400 Series, Single Flow Range (BPD)	Up to 10,000
400 Series, Integral Tandem Flow Range (BPD)	Up to 12,000
538 Series Single Flow Range (BPD)	Up to 20,000
538 Series, Integral Tandem Flow Range (BPD)	Up to 24,000
Percent of Gas Handling	98%
AR Bearings	Up to 7



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