

VAPRO GAS HANDLING DEVICE

The Vapro can help increase production, reduce downtime and improve ESP reliability in wells previously considered too challenging for ESPs

APPLICATIONS

- Well with a high Gas/Liquid Ratio (GLR)
- Horizontal wells that slug gas
- Gas well dewatering
- Gas lift to ESP conversions

FEATURES & BENEFITS

- Axial flow impeller:
 - Raises GLR threshold without gas locking
 - Handles gas slugs into the system
 - Less cycling for extended run life
- Option to use with a Gas Separator
 - For extremely high gas content wells (up to 90 %)
- Abrasion-resistant tungsten carbide bearings & high-strength Inconel shafts:
 - Increase run life in abrasive wells
 - Handle higher horsepower applications
- Advanced in-house gas-handling design:
 - Interfaces with Borets pump designs to optimize tapered pump designs
 - Optimum gas lift affect by transferring gas in to the tubing instead of separating it
- Vapro stages are casted and the gas handlers are manufactured at Borets facility certified to API Spec Q1, ISO 9001: 2008 and ISO 14001:2004 / OSHAS 18001:2007
 - Control in quality and cost
 - Rapid prototype for future designs allby Borets
 - Proprietary casting design and process
- Optimized vane openings to prevent gas locking
 - Improves up time of unconventional well

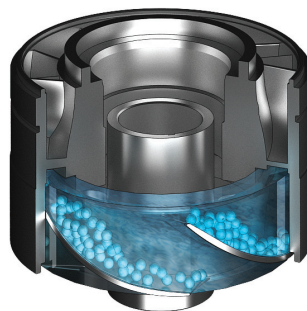
The Borets Vapro gas handler is the most efficient multiphase gas-handling pump in the industry, allowing trouble-free operation of ESP systems in extreme gas conditions and reducing the tendency for underload shutdowns due to gas interference in the pump, resulting in increased production.

The Vapro is designed to initially reduce the size of the gas bubbles, and then change the distribution of the gas into a more homogeneous flow regime. This creates a mixture of liquid and gas that will behave more like a single-phase fluid as it enters the primary pump.

For more aggressive conditions with free gas content up to 90 %, the Vapro can be installed above a rotary or vortex gas separator to reduce the amount of gas entering the unit.

When free gas is introduced into the pump impeller, it restricts the liquid flow path and results in flow degradation, as illustrated in Figure 1. As a result, this leads to unstable production rates, pump surging and gas-locking.

Gas locking and gas separation are a function of the fluid properties, well bore geometry and deviation. By discussing with your Borets representative we can best model the expected gas handling performance of the ESP system.



VAPRO GAS HANDLERS SPECIFICATIONS

The 400 Series Vapro is applicable in wells where the percent of free gas at the intake is up to 70 %, 538 Series Vapro can be used in wells where the percent of free gas is up to 65 %.

In wells where the percent of free gas at the intake is up to 90 %, the Vapro can be installed together with a gas separator.

| | 400 Series | | | | | | | | 538 Series | |
|---|-------------------------|------------------------|----------------------------|---------------------------|----------------------------|---------------------------|------------------------------|------------------------------|---------------------------------|---------------------------------|
| | Vapro 750 | | Vapro 2000 | | Vapro 3200 | | Vapro 5300 | | Vapro 12500 | |
| | 60 Hz | 50 Hz | 60 Hz | 50 Hz | 60 Hz | 50 Hz | 60 Hz | 50 Hz | 60 Hz | 50 Hz |
| Housing Diameter in. (mm) | 4.0 (101.6) | | | | | | | | 5.38 (136.60) | |
| Shaft BHP Limit | | | | | | | | | | |
| Standard, HP (kW) | 153 (114) | 127 (95) | 218 (162) | 181 (135) | 218 (162) | 181 (135) | 354 (264) | 295 (220) | 645 (481) | 538 (401) |
| High Strength, HP (kW) * | 367 (274) | 306 (228) | 506 (377) | 421 (314) | 506 (377) | 421 (314) | 775 (578) | 646 (482) | 1 230 (918) | 1025 (765) |
| Power consumed at BEP 1 stage, HP (kW) | 0.414 (0.309) | 0.240 (0.179) | 0.708 (0.518) | 0.410 (0.300) | 1.135 (0.847) | 0.657 (0.490) | 0.848 (0.633) | 0.491 (0.366) | 3.290 (2.454) | 2.741 (2.045) |
| Flow range, BPD (m ³ /d) | 150 - 720 (24 - 114) | 126 - 597 (20 - 95) | 717 - 2,038 (114 - 324) | 597 - 1,698 (95 - 270) | 717 - 2,868 (114 - 456) | 597 - 2,390 (95 - 380) | 2,264 - 5,434 (360 - 864) | 1,887 - 4,528 (300 - 720) | 4,000 - 13,000 (636 - 2,067) | 3,333 - 10,830 (530 - 1,722) |

* Soft Start

BORETS VAPRO OPERATING RANGE

