

Liquefied gas horizontal surface pumping systems

High-pressure systems increase production

Baker Hughes, a GE company (BHGE), designs high pressure surface applications with the industry's most robust pressure boundary components. We are the industry's sole provider of **turnkey, fully automated, mobile CO₂ HPump™ horizontal surface pumping systems**.

The fully assembled, portable unit option provides customers unmatched flexibility to inject CO₂ and transfer NGL with higher pressures for enhanced oil recovery.

Most fields initially produce without artificial lift, but as the reservoir pressure depletes, some form of artificial lift is employed. In many cases, secondary recovery is used such as horizontal producers or injectors. Thermal recovery or gas injection as a means of tertiary recovery continues to expand recoverable reserves and extend the life of the field.

This fully engineered system is delivered at your well site complete with a CO₂ specific centrifugal pump, all necessary valves, a fully automated variable speed drive, piping, hardware, and all electrical components pre-wired. These system components make this the industry's leading plug-and-play system. With a BHGE CO₂ injection HPump, the stranded oil and gas that might not otherwise have been produced, is lightened as the CO₂ expands in the reservoir to push additional production to the surface. The

CO₂ will also assist in slowing the decline of production reservoir pressure. This process of enhanced oil recovery provides sustainable energy for the future.

BHGE CO₂ high pressure system design benefits

- Increased pressure capabilities improve component design to increase field safety and reduce application risk
- Design includes double O-ring fluid seals to create superior containment at the equipment joints
- Integral CO₂ seal mounting system can be adapted to several seal designs depending on fluid conditions
- Increased pump wall housing thickness along the full length of the pump handles higher operating pressures
- Rear pullout thrust chamber maintenance capability decreases service time
- Self-lubricating graphite/metal alloy bearings are ideal for low lubricity fluids

The system's core is a multistage centrifugal pump, a thrust chamber, and a premium efficient surface motor mounted to a skid. Our customers have reported 65% to 88% maintenance cost reductions with this simple design. Based on our rugged



BHGE CO₂ trailer-mounted horizontal surface pumping system.

electrical submersible pump (ESP) design, this energy-efficient technology is your best choice for any job involving fluid transfer, fluid injection, and pressure boosting.

North Slope customer experiences 14-year run time with NGL boost system

The ultimate proof of reliability is an actual field application bolstered with research and development testing. A BHGE customer is experiencing a cumulative run time of 14+ years with our NGL boost systems. The units installed on Alaska's North Slope use self-lubricating graphite/metal alloy bearings and are operating in parallel providing a larger capacity for boosting. The customer has stated that BHGE pumping systems are the best solution for NGL booster service.

Series high pressure applications create production flexibility for CO₂ system operator in Mississippi

Another BHGE CO₂ example application operates in Mississippi. These series systems boost over 5,000 BPD at over 5,000 psi. By splitting the pressure between the two systems, we are able to lower the differential pressure required for each pump

system. These series applications allow operators to vary their injection pressure in their fields, creating production flexibility by placing pumps in separate locations.

Trailer-mounted CO₂ HPump system reduces CAPEX in multiple US fields

A customer in the US owns significant CO₂ reserves used for tertiary oil recovery. The BHGE 250 hp HPump system is trailer-mounted and designed for portability in the field. With this portable system, our customer can inject CO₂ in multiple fields with multiple wells, reducing capital expenditures.

HPump systems handle varying field conditions

HPump systems are able to endure changing field conditions, especially when the system is equipped with a **BHGE variable speed drive (VSD)**. Whether the operation calls for high-flow low pressure or low-flow high pressure, BHGE solutions cover a wide range from 800 to 55,000 bpd and up to 6,250 psig discharge pressure, with horsepower ratings up to 2,500 hp.

For critical field installations, the BHGE mobile CO₂ trailer can be equipped with a bypass line. This bypass capability ensures

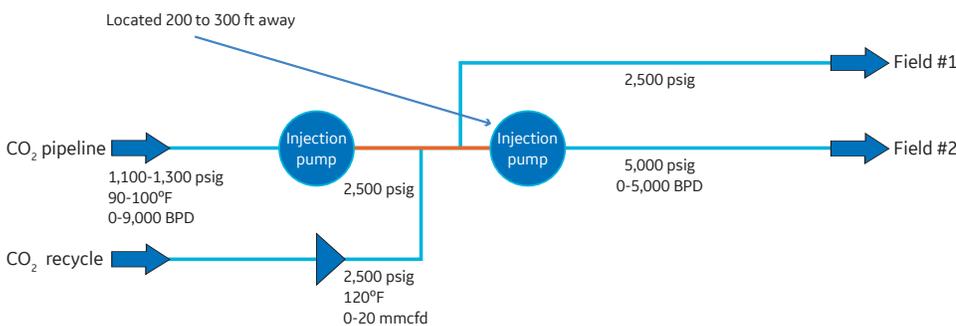


BHGE CO₂ HPump surface pumping system permanent installation.

operators will never stop injection, even if the system is not operational.

HPump surface pumping systems for longer run life, lower maintenance costs

The liquified gas system is just one of several models in the HPump product line. Our reliable HPump systems offer longer run life and lower maintenance costs when compared with other surface pumping systems. The system's simplicity also speeds up manufacturing. Whether you are pumping water, CO₂, or crude oil, call BHGE to discuss solutions for your surface pumping challenges.



CO₂ series system site example for enhanced recovery

bhge.com

Copyright 2018 Baker Hughes, a GE company, LLC ("BHGE"). All rights reserved. BHGE provides this information on an "as is" basis for general information purposes. BHGE does not make any representation as to the accuracy or completeness of the information and makes no warranties of any kind, specific, implied or oral, to the fullest extent permissible by law, including those of merchantability and fitness for a particular purpose or use. BHGE hereby disclaims any and all liability for any direct, indirect, consequential or special damages, claims for lost profits, or third party claims arising from the use of the information, whether a claim is asserted in contract, tort, or otherwise. BHGE reserves the right to make changes in specifications and features shown herein, or discontinue the product described at any time without notice or obligation. Contact your BHGE representative for the most current information. The Baker Hughes logo and HPump are trademarks of Baker Hughes, a GE company, LLC. GE and the GE Monogram are trademarks of the General Electric Company.