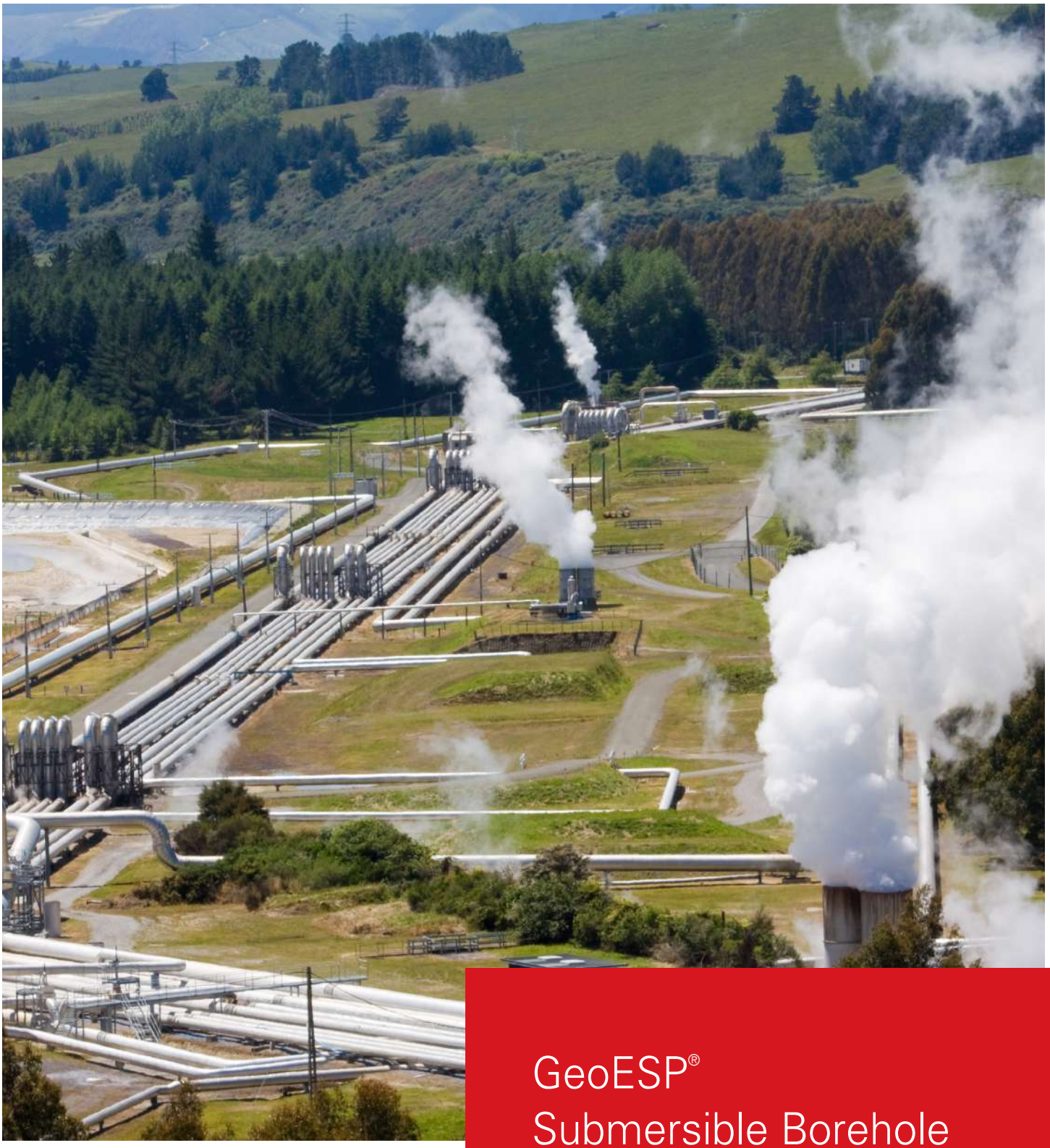


GeoESP®
Submersible Borehole and Surface Pumps

RELIABLE WATER MANAGEMENT IN GEOTHERMAL ENERGY PRODUCTION

SUMMIT ESP

A HALLIBURTON SERVICE

Submersible Borehole and Surface Pumps for Geothermal Operations

GEOTHERMAL POWER IS CLEAN, CONTINUOUS, AND RENEWABLE, MAKING IT AN ATTRACTIVE ALTERNATIVE TO COAL AND NATURAL GAS AS A BASE ENERGY SOURCE

To generate geothermal energy, operators depend on pumping systems that move superheated water from deep in the earth to surface facilities and back underground again. Efficiency and environmental safety depend on these systems. You can depend on these systems when they come from Halliburton. We have the expertise, technology, and service excellence needed to outperform all other solutions.

Application Expertise

Our global team includes specialists with more than 20 years of experience in geothermal applications. We understand the unique requirements in moving superheated water and steam, and leverage our extensive experience with other geofluids to deliver a uniquely qualified solution.

Lifting geofluids from deep within the earth is what we do. Halliburton's ESP-based artificial lift technology is field-proven, withstanding thermal cycling, scaling, abrasion, and corrosion in the harshest environments. Halliburton has thousands of artificial lift systems deployed around the world.

Top Tier Technology

Our GeoESP® submersible borehole and surface pumps directly address the hardest problems in moving geofluids to the surface—thermal cycling and scale resistance. We use heat-resistant materials to protect pumps, motors, and other components from high temperature and thermal shock.

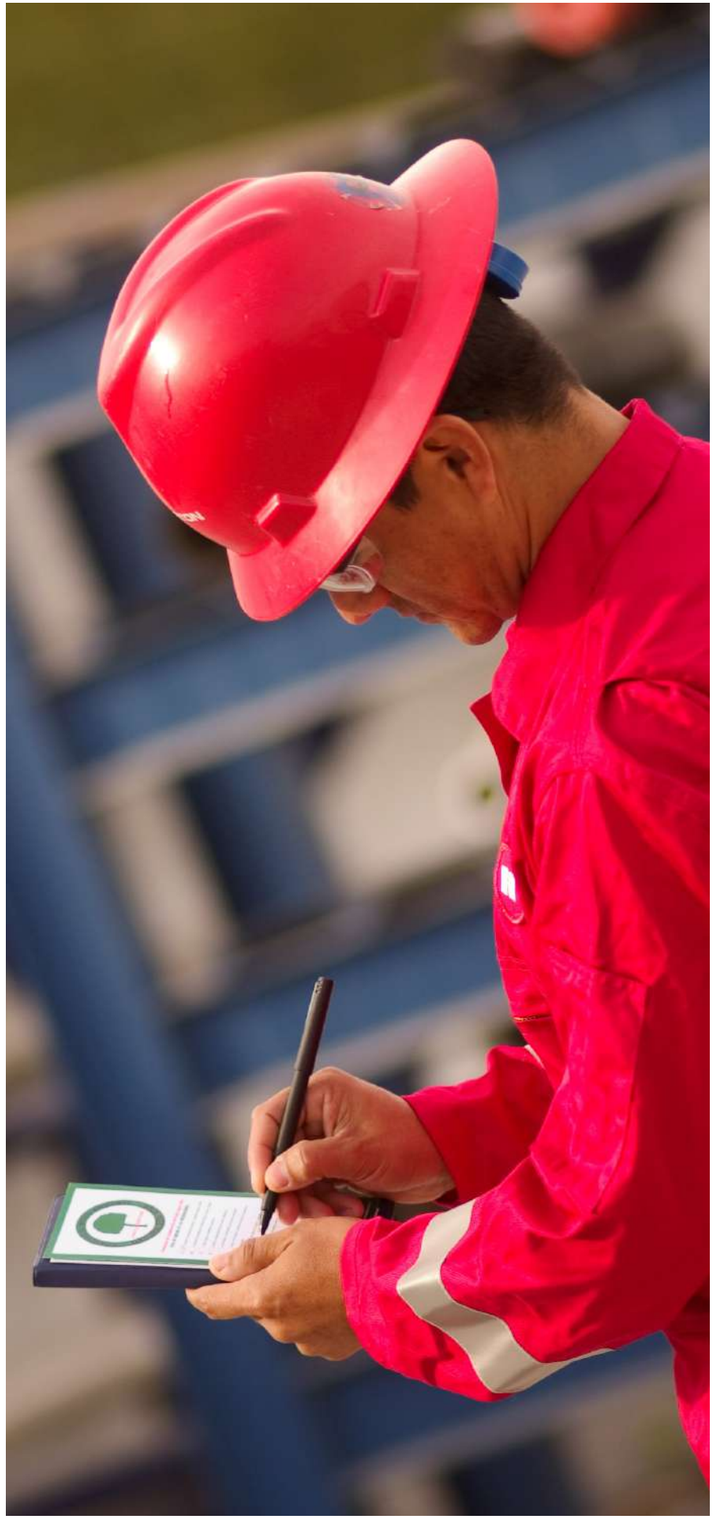
Locking mechanisms within the pumps further protect bearings from excessive heat. Our DuraHard® coatings protect equipment from calcium carbonate scaling as well as abrasives and corrosives. Our molecular bond coating provides hardness comparable to carbide materials with added ductility. Spiral grooves and specialized materials make our bearings and bushings particularly resistant to scale.

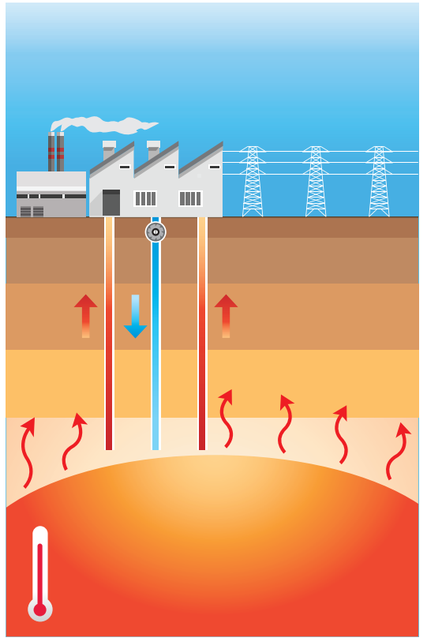
Halliburton's Research and Technology Center brings together product engineers, R&D engineers, manufacturing, reliability, and quality teams focused on innovation and reliability. The state-of-the-art facility is fundamental to continuous performance improvement in harsh environments. Test loops and wells allow system integration testing prior to field development and validate operation in extreme conditions.

UNPARALLELED SERVICE

Top performance requires great technology plus an unwavering commitment to customer service. We combine best-in-class product performance and service excellence to deliver a level of service that sets Halliburton apart.

While many providers focus on product line management, Halliburton's Artificial Lift team has a different approach. We hold ourselves to a higher standard, especially when it comes to customer service in today's energy industry. Our focus is on customers and their needs, first and foremost.





WHY ARE OPERATORS RELYING ON GEOTHERMAL ENERGY?

» The heat within 10,000m of the earth surface has 50,000 times the energy than all the oil and natural gas in the world.
– USUCS

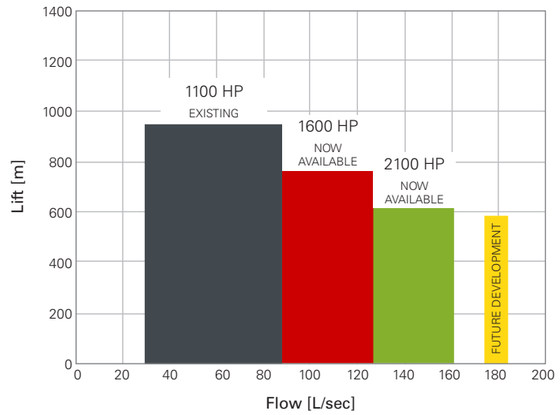
» Global geothermal energy market will reach USD $9 Billion by 2025.
– Zion Market Research

» The share of renewable energy in the global energy mix is on a continuous rise, and projected to grow at a CAGR of 4.9% from 2017 to 2025.
– Allied Market Research

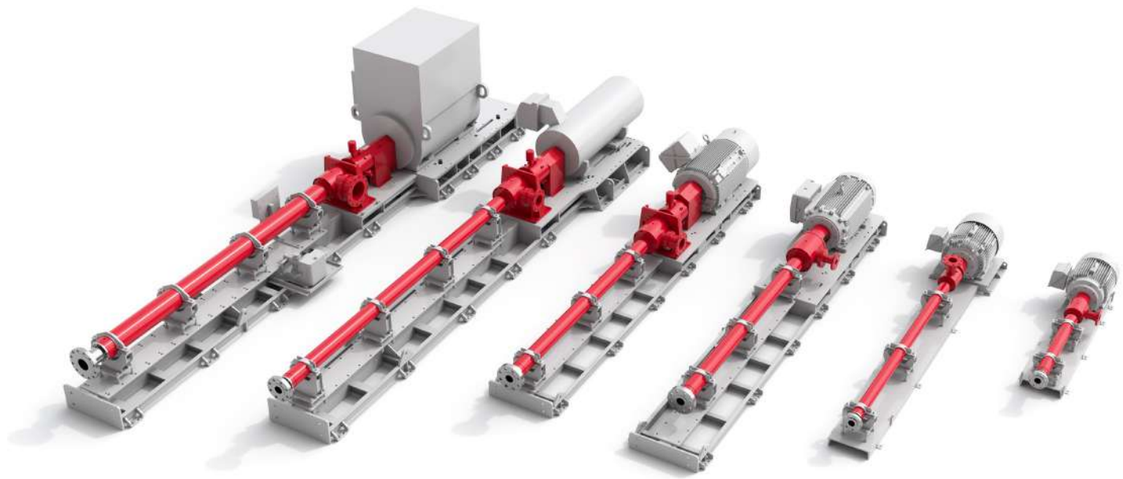
HIGH EFFICIENCY ESP SYSTEMS FOR GEOTHERMAL ENERGY PRODUCTION

» Production and injection wells
» Scale, corrosion, and abrasion resistant
» Thermal shock resistant
» Heat resistant up to 302°F (150°C) BHT
» Up to 2100 HP
» Up to 160 L/sec flow rate
» Up to 750m lifting head
» Extreme high-load seal section
» Bag-less scale resistant seal

FUTURE DEVELOPMENTS INCLUDE MOTORS UP TO 3000 HP AND PUMPS UP TO 200 L/SEC.



HERCULES™ HORIZONTAL PUMPING SYSTEMS



Flow Range » 800 to 70,000 BPD
(23 to 2,000 USgpm, 5 to 465 m^3/hr)

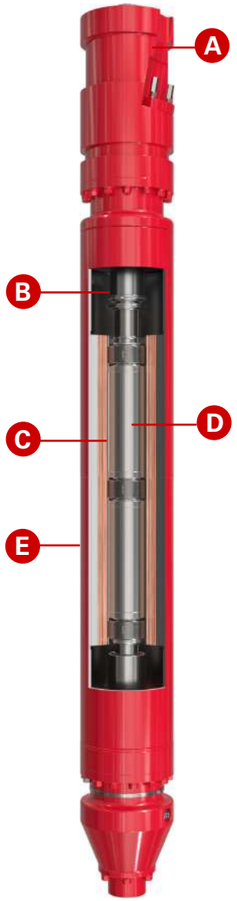
Discharge Pressure » From 300 up to 7100 psi (20 to 490 BAR)

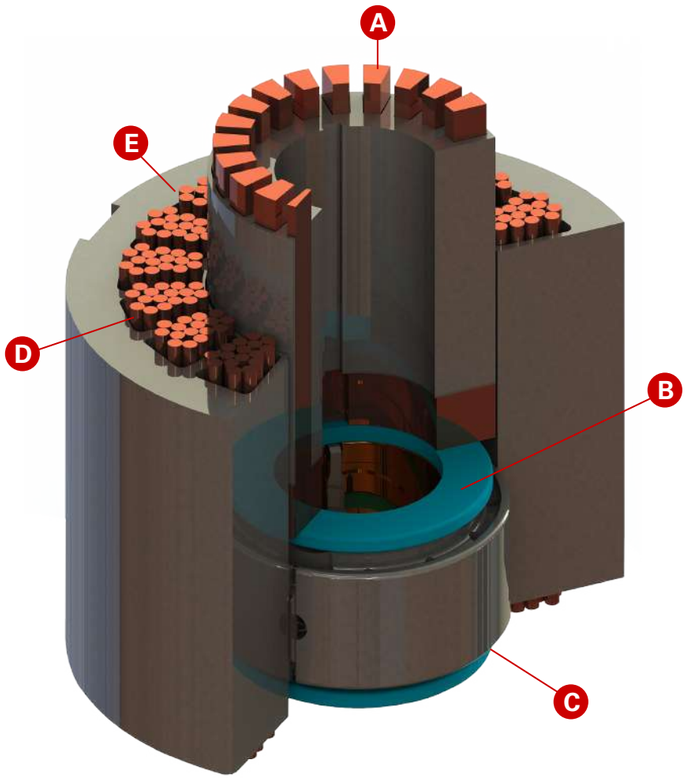
Horsepower » From 20 to 2,500 hp (15 to 2000 kW)

Temperature » Up to 500°F (260°C) for extreme applications

ELECTRIC SUBMERSIBLE PUMP TECHNOLOGY

Corsair™ Motor





A. High-temperature tape-in pothead for maximum reliability and performance

B. Compliant mount, tungsten carbide radial supports in the head and base to help reduce vibration

C. Mechanical bearing retainers incorporated into Big Foot™ bearings allow movement of rotor stack within stator during thermal cycling

D. Non-recessed rotors reduce bearing temperature, leading to significant increase in reliability and efficiency

E. High-temperature insulation system allow successful operation in high-temperature wells

A. Shaped rotor bars >> New design utilizes shaped rotor bars, resulting in less current waste and a more efficient motor

B. Flat-top rotors >> Incorporate thermal insulated washers and eliminates the need for inserting motor bearings into recessed areas – thus reducing friction and heat while improving reliability and performance

C. Self-aligning, wide-profile, Big Foot™ bearings >> Large wide-profile bearing increases heat transfer, reducing internal motor temperatures. The Big Foot bearing also distributes side loads over larger areas, thus reducing fretting damage in the stator laminations

D. Standard double-wrapped polyimide insulated windings >> This feature provides added protection that improves reliability

E. Precision hand-wound stators >> These stators allow more room in the slot for additional copper wire, thus increasing efficiencies and performance; hand-winding also reduces the potential for damaging wire during construction

Defender™ Seal

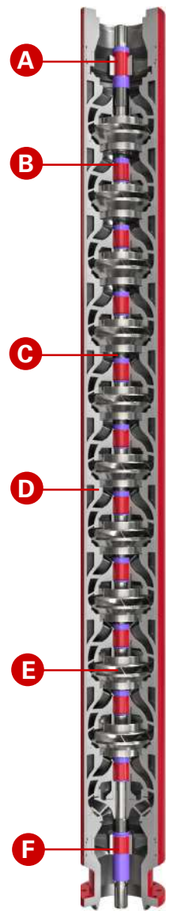
A. Super sand head eliminates scale deposition

B. Tungsten carbide radial bearings provide longevity

C. Extended expansion capacity to cope with thermal cycling

D. Extreme load thrust bearing helps prevent overload during system upset

Tiger Shark® Pump



A. Enhanced tungsten carbide material throughout pump

B. Grooved bushings help prevent scale deposition

C. Stage coatings help prevent $CaCO_3$ scale and NORM scale sticking

D. Erosion Buster® design in every diffuser prevents abrasive recirculation within the pump

E. Special retaining ring provides secondary press-fit bushing retention to prevent bushing from spinning due to scale deposition or thermal cycling

F. Double-sleeve system provides more support to critical shaft end

Below top, wide-vane design » Tiger Shark® XR 900 pump stage design offers 150 percent vane opening expansion to increase gas and solids handling capabilities, while maintaining high efficiency and lift

Below bottom, Erosion Buster® design » Erosion Buster® design redirects fluid path inward and into the primary flow path, thus decreasing wear on critical areas

Sales of Halliburton products and services will be in accord solely with the terms and conditions contained in the contract between Halliburton and the customer that is applicable to the sale.

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HALLIBURTON

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