The popular and dependable Tiger Shark® pump line is now even more reliable with the addition of the Tiger Shark® II (TS2) pump.

**Features**
- Patent-pending hydraulic designs
- Extended system flow range
- Improved head curve lift to shut off point
- Lower hydraulic thrust
- Heavier wall construction in pump components

**Benefits**
- Higher standard in pump hydraulics with innovative design concepts
- Adapts to changing well production
- Improves gas handling, increases well drawdown, and improves ultimate reserve recovery
- Improves uptime by keeping gas in solution
- Extends operating range
- Extends pump run life

**Applications**
- Conventional oil fields
- Unconventional oil and gas fields
- Vertical, Horizontal or deviated wells
- Abrasive wells

**Plus**
- Flanged sleeve sand exclusion technology for rapidly declining, abrasive wells
- Patented Erosion Buster® design increases run life in abrasive environments
- Wide-vane technology for gas lock prevention

**DESIGNED FOR MAXIMUM FLEXIBILITY IN UNCONVENTIONAL, ABRASIVE, GASSY WELLS**

Summit ESP® – A Halliburton Service has designed and developed the optimum pump line for producing and developing unconventional resource plays. The Tiger Shark® II XRange™ (XR) pump line offers an industry-leading, extended operating range with capabilities to produce volumes from lower than 25 barrels per day and increasing up to 64,000 barrels per day.
**TIGER SHARK® II PUMPS: THE BEST CHOICE FOR HARSH ENVIRONMENTS**

Gas, corrosives, abrasives, and heat are ongoing challenges to attaining long ESP run life. The superior TS2 pump design is targeted to increase run life and extend operating range in extreme environments. Technical enhancements have resulted in optimal pump performance in gassy, corrosive, abrasive, and high-temperature wells.

**Tiger Shark® II Pump Enhancements and Benefits**

<table>
<thead>
<tr>
<th>Enhancements</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patented High Thermal Expansion Material (HTEM)</td>
<td>Creates a secondary mechanical lock to hold bushing from slipping, and retains bushing diffuser connection in elevated operating temperature conditions</td>
</tr>
<tr>
<td>Upgraded bearing material</td>
<td>Increased bearing longevity and longer run life in abrasive environments</td>
</tr>
<tr>
<td></td>
<td>» 6X increase on abrasive resistance</td>
</tr>
<tr>
<td></td>
<td>» 3X longer pump performance</td>
</tr>
<tr>
<td>New, patent-pending “Snap-Trap” spiral ring retention</td>
<td>Sleeve aids in spiral ring retention and works in tandem with the spiral ring installation tools to ensure proper installment, seating, and the reliability of spiral rings</td>
</tr>
<tr>
<td>Overlapping head and top bearings</td>
<td>Top bearing protrusion mates with pocket in the head to create an overlapping seal that will help prevent abrasive wear on the housing and thread washout</td>
</tr>
<tr>
<td>Extended-base XR bushing</td>
<td>Provides greater radial support to the shaft</td>
</tr>
<tr>
<td>Dual-sleeve technology</td>
<td>Increases shaft support interface while still allowing for adjustment to shaft extension</td>
</tr>
</tbody>
</table>

**Cutting-edge ESP technology coupled with gold-standard service and basin-specific application expertise widens the performance gap to our closest competitors.**

A. Overlapped head and top bearing  
B. Improved Tungsten carbide material throughout pump  
C. Erosion Buster® in every diffuser  
D. HTEM ring, which provides secondary press-fit bushing retention  
E. Double-sleeve system provides more support to critical shaft end  
F. Snap-Trap – secondary retaining ring retention
State-of-the-art computational fluid dynamics (CFD) programs are used to predict performances of new pump stages. By incorporating CFD modeling into each step of our iterative design process, our engineers can quickly refine the design features and rapidly deliver an optimally efficient, high-performance stage to market. Numerical methods are used to digitally test the pump long before parts are manufactured.

Top » State-of-the-art computational fluid dynamics (CFD) programs are used to predict performances of new pump stages. By incorporating CFD modeling into each step of our iterative design process, our engineers can quickly refine the design features and rapidly deliver an optimally efficient, high-performance stage to market. Numerical methods are used to digitally test the pump long before parts are manufactured.

Bottom left, 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.

Bottom right, sand wedge design » Patented Erosion Buster® design redirects fluid path inward and into the primary flow path, thus decreasing wear on critical areas, hence increasing run time.
**Tiger Shark® XRANGE™ Pump Stages**

**Maximum Flexibility and Range**
Summit ESP® Tiger Shark® XRANGE® (XR) pump stages incorporate innovative hydraulic design concepts with wide mixed-flow vanes and greater operating ranges, designed specifically to handle broader drawdowns of conventional wells and rapidly declining, sandy, and gassy wells typical of today’s dynamic unconventional vertical and horizontal drilled shale plays across North America.

**XRANGE® Extended Range (XR)**
Tiger Shark XR pump stages incorporate an abrasion-resistant bearing insert design that absorbs downthrust produced by the stages in the pump rather than the seal. The XR design eliminates the need for compression pumps that require time-consuming and precise field shimming. Imprecise shimming can potentially lead to short run times due to human error because each connection requires accurately measured, calculated, and performed shimming.

**Extreme-Flow Applications**
Tiger Shark XR 320 pump stages have a low-end operating range of less than 45* barrels per day and a high-end operating range of 420 barrels per day. The Tiger Shark XR 900 pump stages have a low-end operating range of 200* barrels per day while offering a high-end operating range of 1,650 barrels per day. Additional Tiger Shark XR pump stages will overlap production ranges up to 64,000 barrels per day. These broad and efficient operating ranges allow the operator to maintain maximum production without the high costs associated with system changeouts and nonproductive time as the well productivity declines.

**System Approach**
A system properly designed by experienced Summit ESP application engineers can accommodate changing conditions during the life of the well, possibly eliminating the switchover to rod lift as the rate falls below legacy electrical submersible pump applications. Tiger Shark pump extended-range gas handling (XRGH) can run in conjunction with XR pumps and Liberator™ gas separators. The gas handling pump stages with hydraulic vane configurations can accommodate up to 60 percent free gas. Adding Corsair™ motors allows the operator to expect and receive increased run times through reduced vibration, improved sealing, and better dielectric strength.

* Consult your Summit ESP Representative for low-flow and high-gas applications.
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.