For more than a century and a half, Flowserve has been in the forefront of virtually every significant advancement in pumping technology to meet cavern fluid handling challenges. For those applications, Flowserve offers the world’s most complete line of submersible motor pumps and motors – Pleuger water-filled and Byron Jackson oil-filled. Flowserve also offers a full menu of technical service and support for those products.

**Product Brands of Distinction**

Byron Jackson® Pumps  
Flowserve® Pumps  
IDP® Pumps  
Pleuger® Pumps  
Worthington® Pumps
**Cavern Electrical Submersible Pumps**

**Submersible Oil-Filled Motor Feature (Byron Jackson Design)**

4-Pole (hp)

<table>
<thead>
<tr>
<th>Power Output Range Four-Pole Submersible Oil-Filled Motors</th>
<th>Motor Type</th>
<th>8M</th>
<th>10M</th>
<th>12M</th>
<th>14M</th>
<th>17M</th>
<th>21M</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz Power Output (HP) (S.F. 1,0)</td>
<td>4-27</td>
<td>34-85</td>
<td>107-180</td>
<td>107-270</td>
<td>215-540</td>
<td>540-1800</td>
<td></td>
</tr>
<tr>
<td>60 Hz Power Output (HP) (S.F. 1,1)</td>
<td>5-30</td>
<td>40-100</td>
<td>125-200</td>
<td>125-300</td>
<td>250-600</td>
<td>600-2000</td>
<td></td>
</tr>
</tbody>
</table>

4-Pole (kW)

<table>
<thead>
<tr>
<th>Power Output Range Four-Pole Submersible Oil-Filled Motors</th>
<th>Motor Type</th>
<th>8M</th>
<th>10M</th>
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<th>14M</th>
<th>17M</th>
<th>21M</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz Power Output (KW) (S.F. 1,0)</td>
<td>3-20</td>
<td>25-63</td>
<td>80-132</td>
<td>80-200</td>
<td>160-400</td>
<td>400-1350</td>
<td></td>
</tr>
<tr>
<td>60 Hz Power Output (KW) (S.F. 1,1)</td>
<td>3,7-22</td>
<td>30-75</td>
<td>93-150</td>
<td>93-225</td>
<td>185-450</td>
<td>450-1500</td>
<td></td>
</tr>
</tbody>
</table>

2-pole oil filled motors (pumps) available on request per application.

**Submersible Water-Filled Motor Feature (Pleuger Design)**

2-Pole (hp)

<table>
<thead>
<tr>
<th>Power Output Range Two-Pole Submersible Water-Filled Motors</th>
<th>Motor Type</th>
<th>MG</th>
<th>M8</th>
<th>M10</th>
<th>VN12</th>
<th>VN14</th>
<th>MI16</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz Power Output (HP)</td>
<td>7,5-50</td>
<td>45-120</td>
<td>100-310</td>
<td>220-360</td>
<td>250-540</td>
<td>400-900</td>
<td></td>
</tr>
<tr>
<td>60 Hz Power Output (HP)</td>
<td>8,5-60</td>
<td>55-140</td>
<td>120-355</td>
<td>250-425</td>
<td>290-585</td>
<td>460-1050</td>
<td></td>
</tr>
</tbody>
</table>

2-Pole (kW)

<table>
<thead>
<tr>
<th>Power Output Range Two-Pole Submersible Water-Filled Motors</th>
<th>Motor Type</th>
<th>MG</th>
<th>M8</th>
<th>M10</th>
<th>VN12</th>
<th>VN14</th>
<th>MI16</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz Power Output (KW)</td>
<td>5,5-37</td>
<td>33-90</td>
<td>75-230</td>
<td>185-270</td>
<td>185-400</td>
<td>300-670</td>
<td></td>
</tr>
<tr>
<td>60 Hz Power Output (KW)</td>
<td>6,4-45</td>
<td>40-106</td>
<td>90-265</td>
<td>185-315</td>
<td>215-435</td>
<td>345-770</td>
<td></td>
</tr>
</tbody>
</table>

4-pole water-filled motors (pumps) available on request per application.

**Submersible Pump End Feature**

Flowserve submersible pump units are multistage centrifugal units which operate below liquid level and are driven by oil-filled or water-filled AC three-phase induction submersible motors. Pumps and motors form a single enclosed unit which, when installed vertically in cavern, is held in position by the connected discharge pipe at the non-return valve or discharge casing.

Flowserve submersible pump units are offered in a wide range of applications. Pumps are available from 4” to 48” bowl diameter with capacities up to 6000 m³/h (25 000 gpm) and heads up to 800 m (2600 ft).

Pump units are designed and manufactured to the highest quality with high pump efficiency and long working life under the most adverse conditions. They are extensively tested and inspected to ensure operational safety.

Flowserve submersible pump units are designed on the principle of a modular structure. Thus, with a limited number of parts, different tailor-made requests can be achieved. Pumps are equipped with non-return valves to guarantee optimal functional safety (water hammer).

Flowserve submersible pump units provide economic solutions for almost every user’s requirements.

To produce high-quality submersible pumps and motors requires both specialized know-how and continually evolving manufacturing processes. All submersible pump products are produced using the most advanced manufacturing techniques – from initial development base CAD to quality-controlled CNC production equipment. It is not by chance that among experts Flowserve has been a byword for top product quality for decades.
General Description of Electrical Submersible Cavern Pumps

BJ Oil-filled Motors and Pleuger Water-filled Motors

Flowserve submersible pumps with oil-filled or water-filled motors are designed to handle explosive fluids / LP gas. The installation conditions must ensure that both the pump and motor are always totally submerged and monitored by explosion-proof level sensors.

Motor and signal cables are protected via cable protection hoses / pipes or special armored cables will be used. The cable protection pipes or hoses are filled with motor oil (oil-filled motors) and with water (water-filled motors).

An oil-filled header tank, including 35-50 psi nitrogen (used by oil-filled motors) on top of the wellhead, is provided to always guarantee positive pressure in the motor. Filling additional nitrogen in the header tank guarantees that no moisture can enter the header tank. Explosion-proof instrumentation monitors oil fill level in the motor and triggers volume compensation from the header tank upon low level detection.

Water-filled header tanks (without nitrogen) are required when using water-filled motor design (Pleuger) pumps. Static positive pressure is sufficient for explosion-proof save duty (level monitored).

The special glands at the wellhead (main cables, signal cables and header tank pipes / hoses) are explosion-proof and completely sealed for hazardous areas.

For liquefied petroleum gas (LPG), a medium special gas-tight gland design is available.

For cable junction boxes (main and signal cable), an explosion-proof design is provided.
**Pumps**

**Material Options**
Special materials are available for cavern electrical submersible pump bowls, impellers, shafts, wear rings and connections

- **Bronze**
- **Super Duplex SST**

**Motors**
Varied motor options are available

<table>
<thead>
<tr>
<th>Water-Filled Design</th>
<th>Oil-Filled Design</th>
<th>Motors With Cooler</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1.jpg" alt="Water-Filled Design" /></td>
<td><img src="image2.jpg" alt="Oil-Filled Design" /></td>
<td><img src="image3.jpg" alt="Motors With Cooler" /></td>
</tr>
</tbody>
</table>
Cavern Electrical Submersible Pumps

Cable and Plug Options

Armored cable with plug motor connection

Cable protection hose ready connected together

Cable with protection hose (water or oil filled)

Cable plug connection (oil-filled motor)

Certificates and Regulations

Flowserve cavern electrical submersible water-filled motors/pumps are certified to ExGuide 04 ATEX 037 X.

ATEX certification for Flowserve cavern electrical submersible oil-filled motors / pumps is expected in 2011.

Worldwide Leader

Flowserve is recognized as a global leader in supplying pump units for cavern services. It has delivered pump units throughout the world that handle crude oil, gasoline, jet fuel, diesel, butane, Proban® and other cavern fluids.
To find your local Flowserve representative:

For more information about Flowserve Corporation, visit www.flowserve.com or call +1 937 890 5839