



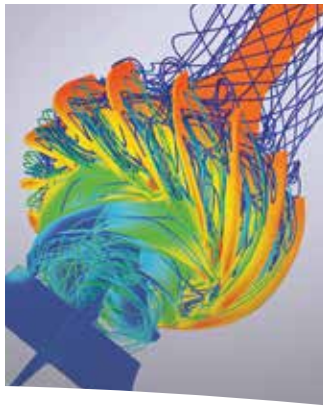
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## ***Lawrence Pumps® VPL3600 Vertical Lineshaft, Slurry Pump***

ISO 13709/API 610 (VS4)



*Experience In Motion*



## ***Pump Supplier to the World***

*Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered, and special purpose pumps and systems.*

### ***Life Cycle Cost Solutions***

Flowserve provides pumping solutions that permit customers to reduce total life cycle costs and improve productivity, profitability and pumping system reliability.

### ***Market-Focused Customer Support***

Product and industry specialists develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle, beginning with the initial inquiry.

### ***Broad Product Lines***

Flowserve offers a wide range of complementary pump types, from pre-engineered process pumps to highly engineered and special purpose pumps and systems. Pumps are built to recognized global standards and customer specifications.

Pump designs include:

- Single-stage process
- Between bearings single-stage
- Between bearings multistage
- Vertical
- Submersible motor
- Positive displacement
- Nuclear
- Specialty

### ***Product Brands of Distinction***

*ACEC™ Centrifugal Pumps*

*Aldrich™ Pumps*

*Byron Jackson® Pumps*

*Calder™ Energy Recovery Devices*

*Cameron™ Pumps*

*Durco® Process Pumps*

*Flowserve® Pumps*

*IDP® Pumps*

*INNOMAG® Sealless Pumps*

*Lawrence Pumps®*

*Niigata Worthington™ Pumps*

*Pacific® Pumps*

*Pleuger® Pumps*

*Scienco™ Pumps*

*Sier-Bath® Rotary Pumps*

*TKL™ Pumps*

*United Centrifugal® Pumps*

*Western Land Roller™ Irrigation Pumps*

*Wilson-Snyder® Pumps*

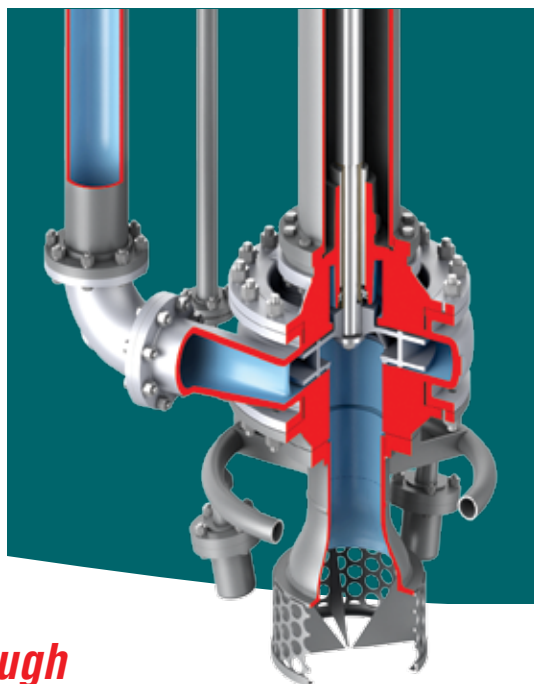
*Worthington® Pumps*

*Worthington Simpson™ Pumps*

**Lawrence Pumps  
VPL3600**

**Vertical Lineshaft,  
Slurry Pump**

ISO 13709/API 610 (VS4)



**Engineered for Tough  
Slurry Applications**

The Lawrence Pumps VPL3600 vertical sump pump is designed for the tough slurry applications found in refineries and delayed coker units. With its rugged ISO 13709/API 610 (VS4) compliant construction, slurry wet end and protected sleeve bearings, the Lawrence Pumps VPL3600 vertical slurry pump is a proven performer in applications containing abrasive solids.

**Application-Driven Design**

The VPL3600 isn't your typical ISO/API lineshaft pump. It's more. It's specifically designed for slurries. Every aspect of the pump is engineered to minimize the destructive effects of abrasive solids. The result is a pump with a typical mean time between repair (MTBR) of five years.

- High chrome iron, thick-walled construction
- Slurry hydraulics
- Repelling vanes on the front and back impeller shrouds
- Water-filled support column
- Hydraulic sparger system
- Fluted, rubber sleeve bearings
- Hard facing of critical shaft areas

**Typical Applications**

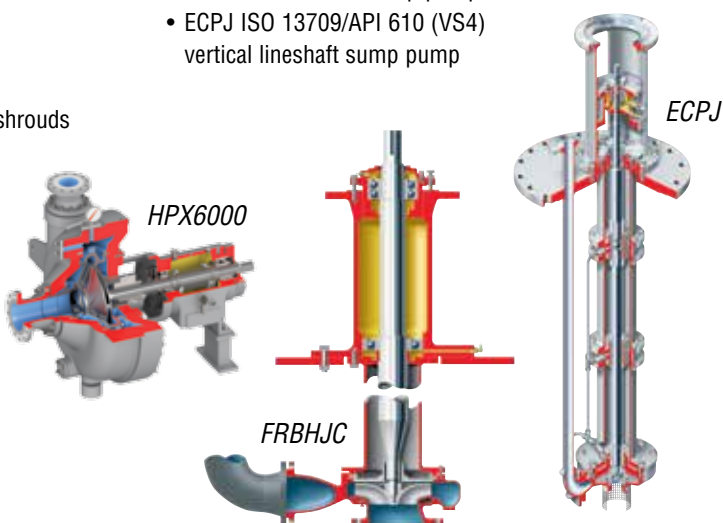
The VPL3600 is designed for the most demanding slurry applications in the oil and gas industry.

- Coke pit (maze)
- Slop oil

**Complementary Pumps**

In addition to the VPL3600, Flowserve can provide several complementary pump models, including the following:

- Lawrence Pumps HPX6000 ISO 13709/API 610 (OH2) fully lined horizontal slurry pump
- FRBHJC cantilever sump pump
- ECPJ ISO 13709/API 610 (VS4) vertical lineshaft sump pump



## Lawrence Pumps VPL3600

### Vertical Lineshaft, Slurry Pump

ISO 13709/API 610 (VS4)

The Lawrence Pumps VPL3600 is a vertical lineshaft pump engineered specifically for slurry applications in refineries and decoking units. Meeting ISO 13709/API 610 (VS4) criteria, the VPL3600 incorporates numerous design enhancements to minimize abrasion and enhance durability.

#### Typical Operating Parameters

- Flows to 1500 m<sup>3</sup>/h (6600 gpm)
- Heads to 150 m (492 ft)
- Temperatures to 100°C (212°F)
- Speeds to 1800 rpm

Custom designs available for conditions exceeding those listed above.

#### Features and Benefits

**Standard High Chrome Iron Wet End** components have excellent abrasion resistance and feature heavy-walled sections to extend their useful life beyond that of typical ISO/API pumps.

**Slurry Impeller** has repelling vanes on the front and back shrouds to minimize suction recirculation and eddy currents. This design also eliminates the need for erosion-prone wear rings.

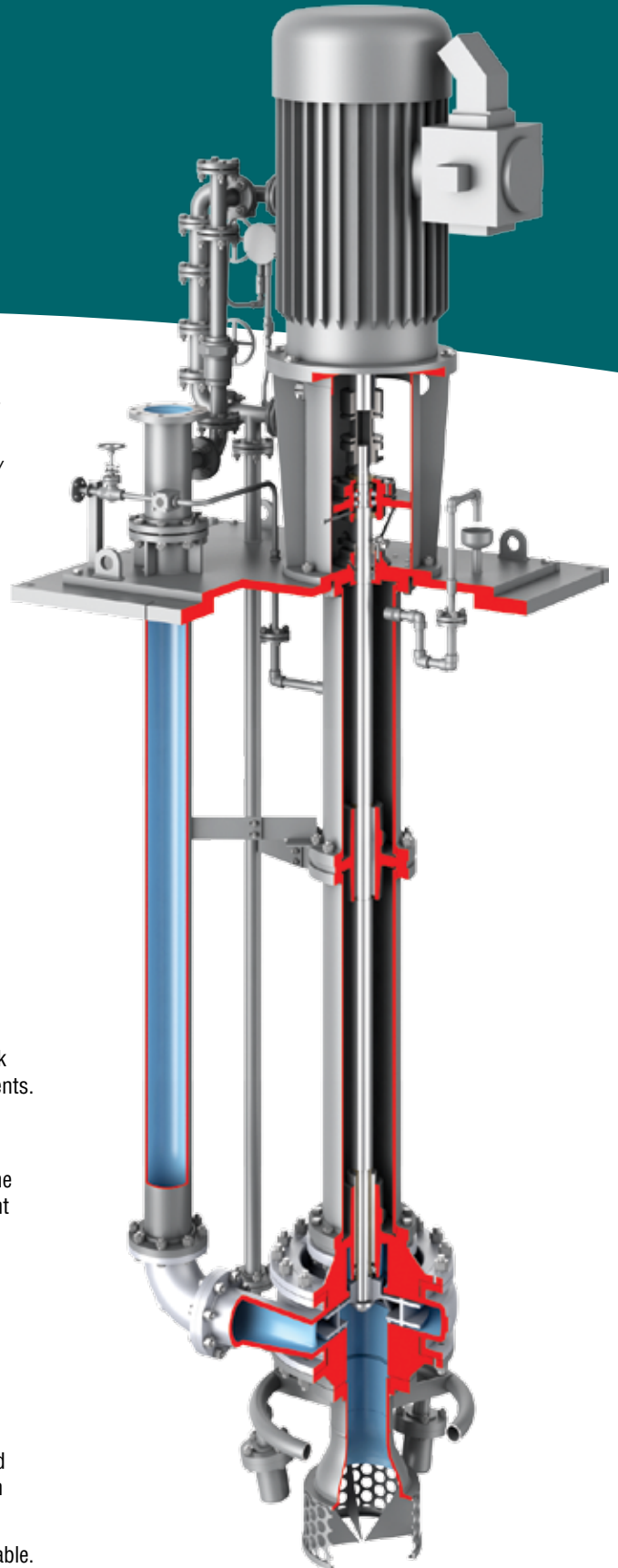
**Water-filled Column** with restriction bushing minimizes the ingress of solids, helping to maintain a clean environment for the shaft and sleeve bearings.

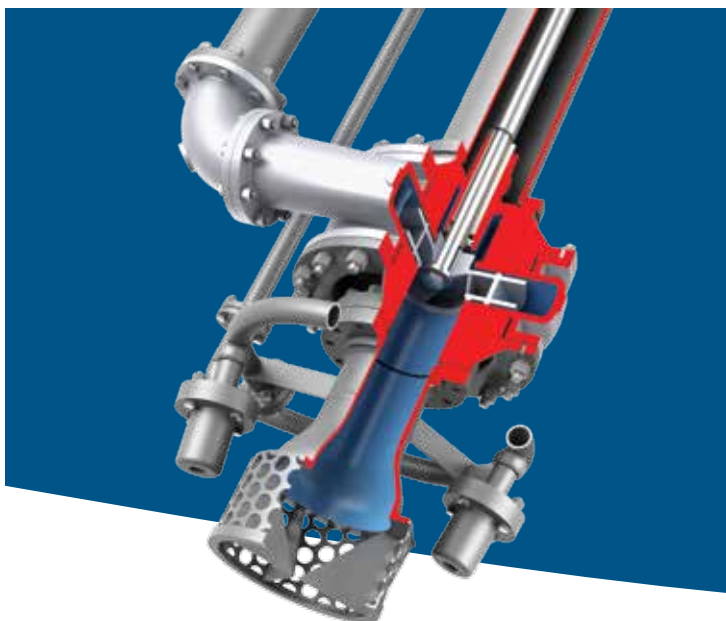
**Fluted FRP/Nitrile Rubber Sleeve (Lineshaft) Bearings** dampen vibration for extended bearing life, even when subjected to frequent starts and stops.

**Custom Shaft Designs** allow for installation in services with sump depths to 12 m (40 ft).

**Back-to-Back Angular Contact Thrust Bearings** provide proven reliability with off-the-shelf sourcing for quick and economical maintenance. Grease and flood oil lubrication available.

**Flanges** meet ASME B16.5. Custom flanges are also available.





### **Water-Filled Support Column**

Protecting the shaft and sleeve bearings from abrasive solids is critical for the long-term durability and performance of a slurry sump pump. The VPL3600 employs a water-filled support column with a tight tolerance restriction bushing to do just that. By filling the column with clean flush water prior to startup, the VPL3600 establishes positive pressure behind the impeller that minimizes the ingress of solids, creating a favorable environment for the shaft and sleeve bearings.

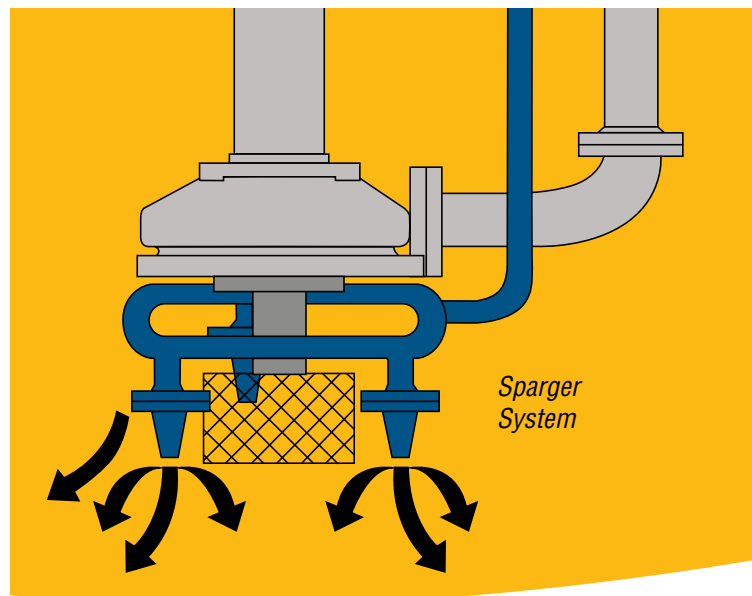
An overflow indicator at the cover plate provides visual confirmation that the column is filled and assurance the system is working properly.

### **True Slurry Hydraulics**

The VPL3600 incorporates true slurry hydraulics for maximum pump performance and longevity. Smartly engineered casing and impeller designs minimize abrasion of critical areas by eliminating abrupt changes in the fluid path and reducing eddy formation. The result is a slurry pump that has a mean time between repair (MTBR) of five years in tough applications like coke pits.

### **Materials of Construction**

The standard VPL3600 wet end is made of an abrasion-resistant high chrome iron material, manufactured per ASTM A532, Class III Type A. The pump may be specified in a broad range of alternative materials, however, to suit application needs. These include ISO 13709/API 610 and NACE MR0175 compliant alloys. Hard facing of critical areas also is available.



### **Hydraulic Sparger System**

To prevent “silting-in” of the pump, Flowserve offers hydraulic sparger system for the VPL3600. The sparger system features a ring of nozzles around the suction strainer that agitates the slurry. Particles are kept in suspension to prevent them from settling around the pump suction.

The sparger system is fed either by clean water from an outside source or application water run through an available duplex filtration system (shown below).

Mechanical agitation systems are also available to break up solids that have settled and solidified around the pump after periods of no operation.



*Options and Technical Data*



**Shaft Sealing Options**

The VPL3600 is available with several shaft sealing arrangements to suit application requirements:

- Single mechanical wet seal
- Pressurized double mechanical wet seal
- Unpressurized double mechanical wet seal
- ISO 13709/API 610 compliant cartridge seals
- Packing

**Optional Inducer**

For applications with low NPSH available, the VPL3600 can be fitted with an optional inducer. This device provides significant improvement in suction performance over a broad flow range by reducing the NPSH required and reducing backflow.

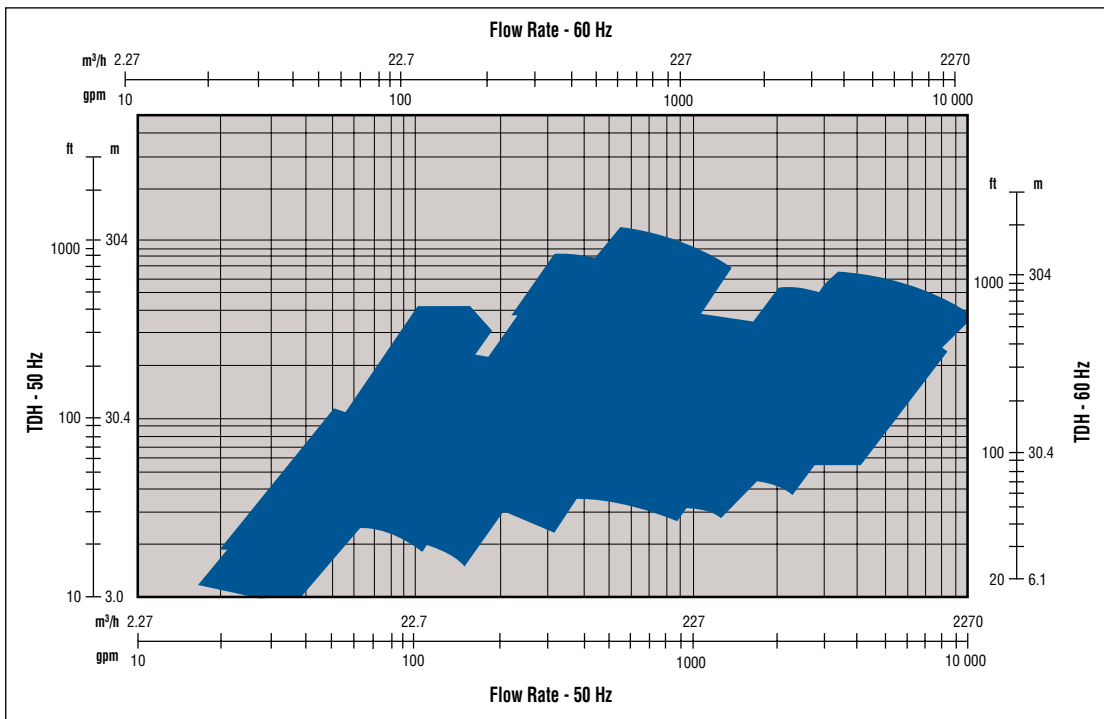
**Available Low-Flow, High-Head Design**

The VPL3600 also is available in a low-flow, high-head configuration. This design features a Barske-style impeller and concentric casing design that allow for stable low-flow operation while balancing radial thrust loads. As with the standard flow model, the low-flow version also integrates slurry hydraulics to minimize abrasion and maximize MTBR.

**Additional Options**

- Mechanical agitator
- Steam jacket
- Oil-lubricated bearings
- API flush plans
- Custom suction screens
- Vortex breakers

**VPL3600 Range Chart**



**Global Service  
and Technical  
Support**



## Life Cycle Cost Solutions

Typically, 90% of the total life cycle cost (LCC) of a pumping system is accumulated after the equipment is purchased and installed. Flowserve has developed a comprehensive suite of solutions aimed at providing customers with unprecedented value and cost savings throughout the life span of the pumping system. These solutions account for every facet of life cycle cost, including:

### Capital Expenses

- Initial purchase
- Installation

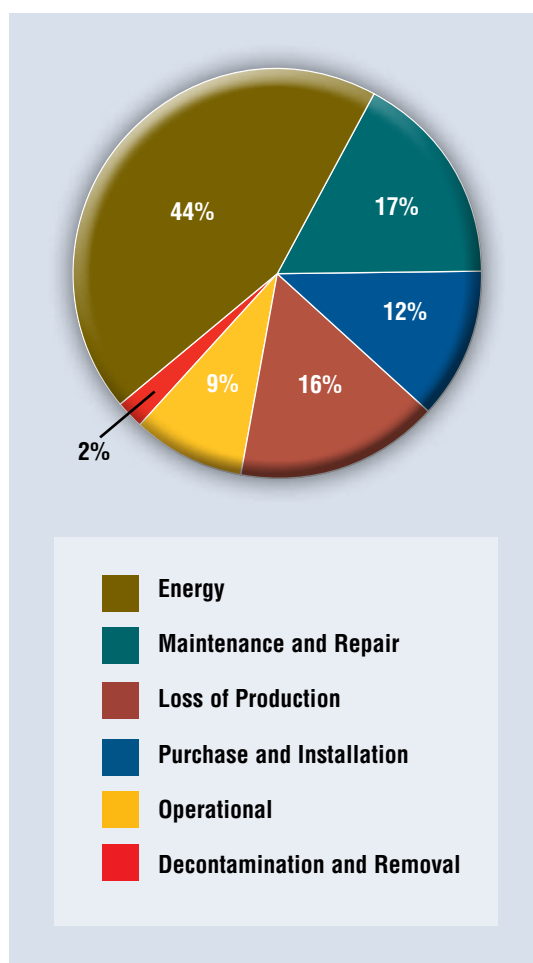
### Operating Expenses

- Energy consumption
- Maintenance
- Production losses
- Environmental
- Inventory
- Operating
- Removal

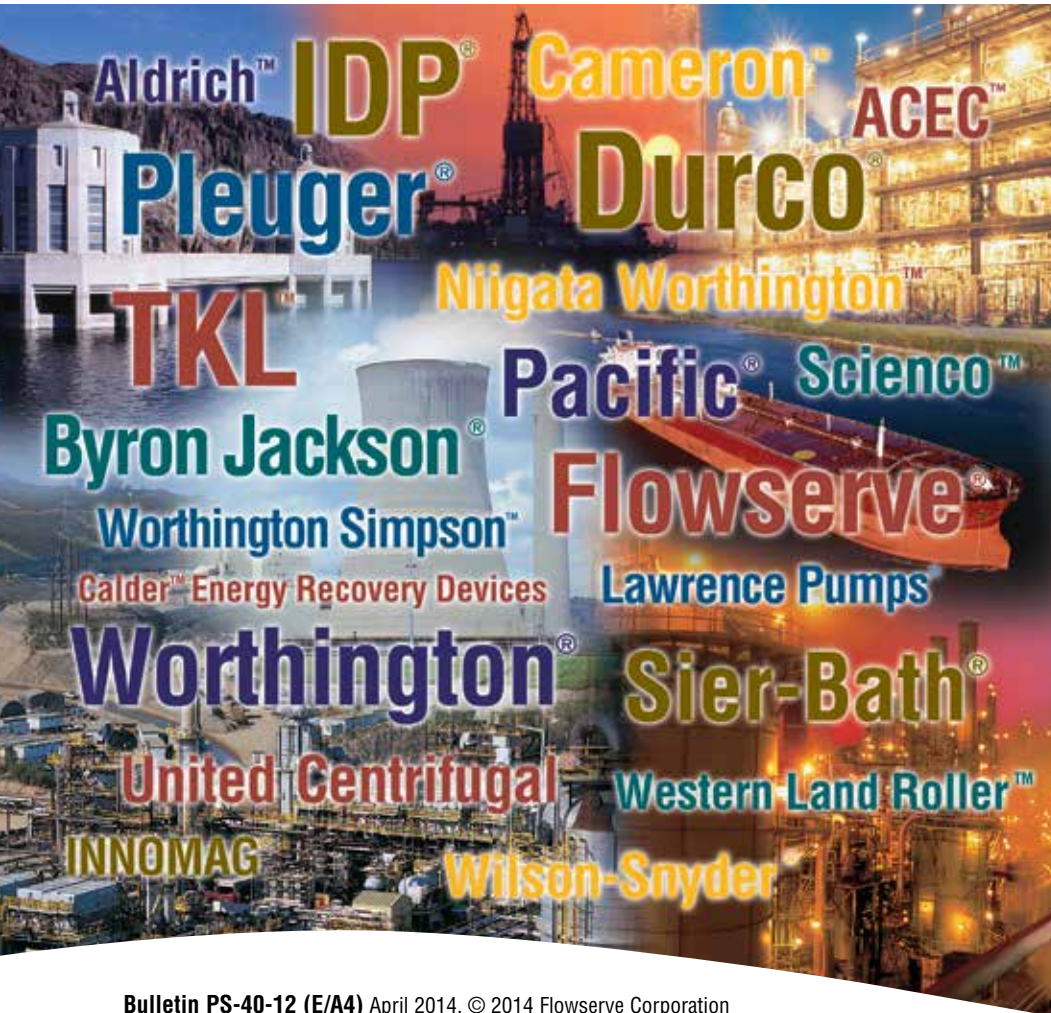
### Innovative Life Cycle Cost Solutions

- New Pump Selection
- Turnkey Engineering and Field Service
- Energy Management
- Pump Availability
- Proactive Maintenance
- Inventory Management

### Typical Pump Life Cycle Costs<sup>1</sup>



<sup>1</sup> While exact values may differ, these percentages are consistent with those published by leading pump manufacturers and end users, as well as industry associations and government agencies worldwide.



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