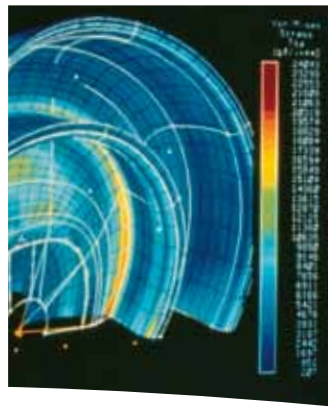




***APKD***  
***Double-Case, Double-Suction Vertical Pump***



***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 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
- Rotary
- Reciprocating
- 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*

*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*

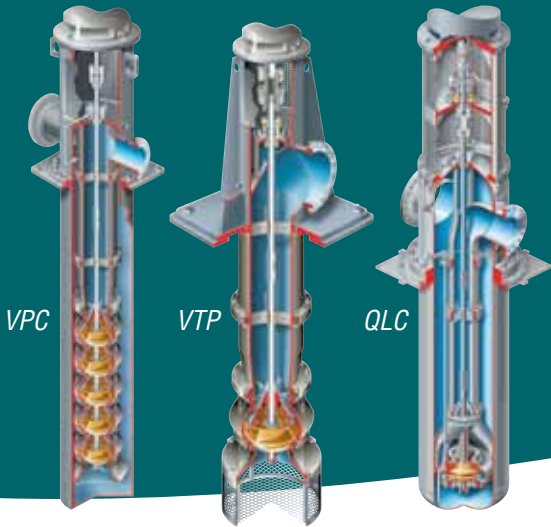
*Worthington® Pumps*

*Worthington Simpson™ Pumps*

**APKD  
Double-Case,  
Double-Suction  
Vertical Pump**



*Complementary Pumps*



**Stable Hydraulic Performance  
With Low Operating Costs**

*Designed for demanding applications where NPSHa is limited, the Flowserve APKD double-case vertical pump offers extraordinary hydraulic performance in a competitively priced package. Its compact double-suction impeller design reduces NPSHr and helps to keep installation and maintenance costs low. Furthermore, four available impeller hydraulics – steep, standard, flat and super-flat – enable the APKD to be optimally sized to meet individual system requirements while reducing energy consumption. The result is an economically attractive and highly versatile pump that provides stable, reliable operation over a wide range of flows or for multiple pump systems.*

**Performance Benefits**

- Stable hydraulic performance over a wide operating range
- Low energy consumption
- Low first-stage impeller peripheral velocity
- Low axial thrust for longer thrust bearing life
- Twin-volute design with low radial loads
- Compact suction can design
- Low vibration

**Typical Applications**

- Condensate
- Heater drain
- Pipeline booster
- Nuclear core and containment cooling
- Desalination

**Complementary Pump Designs**

- VTP vertical turbine, wet pit pump
- QLC and QLQC double-case, double-suction vertical pumps
- VPC general service and ISO 13709/API 610 (VS6) double-case turbine pumps
- WUC ISO 13709/API 610 (VS6) vertical, multistage double-case process pump
- WUJ ISO 13709/API 610 (VS1) vertical lineshaft, multistage process pump



**APKD**  
**Double-Case,**  
**Double-Suction**  
**Vertical Pump**

Field proven in some of the world's most demanding applications, the APKD is ideal for critical services with limited NPSHa. Advanced engineering methods and technologies have resulted in an optimized design which produces excellent performance characteristics as well as highly reliable operation. Available with four impeller hydraulics to enable finely tuned hydraulic selection, the APKD is engineered to better meet customer application requirements and lower total cost of pump ownership.

**Operating Parameters**

- Flows to 4600 m<sup>3</sup>/h (20 200 gpm)
- Heads to 500 m (1640 ft)
- Pressures to 50 bar (725 psi)
- Temperatures from -18°C (-0°F) to 200°C (400°F)
- Speeds to 1800 rpm

**Features and Benefits**

**Double-Suction First-Stage Impeller** reduces NPSHr and diminishes the possibility of cavitation over a wide operating range. It also meets Hydraulic Institute standards for suction-specific speed.

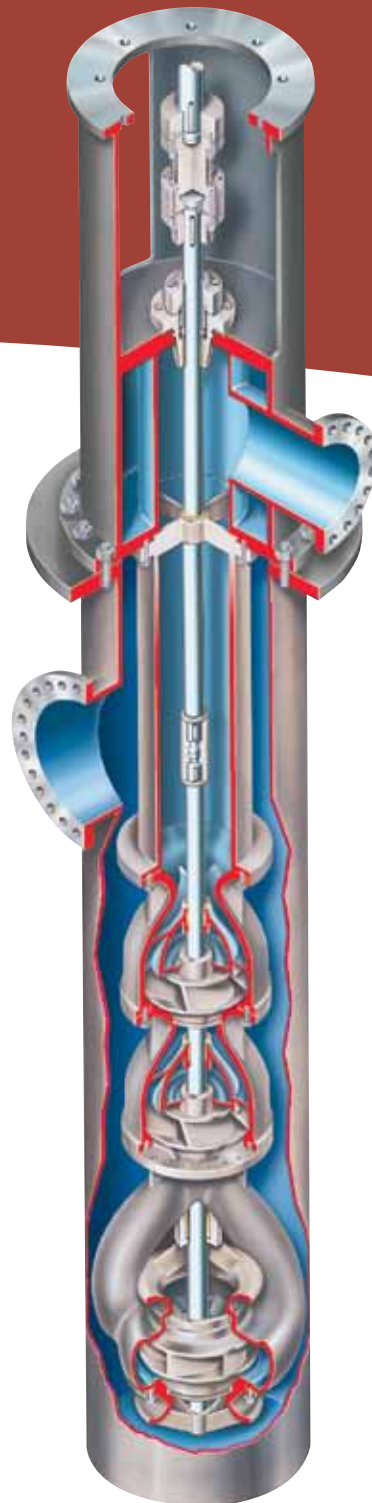
**Heavy-Walled, Twin-Volute Design** minimizes radial loads, thereby extending bearing life.

**Heavy-Duty Discharge Head** maintains motor alignment and provides liquid end and column support.

**Keyed Intermediate-Stage Impellers** are positively secured with lock collars to eliminate axial movement and simplify maintenance.

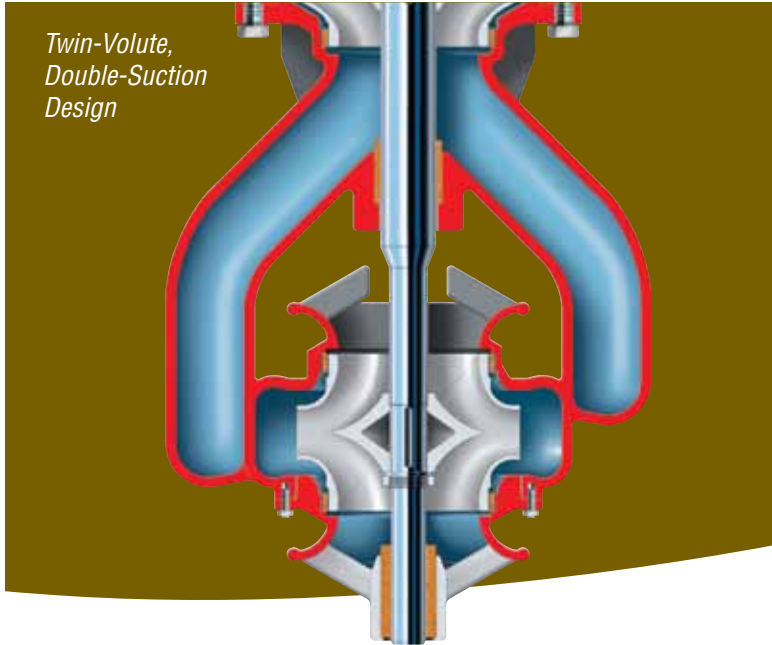
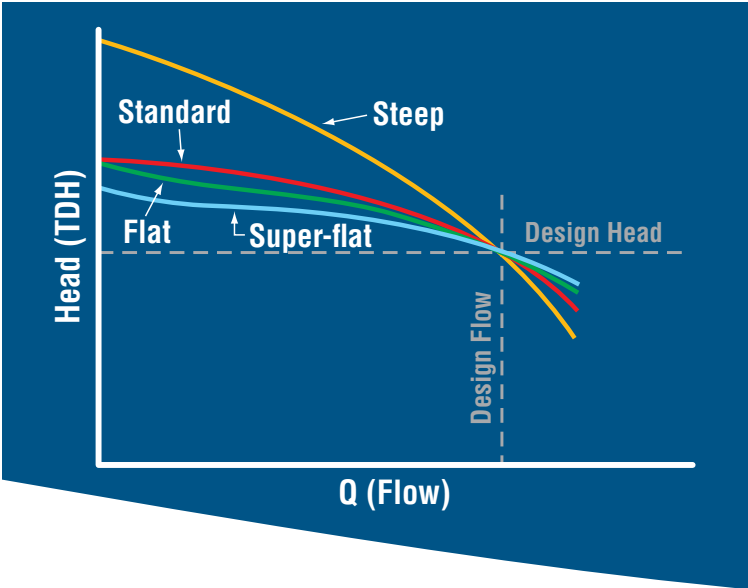
**Versatile Seal Chamber** accommodates numerous seal types to satisfy customer preference as well as safety and environmental requirements.

**Suction Can** assures acceptable flow conditions from the suction flange to the upper and lower inlets of the first-stage impeller. Drain optional.



**Keyed and Flanged Lineshaft Couplings** ensure torque is efficiently transmitted while simplifying disassembly for maintenance.

**Open Lineshaft Construction** allows the lineshaft bearings to be lubricated by the pumped fluid.



**Engineered Impeller Hydraulics for Efficient, Stable Performance**

The APKD is available with four different impeller hydraulics that enable it to be optimized for individual system requirements. This hydraulic versatility permits the pump efficiency to be maximized and the head rise to shut-off to be optimized for the application.

The APKD can be offered with a head rise to shut-off as low as 15% over the rated head, compared to approximately 40% over the rated head for most vertical turbine designs. The resultant horsepower reduction translates into considerable energy savings, particularly under partial load or off-peak operating conditions.

The four available impeller hydraulics and their associated head rise to shut-off (stated as a percent increase over the rated head) are:

- **Steep:** Up to 120%
- **Standard:** Up to 50%
- **Flat:** Up to 30%
- **Super-flat:** Up to 20%

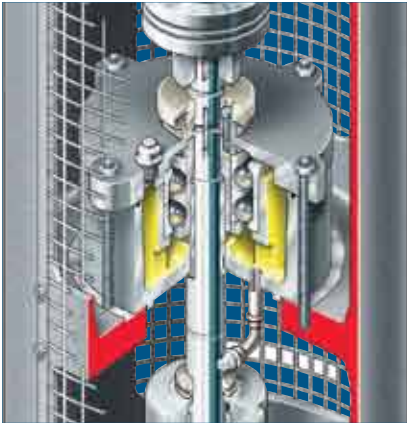
**Integral Axial Thrust Bearing Assembly**

An optional axial thrust bearing assembly is designed to handle the total hydraulic thrust as well as the rotor weight. Self-lubricating anti-friction bearings are utilized for standard applications. The integral axial thrust bearing assembly is available on APKD pumps with IEC motors.

**Twin-Volute, Double-Suction Design**

The APKD’s innovative twin-volute, double-suction first-stage impeller design provides numerous advantages over conventional vertical turbine designs.

- Significantly lowers NPSHr so pump and suction can lengths are minimized and installation costs are reduced.
- Permits higher head and operating speed for multistage units while maintaining excellent suction attributes.
- Inherently balanced hydraulic thrust results in longer thrust bearing life.
- Produces minimal radial loads to extend sleeve bearing life.



**Options and  
Technical Data**



**Nuclear Service Compliance**

Flowserve APKD pumps can be furnished in full compliance with the requirements of ASME III, RCC-M and other nuclear power plant construction codes. The APKD's hydraulic versatility makes it ideal for the unique requirements of nuclear applications. Its low impeller peripheral inlet velocity has proven to be especially well suited for the operational modes of safety-related pumps in nuclear power generating stations.

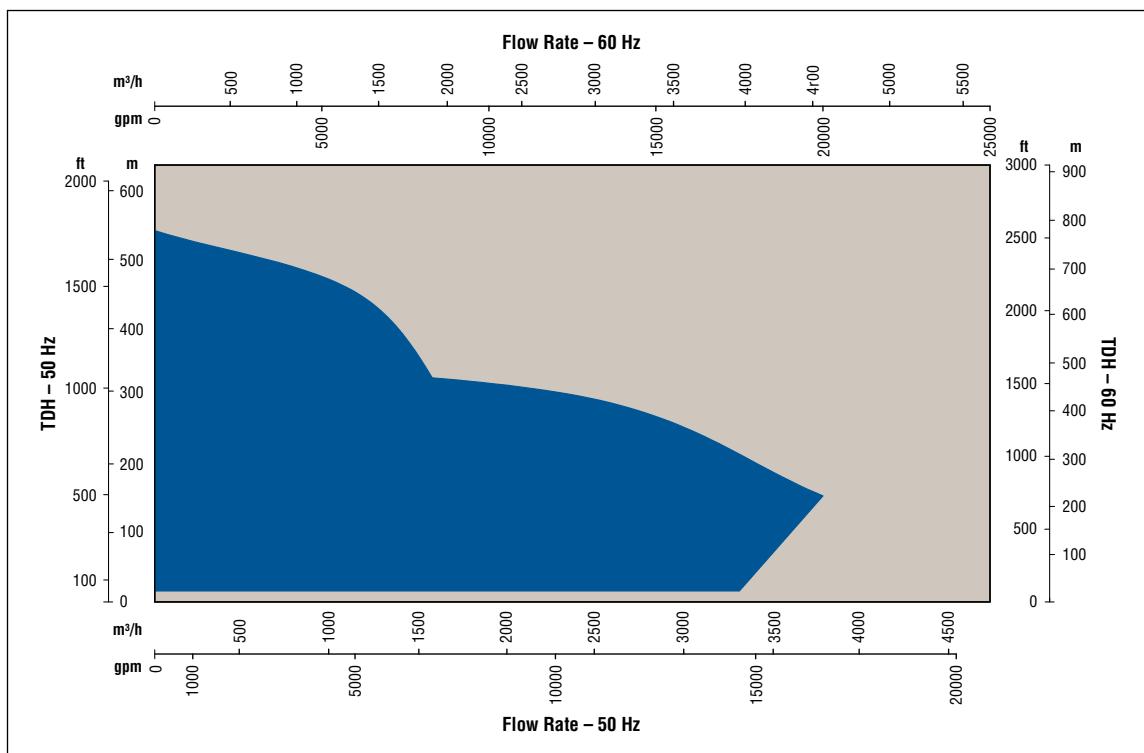
**Suction Configurations**

The APKD is available with above or below ground suction flanges to suit application and site requirements.

**Additional Options**

- Shaft sleeves under all pump bearings
- Sealing configurations
  - Packed box with Plan 13 flush
  - Single, dual and split seals
- Multiple drivers
  - Electric motors
  - Variable frequency drives
  - Engines with right angle gears
  - Steam turbines

**APKD 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

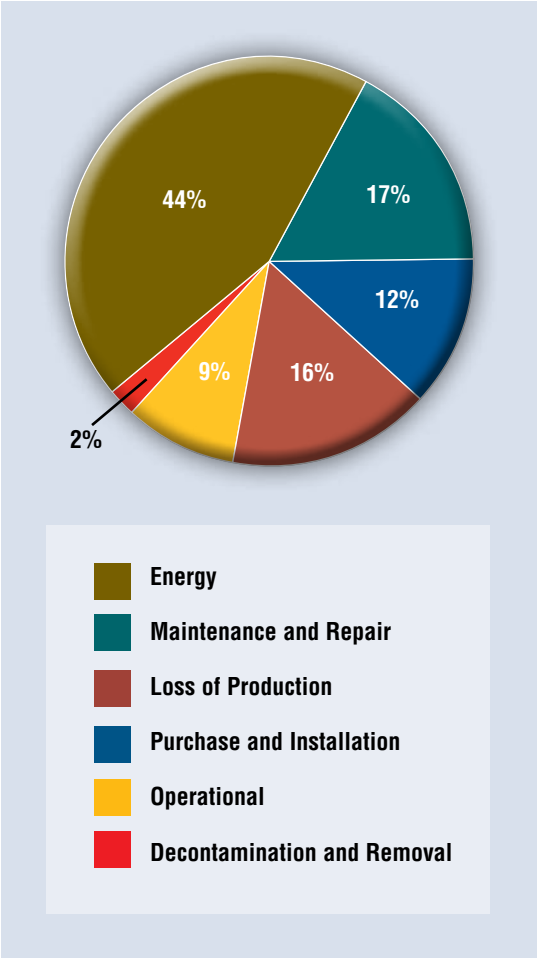
**Operating Expenses**

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

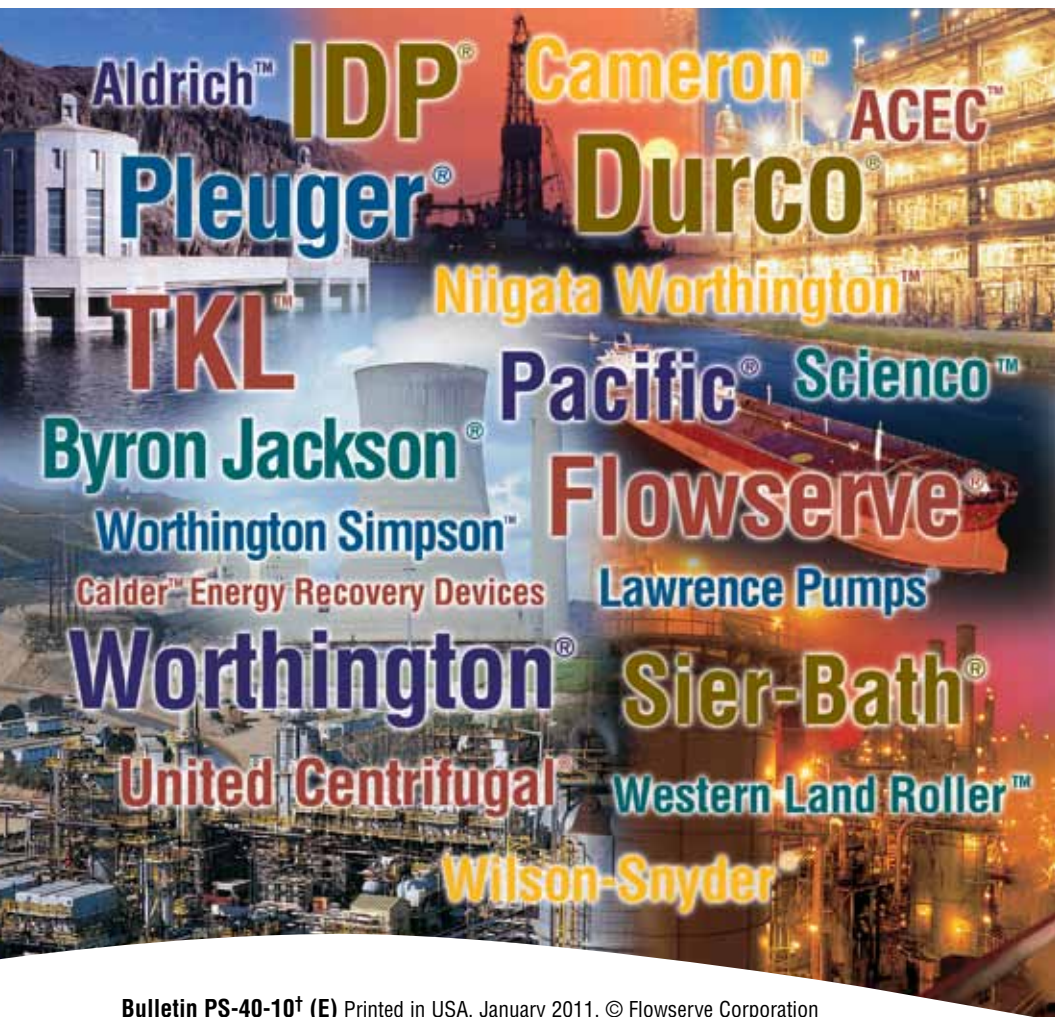
**Innovative Life Cycle Cost Solutions**

- 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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