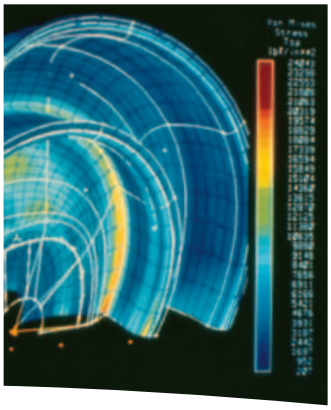
FLOWSERVE

QL Series
Vertical, Double-Suction, Twin-Volute Turbine Pumps

QL – QLQ – QLC – QLQC

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
- 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

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

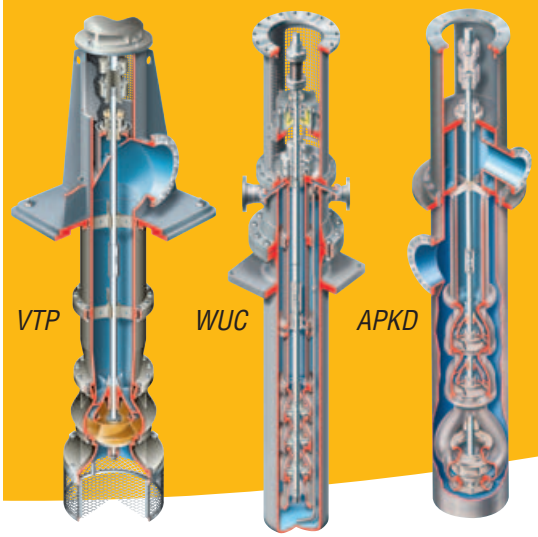
Worthington® Pumps

Worthington Simpson™ Pumps

QL, QLQ, QLC and QLQC

Engineered, Vertical, Double-Suction, Twin-Volute, Turbine Pumps

Complementary Pump Designs



Double-Suction Design Reduces NPSHR and Operating Costs

The Flowserve QL Series vertical, double-suction pumps minimize operating and maintenance problems associated with typical vertical turbine pumps. Available in single- and double-casing designs, QL Series pumps feature an innovative, double-suction impeller that produces more flow and higher head at lower NPSHR and can operate at higher speeds than conventional vertical turbine models. In addition, QL Series pumps require less maintenance and repair than comparably performing turbine pumps.

Engineered Flexibility

QL Series pumps are available in multiple configurations to suit application needs and promote life cycle cost savings:

- QL single stage, wet-pit
- QLQ multistage, wet-pit
- QLC single stage, double-casing
- QLQC multistage, double-casing

Performance Benefits

- Stable hydraulic performance for multiple pump systems or varying capacity needs
- Low axial thrust for longer thrust bearing life
- Twin-volute design with low radial loads for extended pump bearing life
- Flush line to suction bearings for prolonged life

Operating Parameters

- Flows to 25 000 m^3/h (110 000 gpm)
- Heads to 500 m (1600 ft)
- Pressures to 70 bar (1000 psi)
- Temperatures from -45°C (-50°F) to 205°C (400°F)
- Column sizes from 100 mm (4 in) to 1500 mm (60 in)

Typical Applications

- Raw water intake
- Fresh water supply and distribution
- Irrigation
- Fire protection (NFPA 20)
- Cooling water tower
- Condensate extraction, heater drain
- ISO 13709/API 610 process services
- Transfer, loading and unloading
- Steel mill cooling and quench services
- Mine dewatering and acid leaching
- Secondary effluent
- Brine recirculation and blow down for MSF desalination

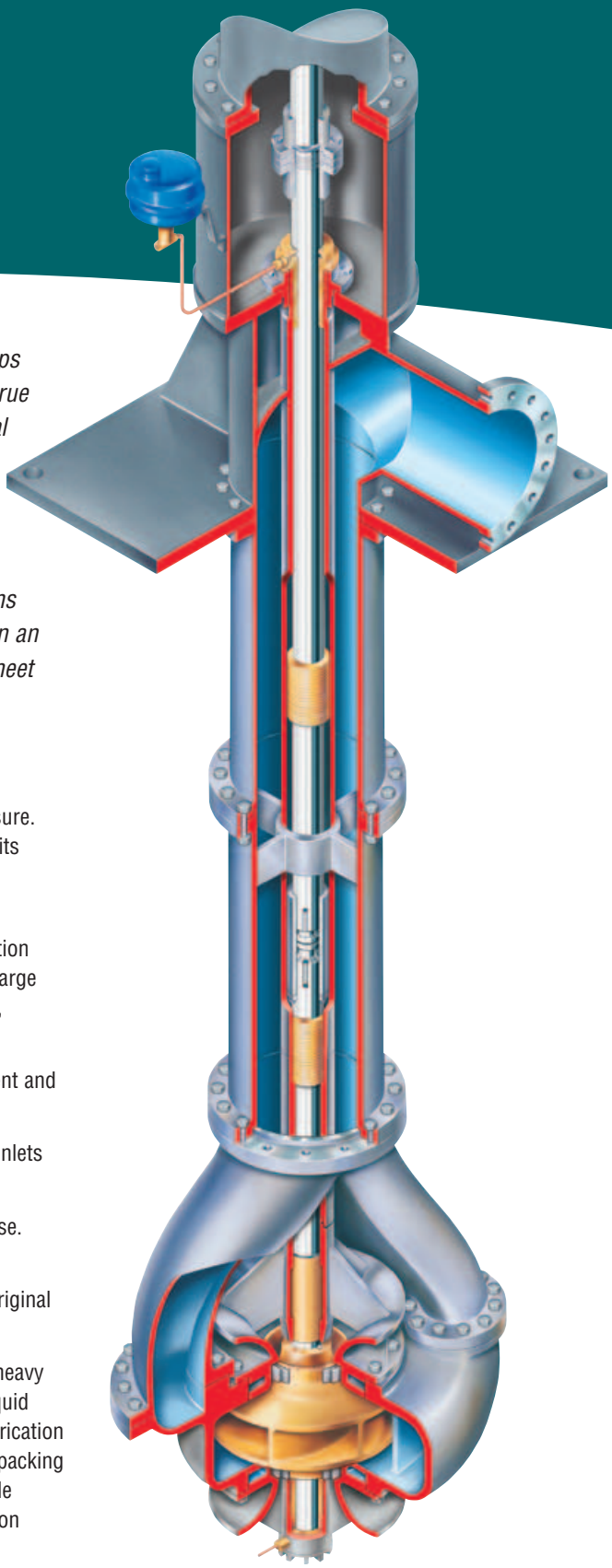
Complementary Pump Designs

- VTP vertical turbine, wet pit pump
- VPC general service and ISO 13709/API 610 (VS6) double-casing, turbine pumps
- WUC ISO 13709/API 610 (VS6) vertical, multistage double-casing process pump
- WUJ ISO 13709/API 610 (VS1) vertical line shaft, multistage process pump
- APKD vertical, double-suction, multistage double-casing pump

FLOWSERVE

QL and QLQ

Single-Casing, Double-Suction, Vertical Turbine Pumps



The Flowserve QL and QLQ vertical, turbine pumps feature double-suction (first-stage) impellers in true twin-volute designs. Providing reliable, economical performance in difficult wet-pit services, QL and QLQ pumping systems are installed worldwide. Their optional enclosed lineshaft construction makes them ideal for use in open sumps as well as numerous industrial applications containing silt or abrasive solids. Also available in an ISO 13709/API 610 (VS2) compliant design to meet varying industry demands.

Double-Suction (First-Stage) Impeller features large passageways and produces balanced hydraulic thrust for a stable performance curve with low shut-off pressure. The double-suction design on multistage pumps permits higher head and operating speed than vertical turbine models while maintaining excellent suction attributes.

Heavy Walled, Twin-Volute Casing with robust transition diffuser moves liquid from casing to column through large waterways at low liquid velocity, minimizing corrosion, erosion and radial loads on bearings.

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

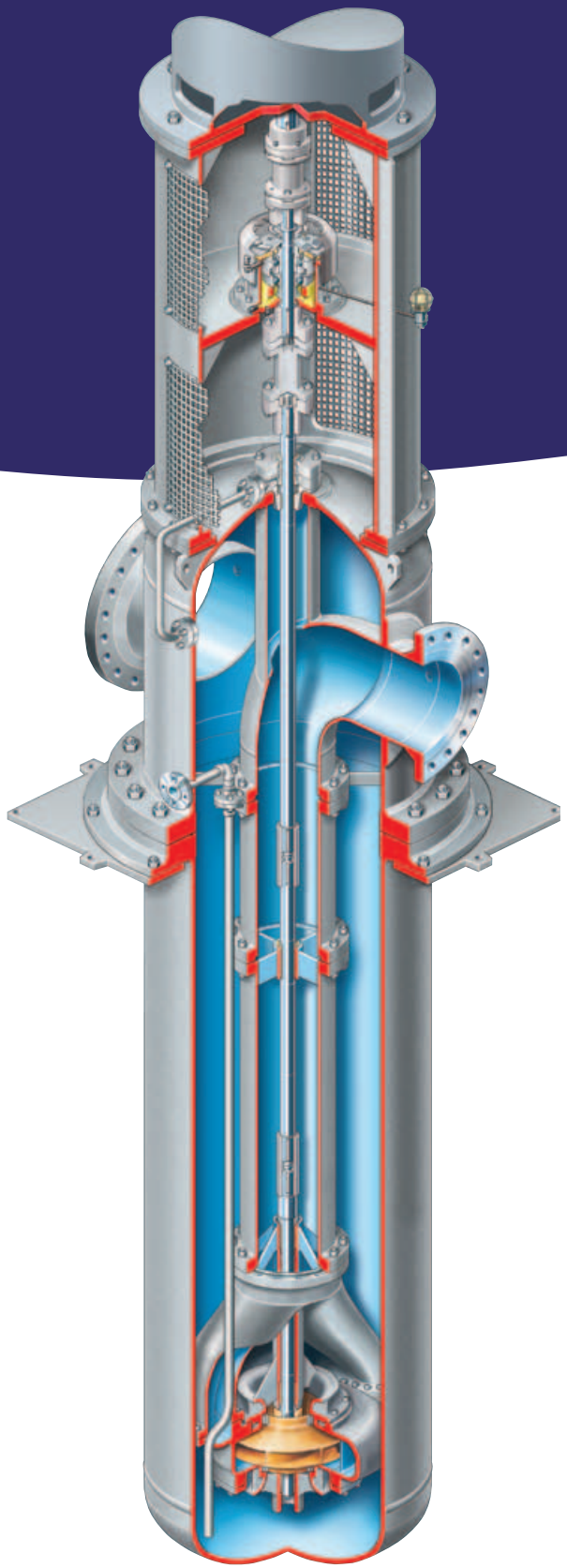
Suction Bells efficiently direct liquid into the impeller inlets with minimum resistance.

Bottom Liquid End Bearing is sealed for life with grease. An optional lubricating line is also available.

Optional Impeller Wear Rings enable restoration of original clearances for increased efficiency.

Optional Enclosed Lineshaft Construction features a heavy walled enclosing tube that isolates the lineshaft and liquid end bearings from the pumped fluid. The enclosed lubrication stuffing box is maintenance free, without a traditional packing arrangement or a mechanical seal to maintain. Available lubrication systems include oil drip, fresh water injection and grease packed.

QLC and QLQC
Double-Casing, Double-Suction, Vertical Turbine Pumps



The QLC and QLQC are double-casing, double-suction, vertical turbine pumps. Available in single or multi-stage units and featuring true twin-volutes, QLC and QLQC pumps incorporate the proven hydraulics of the QL and QLQ into a double-casing configuration. Design flexibility makes these pumps ideal for process applications. Standard and ISO 13709/API 610 (VS7) compliant designs are available to meet varying industry demands. For the power industry, the standard pump design offers the advantage of multistage construction for reliable condensate extraction service. ISO/API compliant pumps are ideal for the aggressive pipeline, storage and transfer applications found within the oil and gas industry.

Versatile Seal Chamber accommodates installation of cartridge style single, dual unpressurized and dual pressurized mechanical seals to meet safety and environmental requirements.

Suction Can creates optimum hydraulic conditions through the suction flange inlet into the suction bell.

Keyed Impeller design provides ease of maintenance.

Renewable Impeller Wear Rings, when fitted, enable the restoration of original clearances and promote high operating efficiency. Casing wear rings are standard.

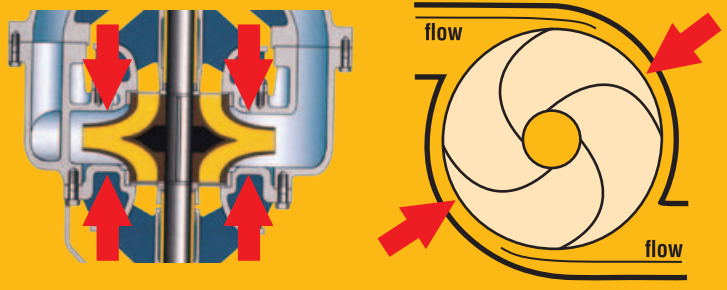
Line Shaft Bearings are spaced to ensure the first critical speed of the rotor is well above running speed. Sleeves are provided under bearings for additional shaft protection.

Line Shaft Bracket is integral to column and assures concentricity and alignment of the shaft for longer bearing life.

Keyed Line Shaft Couplings ease dismantling for maintenance.

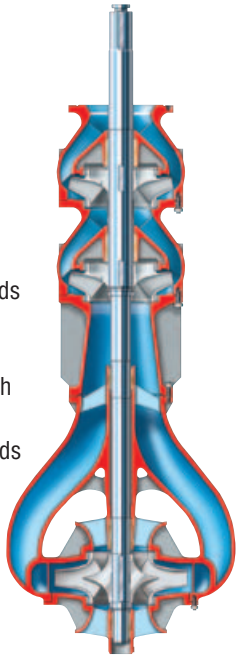
Options and Technical Data

Low Axial and Radial Thrust Loads



Designed to Perform

- Stable hydraulic performance
  - Relatively flat, continuously rising total head to shut-off is ideal for multiple pump systems and services with widely varying capacity needs
  - Low shut-off head (< 125% of rated head) is well suited for systems sensitive to high shut-off pressure
- Low axial and radial thrust loads
  - Extended bearing life
  - Reduced parts and maintenance costs
- Available multistage designs to meet high differential head



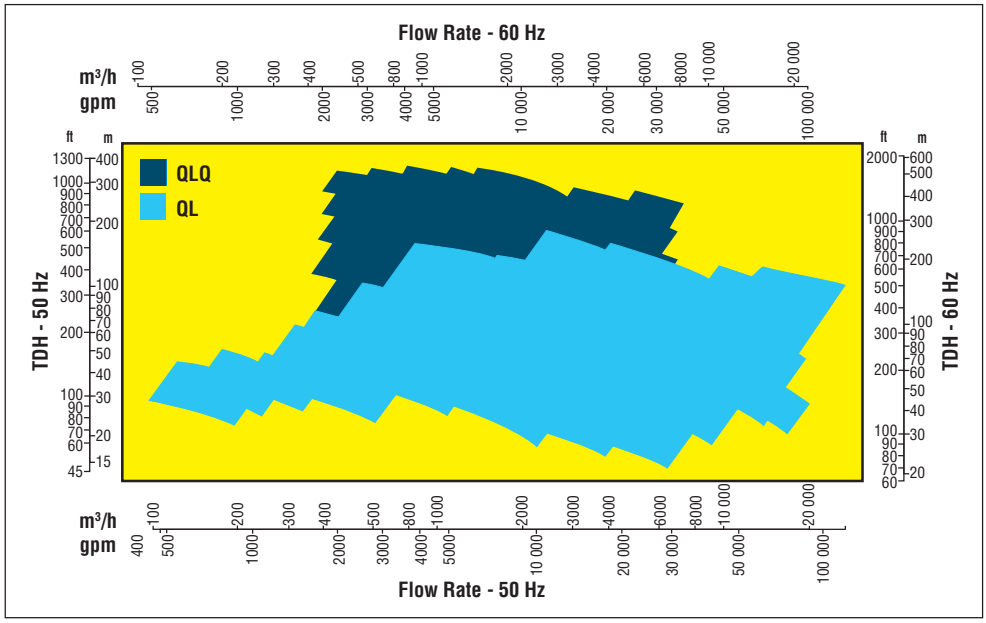
Axial Thrust Bearing Assembly

The axial thrust bearing assembly can be integral to the motor or installed in the pump head. The bearing assembly withstands the total hydraulic thrust as well as the rotor weight. Self-lubricated anti-friction or tilting pad bearings can be utilized.

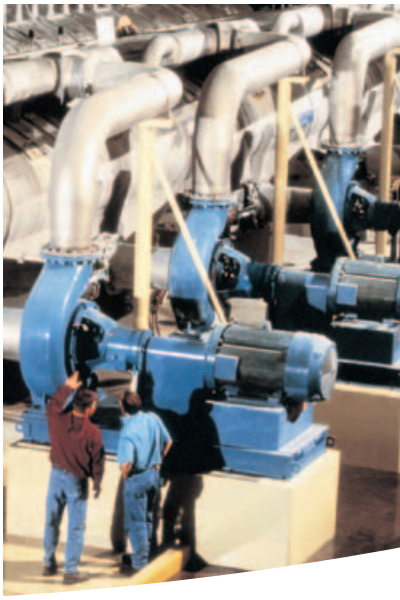
Additional Options

- Sealing configurations
  - Packed box (with Plan 13 for 7+ bar [100+ psi] applications)
  - Single, dual and split seals
- Multiple drivers
  - Electric motors, solid or hollow shaft
  - Variable frequency drives
  - Engines with right angle gears
  - Steam turbines

QL Series 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:

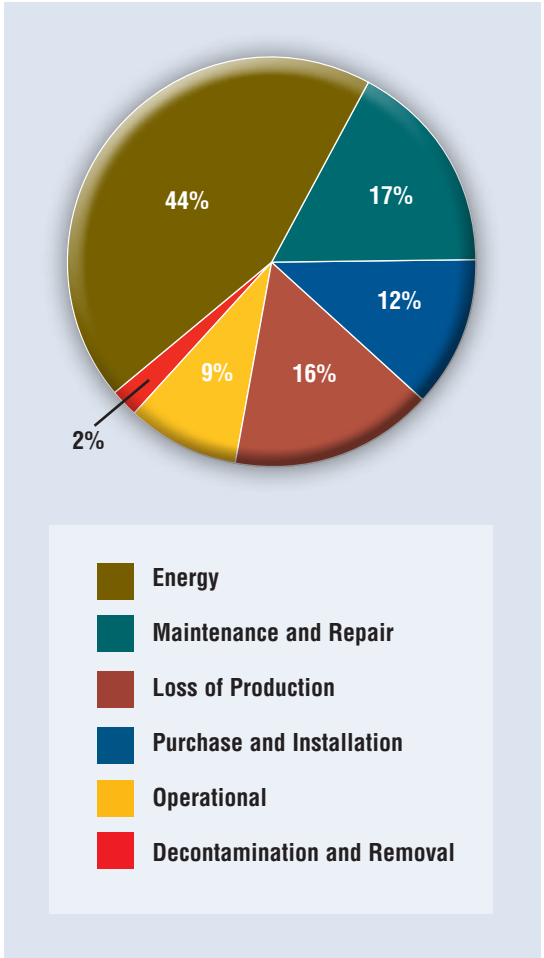
Capital Expenses
- Initial purchase
- Installation

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[1]



[1] 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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