



# *Power Generation*

Combined Cycle • Fossil Fuels • Nuclear



*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.*

***Supplier of Choice to the Power Industry***

Throughout its history, Flowserve has been closely identified with power generation. From the 1840 introduction of the first direct acting steam pump to the installation of the world's largest boiler feed pump at 52 200 kW (70 000 hp), Flowserve has pioneered virtually every significant advancement in pumping technology for the power generation industry.

***Heritage Names of Distinction***

*ACEC™ Centrifugal Pumps*

*Aldrich® Pumps*

*Byron Jackson® Pumps*

*Cameron® Pumps*

*Durco® Pumps*

*Flowserve® Pumps*

*IDP® Pumps*

*Jeumont-Schneider™ Pumps*

*Pacific® Pumps*

*Pleuger® Pumps*

*Scienco® Pumps*

*Sier-Bath® Rotary Pumps*

*TKL™ Pumps*

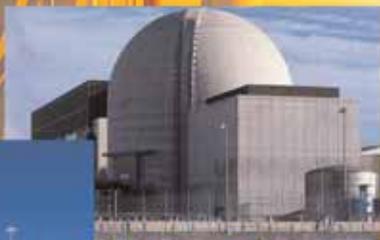
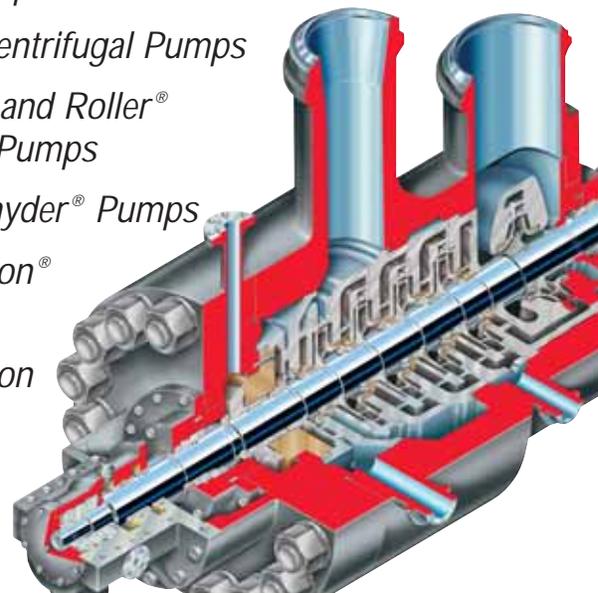
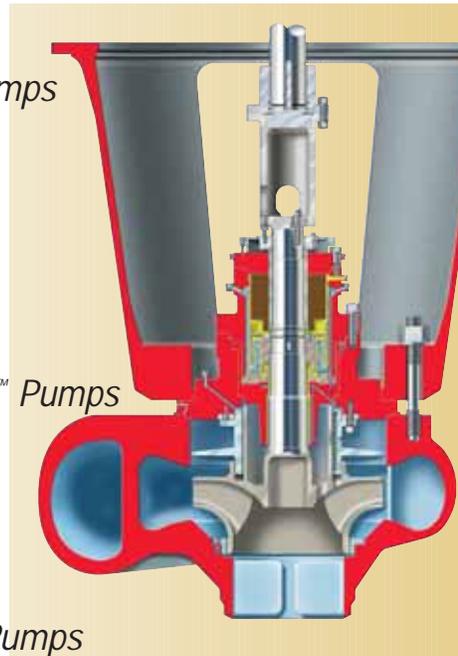
*United® Centrifugal Pumps*

*Western Land Roller®  
Irrigation Pumps*

*Wilson-Snyder® Pumps*

*Worthington®  
Pumps*

*Worthington  
Simpson®  
Pumps*



### ***Pump Designs***

Flowserve offers a wide range of complementary pump types, built to recognized global standards and customer specifications. These include:

- Single Stage Process
- Between Bearing Single Stage
- Between Bearing Multistage
- Vertical
- Submersible motor
- Rotary
- Reciprocating
- Nuclear
- Specialty

### ***Available Configurations***

- Sealed and sealless
- Axially and radially split
- Volute and diffuser
- Close coupled and long coupled
- Single and double casing

### ***Dynamic Technologies***

Few if any pump companies can match the Flowserve capabilities in hydraulic and mechanical design or in materials engineering. Among these capabilities are:

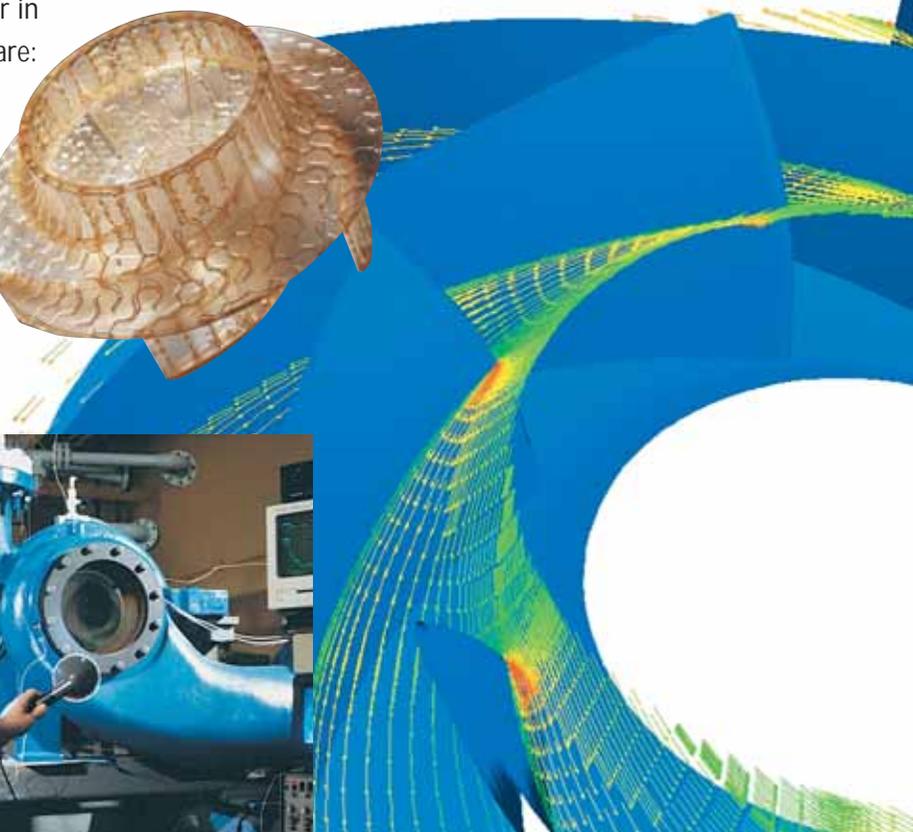
- Computational fluid dynamics
- Flow visualization
- Cavitation studies
- Efficiency optimization
- Finite element analysis
- Rapid prototyping
- Captive alloy foundries
- Non-metallic materials processing and manufacturing



### ***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. Benefits of a pumping partnership with Flowserve include:

- Advanced technology solutions
  - Order engineering
  - Hydraulic engineering
- Broad product reliability
- Worldwide service and support
- Competitive price and delivery
- Technology innovation
- Applications expertise



A vertical rectangular area with a purple tint, containing a faint, semi-transparent image of industrial machinery or a power plant structure.

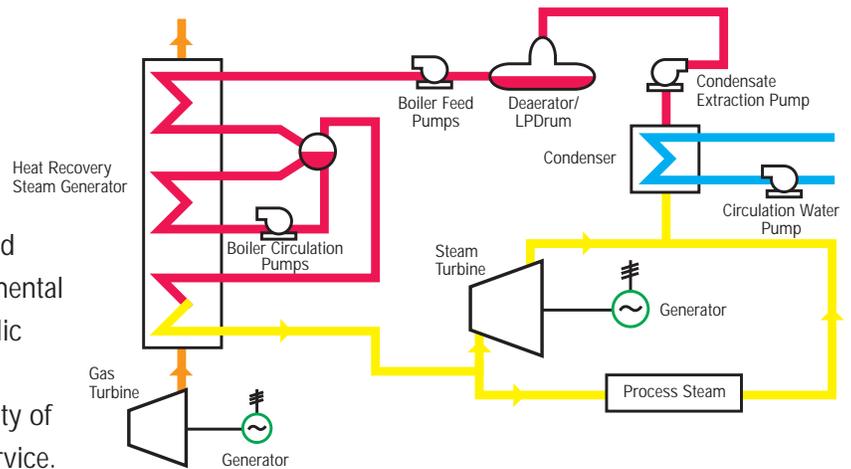
### *Combined Cycle*

The combined cycle power plant with its inherently higher efficiency and lower environmental impact is, in many cases, the optimum choice of today's power generation industry. The Flowserve comprehensive lines of pump products and pumping systems are ideally suited for any combined cycle project, including co-generation of electrical power and steam.



### ***Boiler Feed Water Services***

The pinnacle of the Flowserve line for combined cycle boiler feed service is the multistage segmental ring pump, which provides exceptional hydraulic performance, optimum efficiency and superior reliability. Additionally, Flowserve offers a variety of horizontal multistage pumps for boiler feed service. These include: axially split volute pumps; and double case barrel pumps, in both diffuser and axially split volute configurations.



### ***Condenser Cooling Water Service***

Flowserve offers both horizontal and vertical pumps for condenser cooling water service. These are available in a wide range of hydraulic and material configurations. Non-pullout or pullout construction is available on vertical models.



### ***Condensate Water Service***

Vertically suspended, single or double suction, canned pumps with very low NPSHR provide work-horse duty in these difficult services. Horizontal pump designs are also available.

### ***Auxiliary Services***

Flowserve offers a complete line of horizontal and vertical pumps, including ANSI, ISO and API designs. These may be specified in a wide variety of metallic and non-metallic materials to satisfy virtually all plant-wide pumping needs.



## *Fossil Fuel*

Flowserve leads the market in supplying pumps and pumping systems for fossil fuel power generating plants. No other pump company in the world can match the Flowserve systems knowledge, hydraulic expertise or application know-how. Simply stated, Flowserve offers the power industry's most comprehensive package of pump products, technical support and service.



## *Boiler Feed Water Services*

Boiler feed is an extremely demanding service for pumps, and a boiler feed pump is one of the most critical pieces of rotating equipment in the steam cycle. Flowserve has repeatedly proven that it builds the highest quality, most reliable boiler pumps available.



Flowserve offers radially and axially split multistage pumps with single or double suction first stage impellers. Double case barrel pumps, in both diffuser and volute configurations, are available for the highest pressure applications. Axially split multistage volute type pumps and radially split ring section diffuser type pumps are available to handle moderate pressure applications.

### ***Circulating Water Services***

Flowserve offers both vertical and horizontal circulating pumps in a wide range of configurations, hydraulics and materials to meet any application requirement. Pullout or non-pullout construction is available on vertical pump models. Concrete volute pumps are also available for these services.

### ***Condensate Water Services***

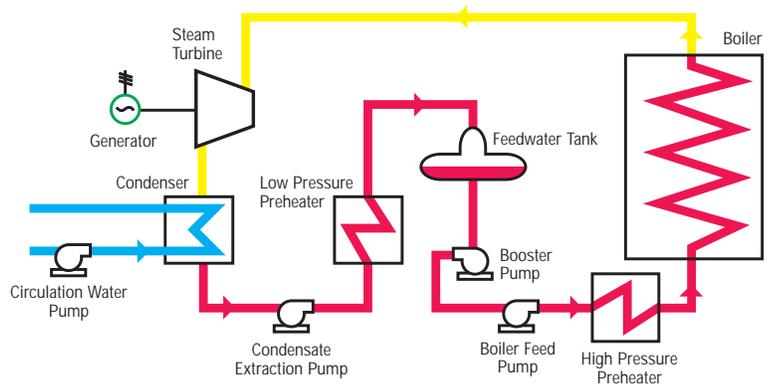
Flowserve has a long and proven performance record for this critical service. Its versatile line of condensate pumps offers unsurpassed hydraulic coverage and a broad range of options to address system requirements. Both single and double suction first stage, vertically suspended pump designs are available.

### ***Flue Gas Desulfurization Services***

Flowserve designs and manufactures pumps for all FGD system services. Some of these services include mill slurry pumps, reagent feed pumps, absorber recirculation pumps, absorber bleed pumps, demister wash pumps and filtrate pumps.

### ***Auxiliary Services***

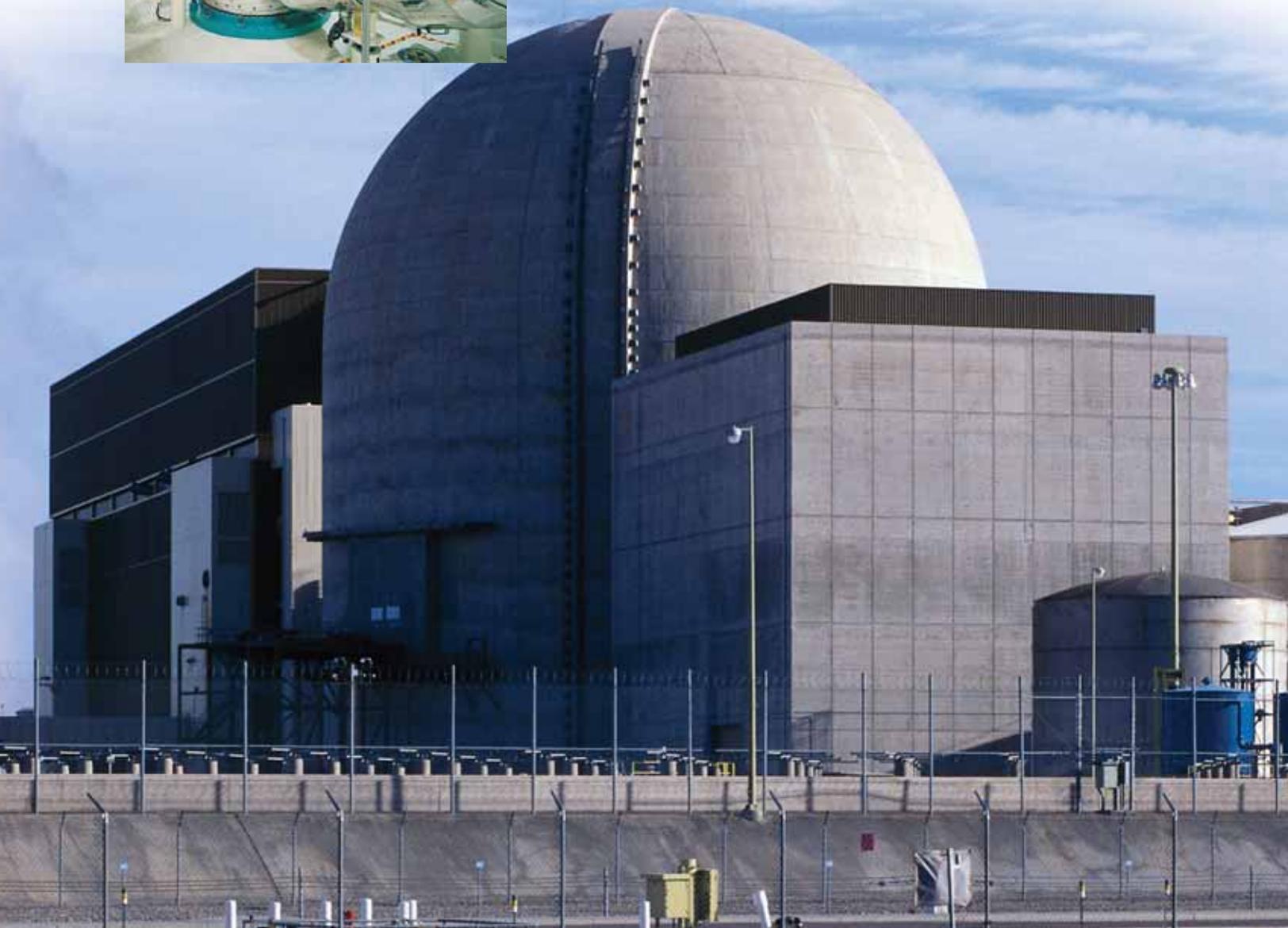
Flowserve offers an extensive line of pumps, including ANSI, ISO and API designs. They are available in a wide variety of metallic and non-metallic materials and in many design and hydraulic configurations to satisfy virtually all plant-wide pumping needs.



## *Nuclear*



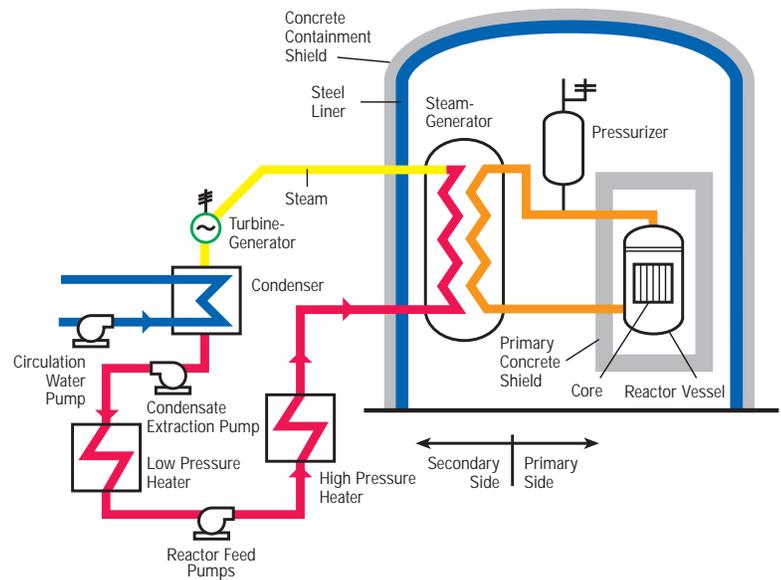
Flowserve experience as a nuclear specialist dates to the birth of the nuclear power generation industry when it provided innovative pumping and sealing technologies under both the Byron Jackson heritage name and the IDP heritage name. Today, Flowserve continues the tradition with products and services “that remain on the leading edge of technological advances in nuclear power. Capabilities include “ASME Section III, Class 1, 2 and 3 pumps and nuclear mechanical seals, plus full repair, upgrade and maintenance service, technical and engineering support.



### Primary Coolant Pumps

- Boiling water reactors
- Pressurized water reactors
- Heavy water reactors

Supplied or upgraded to rigorous technological and NSSS design standards.

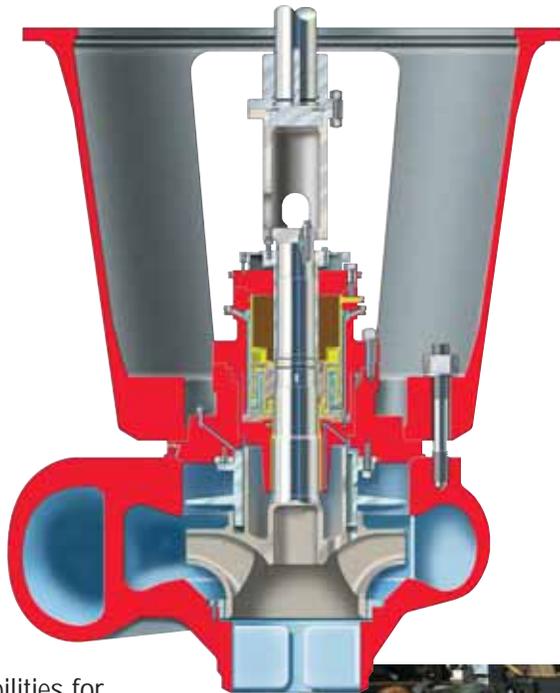


### Nuclear Safety Related Pumps

- Residual heat removal
- Containment spray
- Core spray
- Safety injection
- Charging and makeup
- Essential service water
- Auxiliary feed
- Miscellaneous nuclear

### Conventional Pumping Services

- Reactor feed
- Steam generator feed
- Circulating water
- Condensate extraction
- Booster
- Auxiliary services

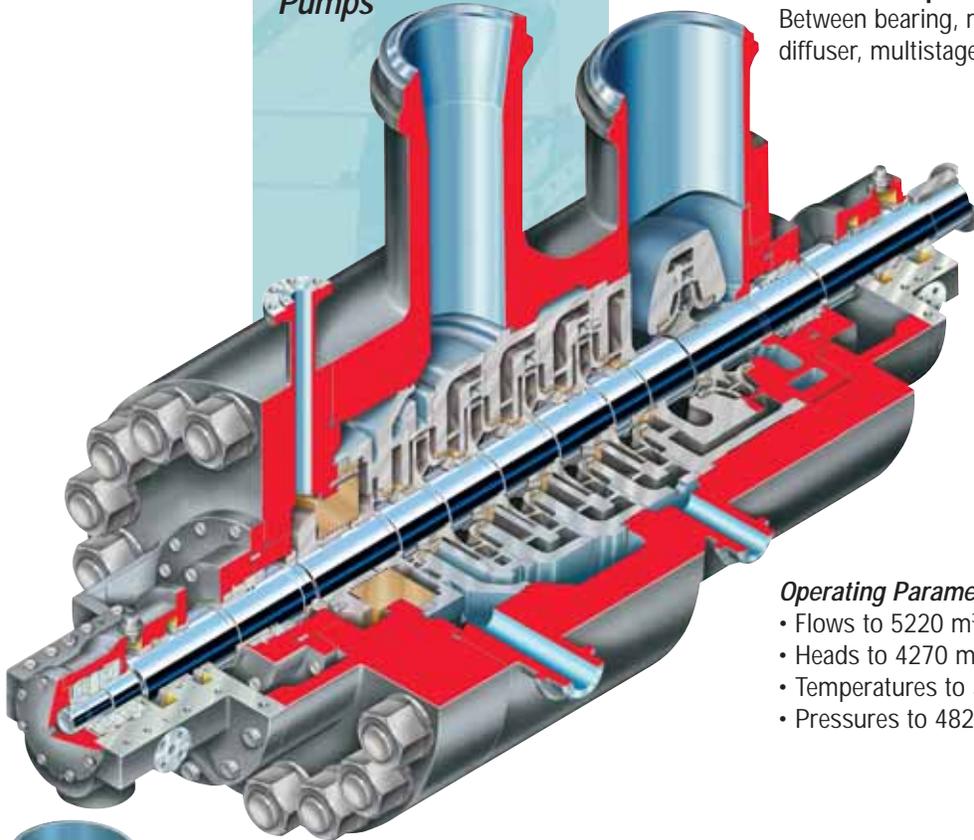


Flowserve provides *Hot Shop* capabilities for ASME Section III, Class 1, 2, 3 Safety Related and other contaminated components.

- Decontamination
- Disassembly and inspection
- Non-destructive examination
- Root cause analysis
- Complete repair and upgrade service
- Reassembly
- Transportation



*Boiler Feed Water  
Pumps*

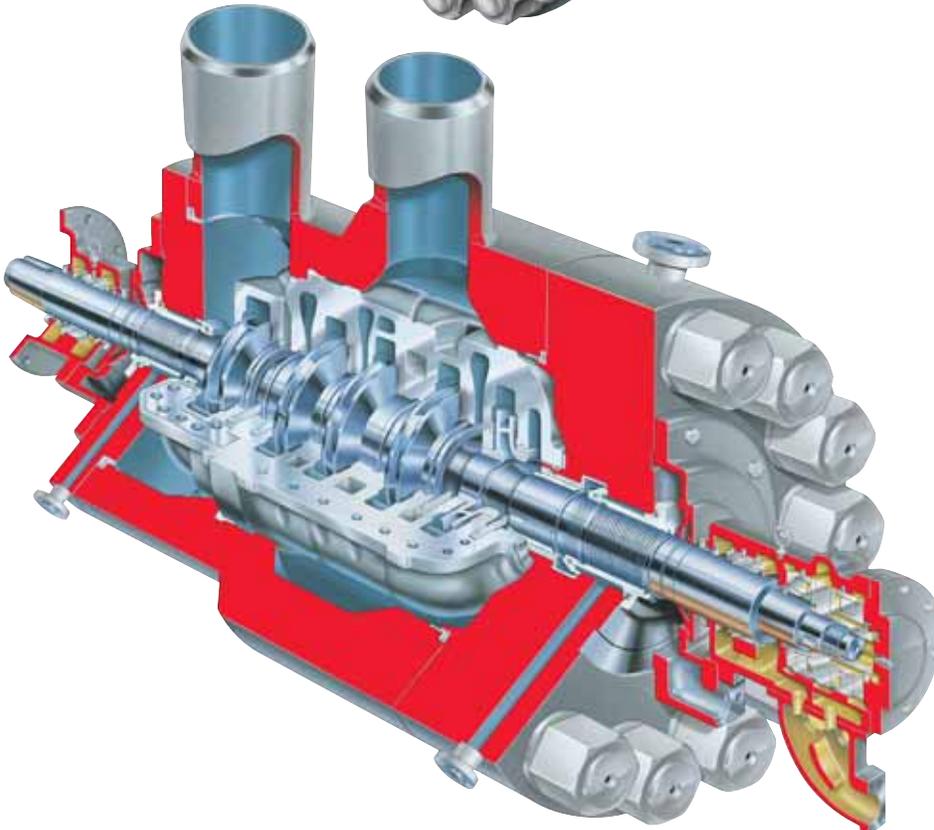


**Multistage, Double Case Diffuser  
Barrel Pumps**

Between bearing, radially split, double case diffuser, multistage designs

*Operating Parameters*

- Flows to 5220 m<sup>3</sup>/h (23 000 gpm)
- Heads to 4270 m (14 000 ft)
- Temperatures to 315°C (600°F)
- Pressures to 482 bar (7000 psi)



**Multistage, Double Case Volute  
Barrel Pumps**

Between bearing, radially split, double volute case, top suction, top discharge, multistage designs

*Operating Parameters*

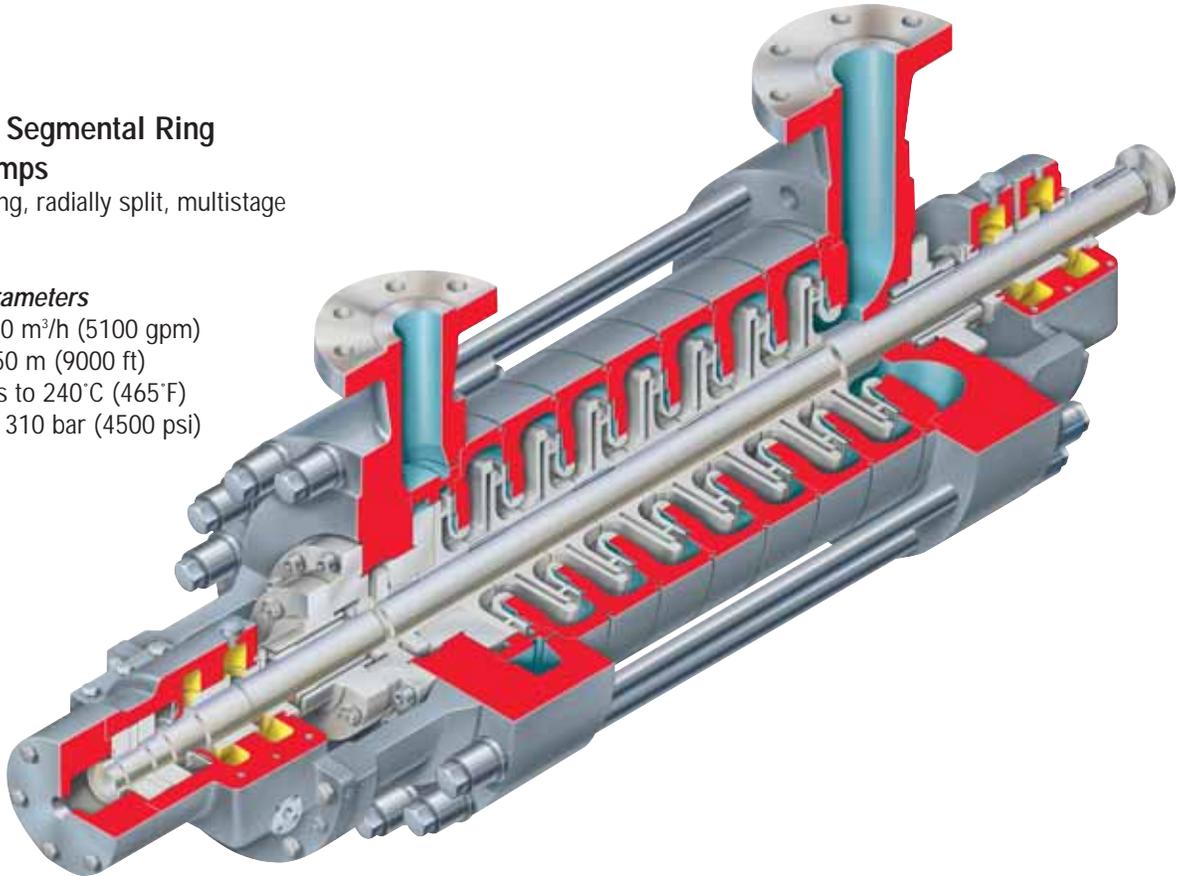
- Flows to 5220 m<sup>3</sup>/h (23 000 gpm)
- Heads to 4270 m (14 000 ft)
- Temperatures to 315°C (600°F)
- Pressures to 482 bar (7000 psi)

### Multistage, Segmental Ring Diffuser Pumps

Between bearing, radially split, multistage designs

#### *Operating Parameters*

- Flows to 1160 m<sup>3</sup>/h (5100 gpm)
- Heads to 2750 m (9000 ft)
- Temperatures to 240°C (465°F)
- Pressures to 310 bar (4500 psi)

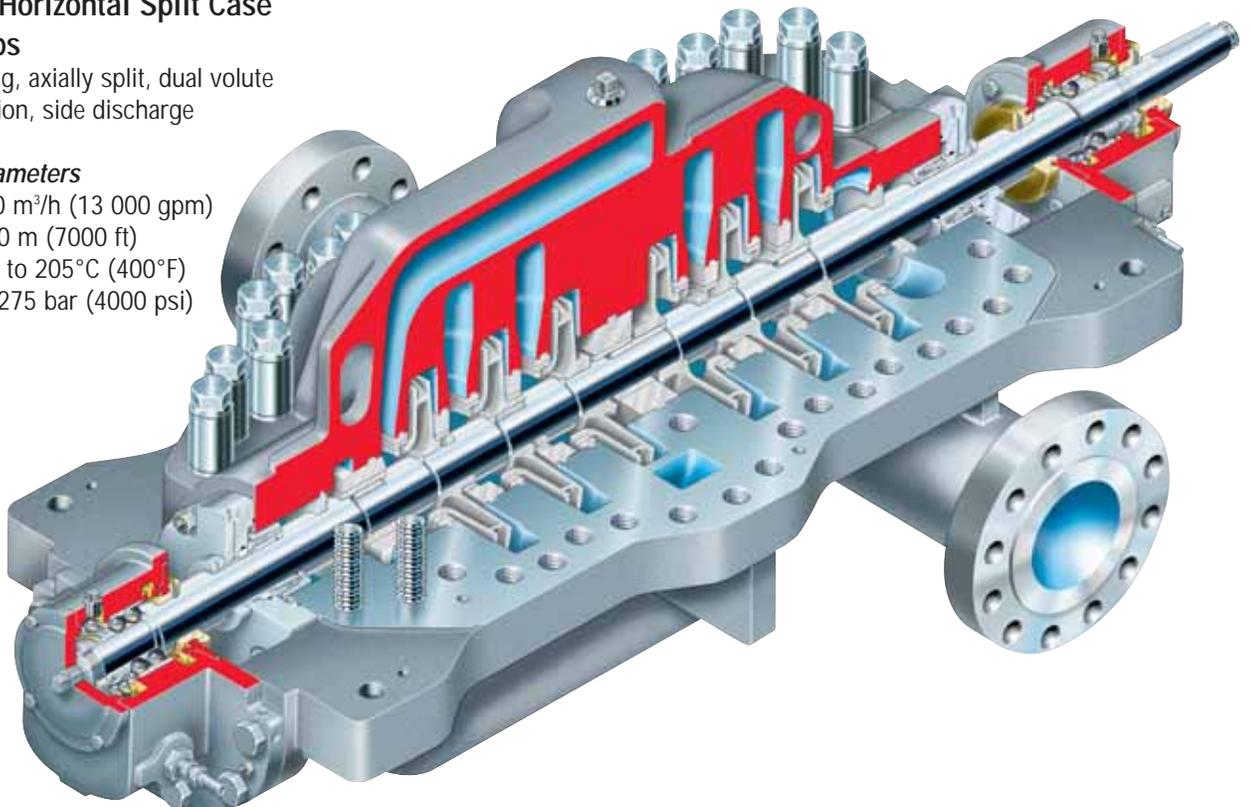


### Multistage, Horizontal Split Case Volute Pumps

Between bearing, axially split, dual volute case, side suction, side discharge

#### *Operating Parameters*

- Flows to 2950 m<sup>3</sup>/h (13 000 gpm)
- Heads to 2130 m (7000 ft)
- Temperatures to 205°C (400°F)
- Pressures to 275 bar (4000 psi)



*Circulating Water  
Pumps*

Flowserve offers a broad range of wet- or dry-pit vertical circulating water pumps for cooling water service. Horizontal design pumps and concrete volute pumps are also available.

**Vertical, Wet-Pit Pumps**

Mixed flow pumps specifically designed for extended operation in condenser cooling water service; pullout and non-pullout designs

*Operating Parameters*

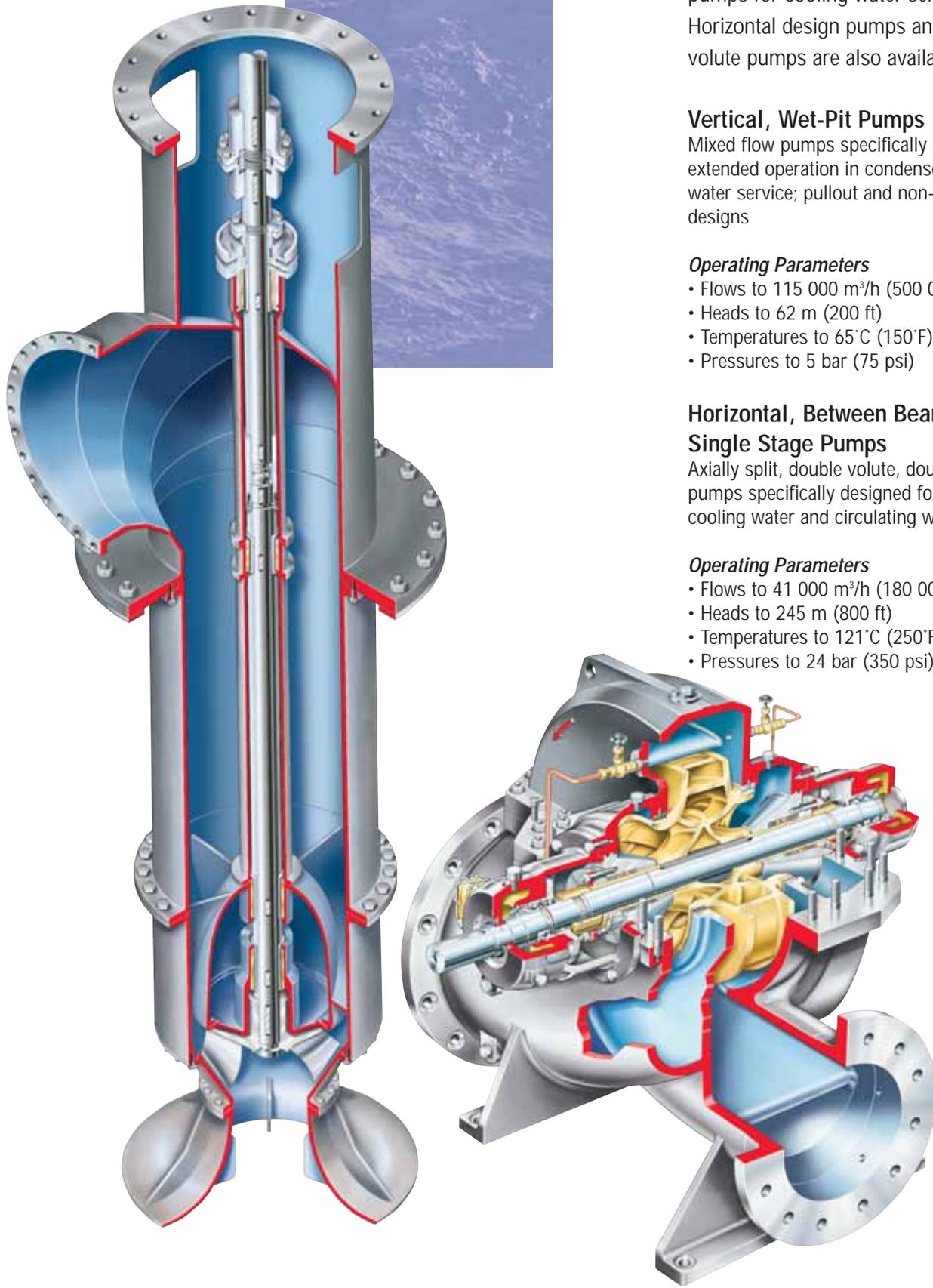
- Flows to 115 000 m<sup>3</sup>/h (500 000 gpm)
- Heads to 62 m (200 ft)
- Temperatures to 65°C (150°F)
- Pressures to 5 bar (75 psi)

**Horizontal, Between Bearing, Single Stage Pumps**

Axially split, double volute, double suction pumps specifically designed for extended cooling water and circulating water services

*Operating Parameters*

- Flows to 41 000 m<sup>3</sup>/h (180 000 gpm)
- Heads to 245 m (800 ft)
- Temperatures to 121°C (250°F)
- Pressures to 24 bar (350 psi)

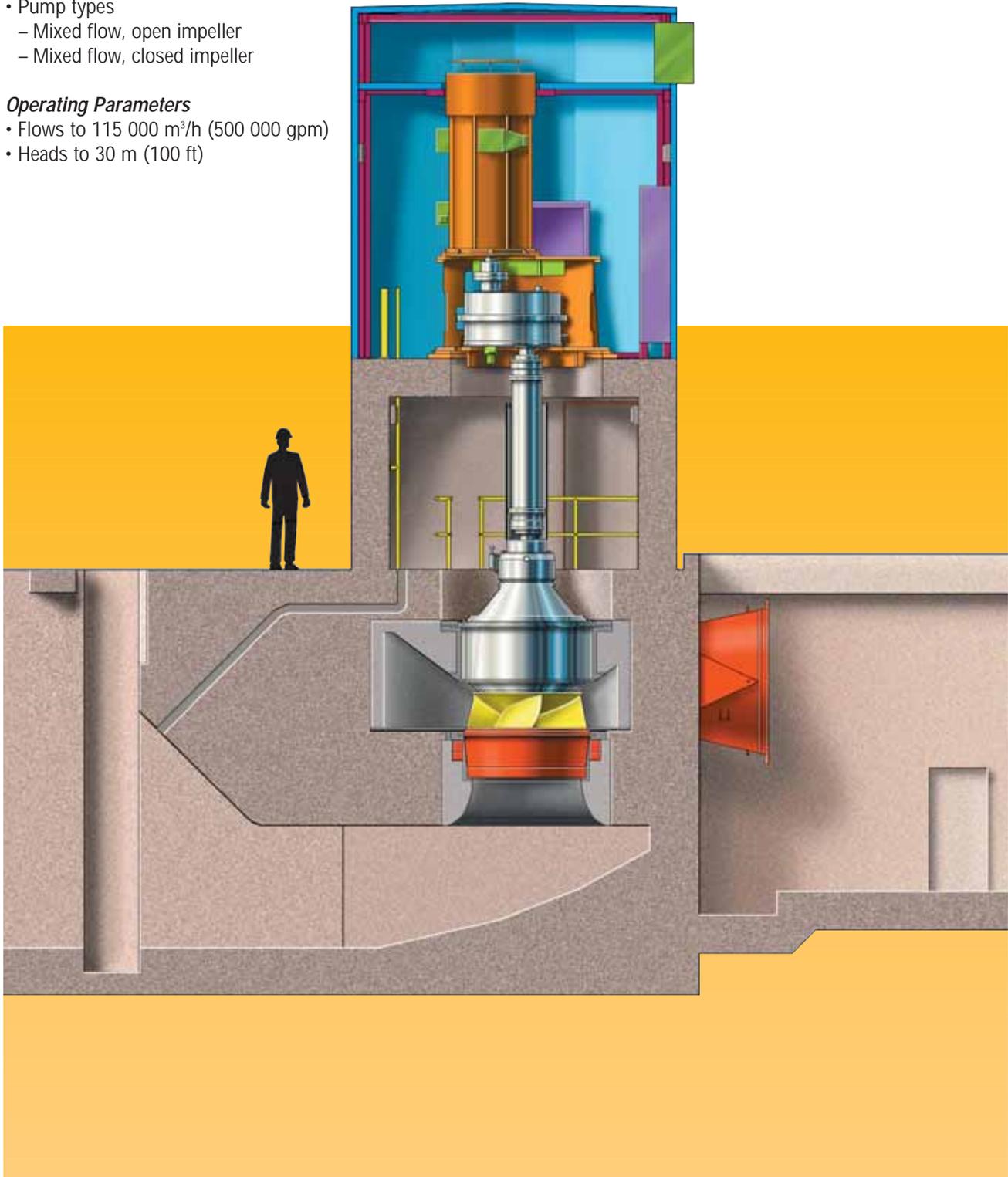


### Concrete Volute Pumps

- Pump assembly integrated into civil construction
- Pre-fabricated concrete sections form intake structure for the pump
- Pump types
  - Mixed flow, open impeller
  - Mixed flow, closed impeller

### Operating Parameters

- Flows to 115 000 m<sup>3</sup>/h (500 000 gpm)
- Heads to 30 m (100 ft)



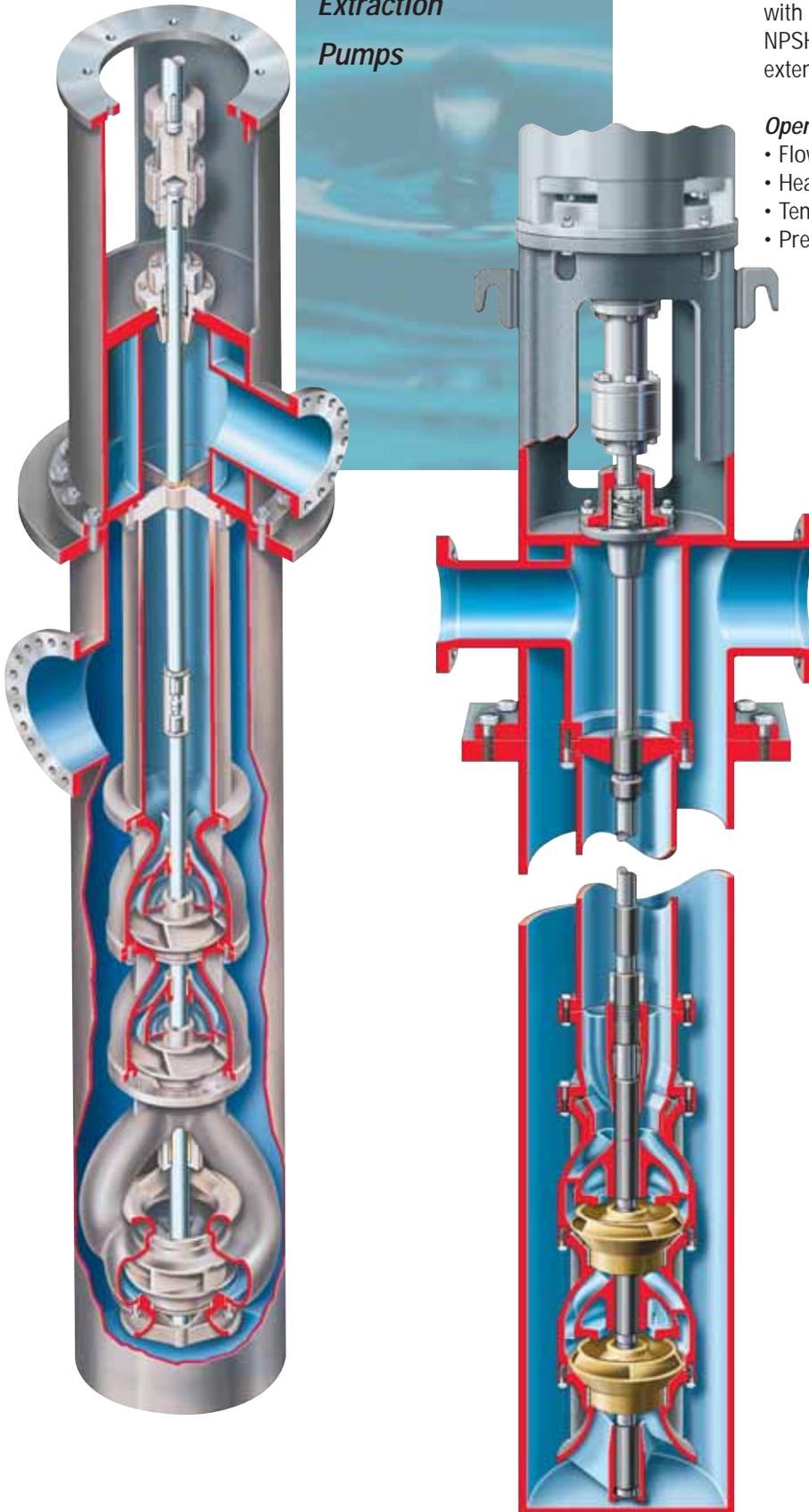
*Condensate  
Extraction  
Pumps*

**Vertical, Multistage, Canned Pumps**

Multistage, mixed flow heavy duty pumps with single or double suction first stage to fit NPSH requirements. Designed for continuous, extended operation.

**Operating Parameters**

- Flows to 4550 m<sup>3</sup>/h (20 000 gpm)
- Heads to 460 m (1500 ft)
- Temperatures to 132°C (270°F)
- Pressures to 55 bar (800 psi)



## Slurry Pumps

Flowserve offers a variety of horizontal type pumps for the difficult slurry handling services found in FGD applications.

### *Single Stage, Process Pumps*

General purpose pump for slurries, light abrasives, severe chemical media

#### *Operating Parameters*

- Flows to 5000 m<sup>3</sup>/h (22 000 gpm)
- Heads to 100 m (325 ft)
- Temperatures to 149°C (300°F)
- Power from 2.2 kW (3 hp) to 600 kW (750 hp)

### *Rubber Lined and Hard Metal Pumps*

Horizontal, single end suction pumps with tangential discharge nozzles for severe duty requirements

#### *Operating Parameters*

- Flows to 10 000 m<sup>3</sup>/h (44 000 gpm)
- Heads to 91 m (300 ft)
- Temperatures to 120°C (250°F)
- Pressures to 10 bar (150 psi)

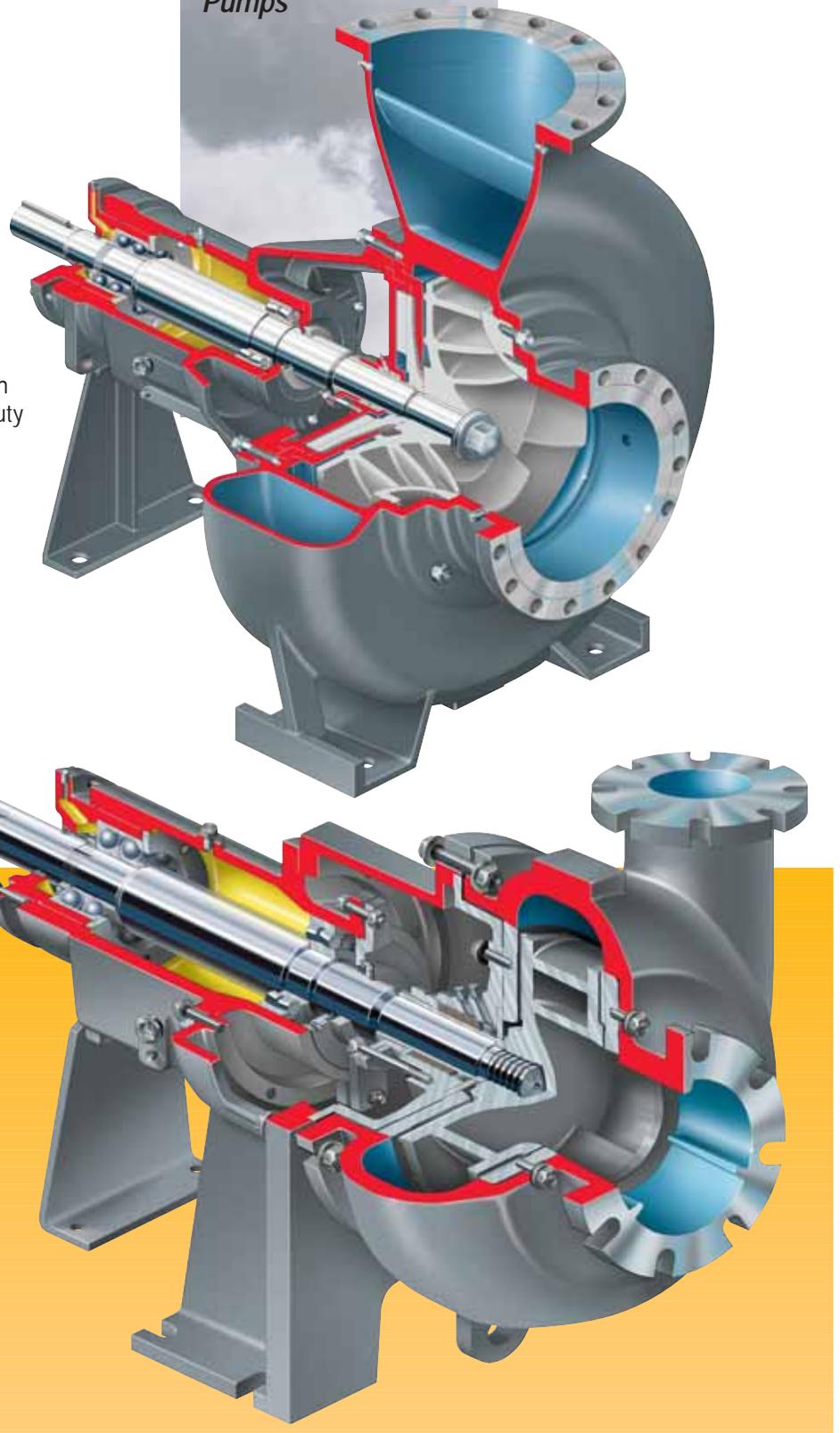
### *Absorber Recycle Pumps*

Radially split pumps with front and back pullout design for recirculation services

#### *Operating Parameters*

- Flows to 17 500 m<sup>3</sup>/h (77 000 gpm)
- Heads to 40 m (130 ft)
- Sizes 600 mm (24 in) to 1000 mm (40 in)

## Flue Gas Desulfurization Pumps



## *Auxiliary Services Pumps*

Flowserve can provide pumping solutions for virtually all power plant support services.

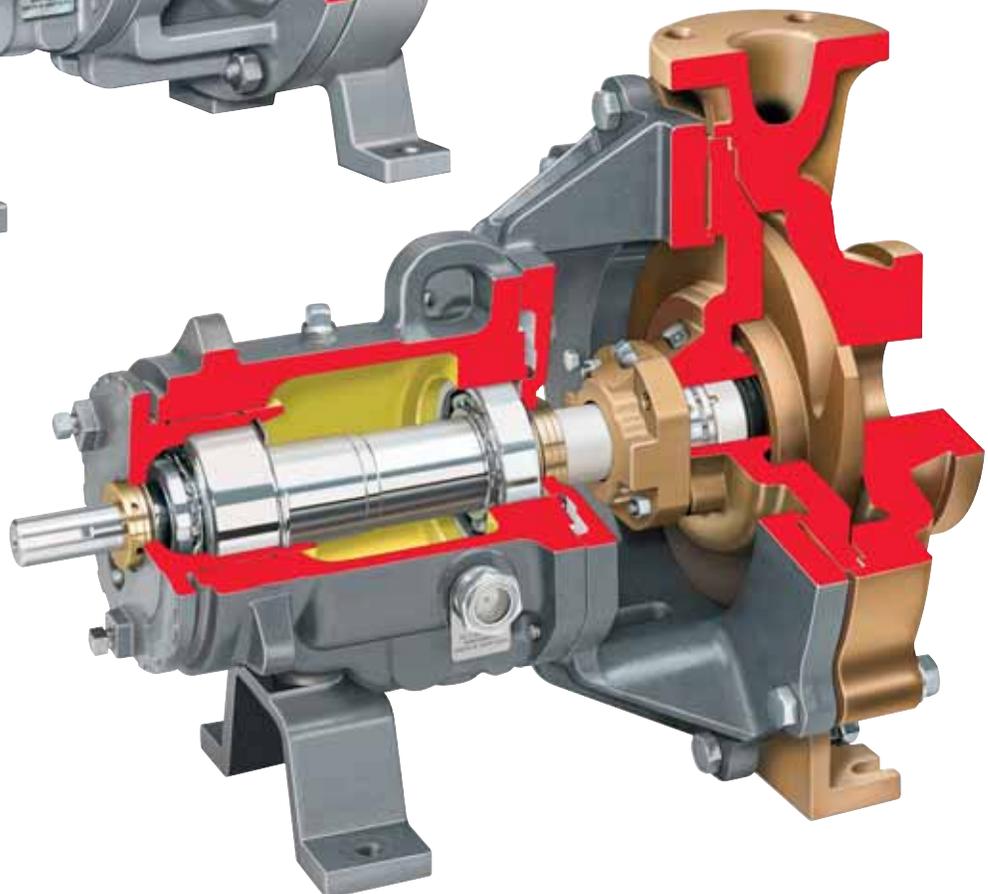
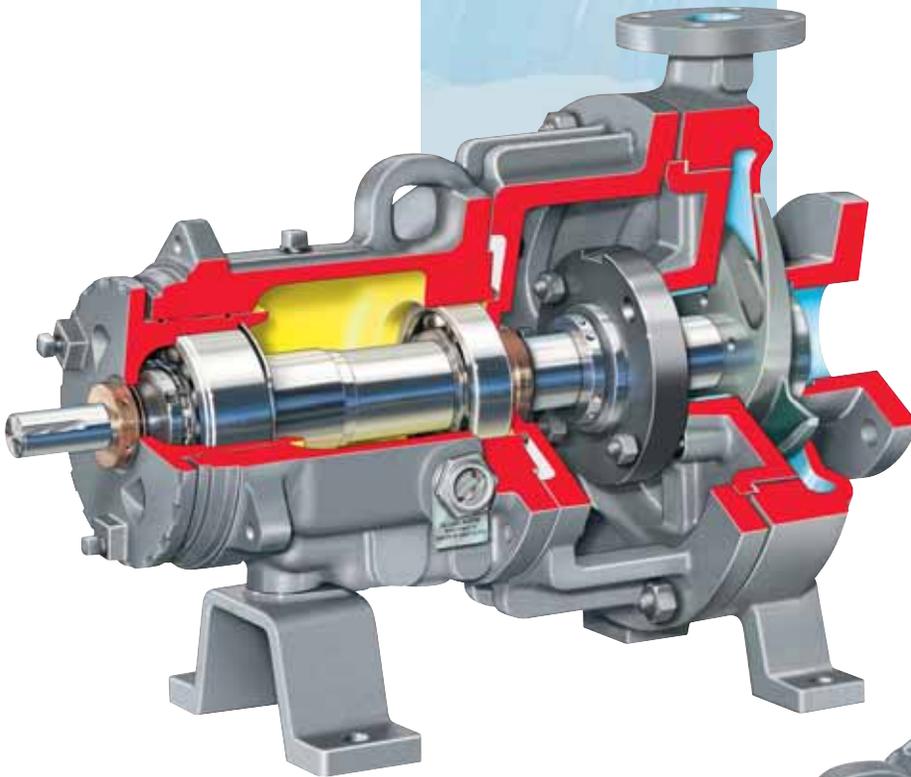
## **Chemical Process ANSI and ISO Standard Pumps**

### *Alloy*

- Low flow, high head
- Sealmatic sealless
- Unitized self-priming
- Recessed impeller solids, slurries handling
- In-line
- Magnetic drive sealless

### *Non-Metallic*

- High grade, glass reinforced polymer
- Fluoropolymer PFA lined
- Mechanically sealed
- Magnetically driven

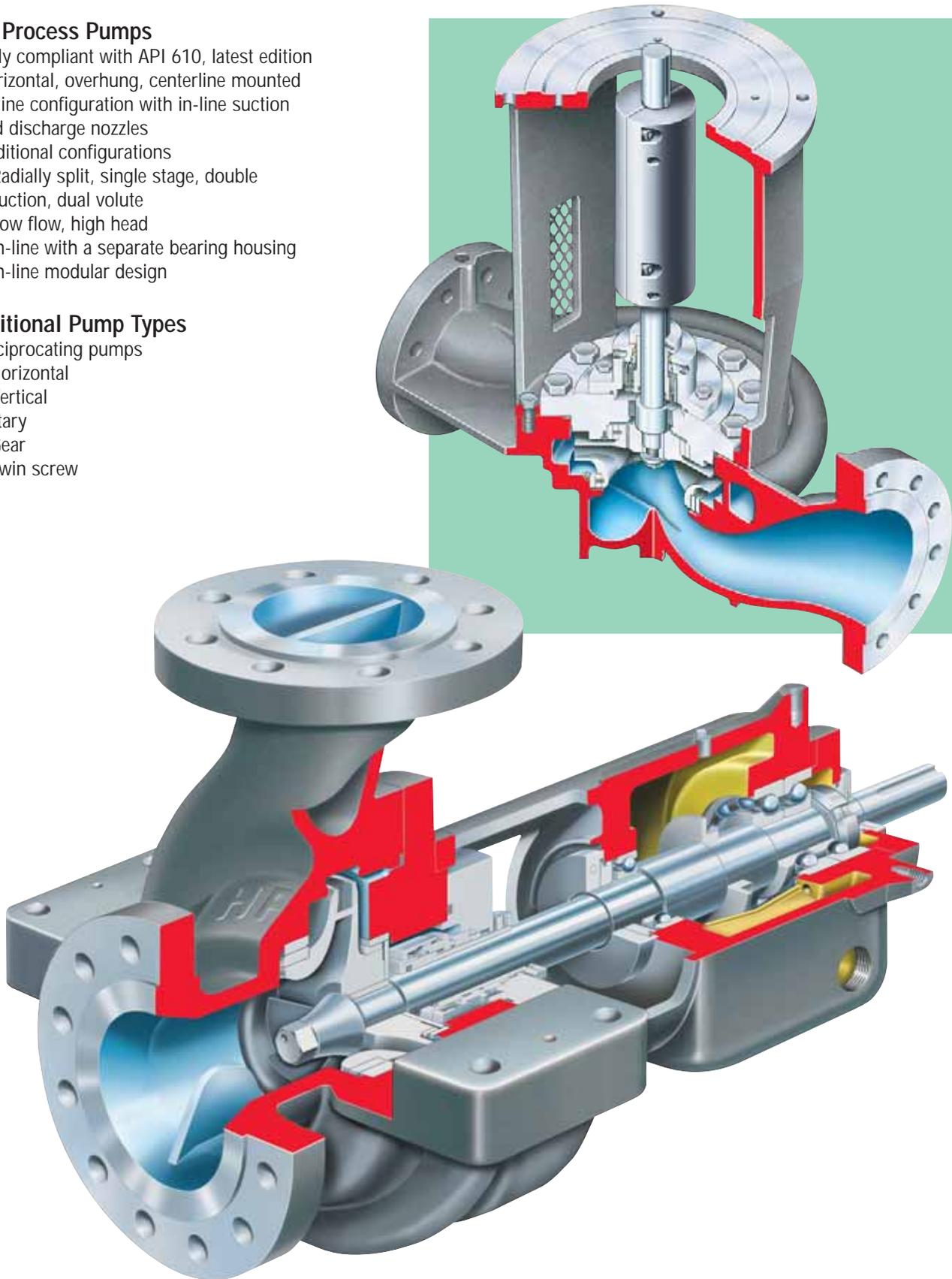


### API Process Pumps

- Fully compliant with API 610, latest edition
- Horizontal, overhung, centerline mounted
- In-line configuration with in-line suction and discharge nozzles
- Additional configurations
  - Radially split, single stage, double suction, dual volute
  - Low flow, high head
  - In-line with a separate bearing housing
  - In-line modular design

### Additional Pump Types

- Reciprocating pumps
  - Horizontal
  - Vertical
- Rotary
  - Gear
  - Twin screw



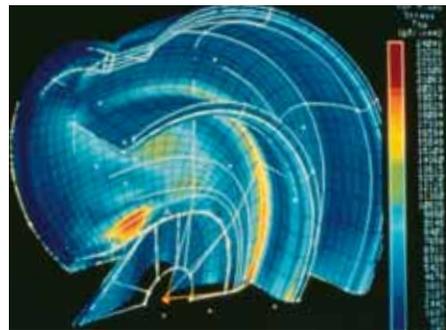
*Technology,  
Technical Support  
and Service*

*Innovation Through Dynamic Technology*

Flowserve is without peer in the development, refinement and application of pump technology. This dynamic creativity is reflected in the strength of the company's commitment to:

- Hydraulic engineering
- Mechanical design
- Materials science
- Intelligent pumping
- Manufacturing technology

All research and technology efforts are directed toward providing customers with greater total value for their investments in Flowserve products and systems. Further, these capabilities enable Flowserve to quickly and accurately provide the best possible solutions to customers' specific pumping problems.



### ***Pump Improvement Engineering Services***

The goal of this specialty service is to help plant technical personnel achieve optimal pumping solutions through engineering and technological assistance. Reducing the costs of operation and maintenance while improving overall equipment reliability is achieved through:

- Field performance testing
- Vibration analysis
- Design analysis and root-cause problem solving
- Material improvements
- Pump and system audit
- Advanced technology solutions
- Nuclear *Maintenance Rule* support
- PumpTrac™ remote pump monitoring and diagnostic services
- Instruction manual updates
- Training courses

### ***Parts and Service***

Quality OEM parts are readily available from a worldwide network of Flowserve service and repair centers, fast response centers and regional parts services offices. All are computer networked to provide “as soon as possible” response to customers’ requests for assistance.

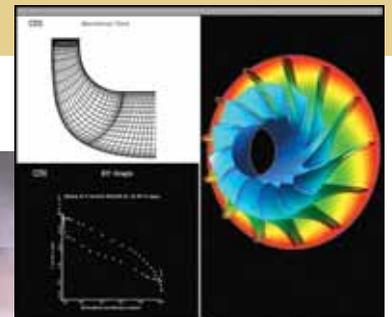
Customer service technicians are on call around the clock, seven days a week to respond to customer queries, to evaluate and troubleshoot reported pump problems and to provide reliable solutions.

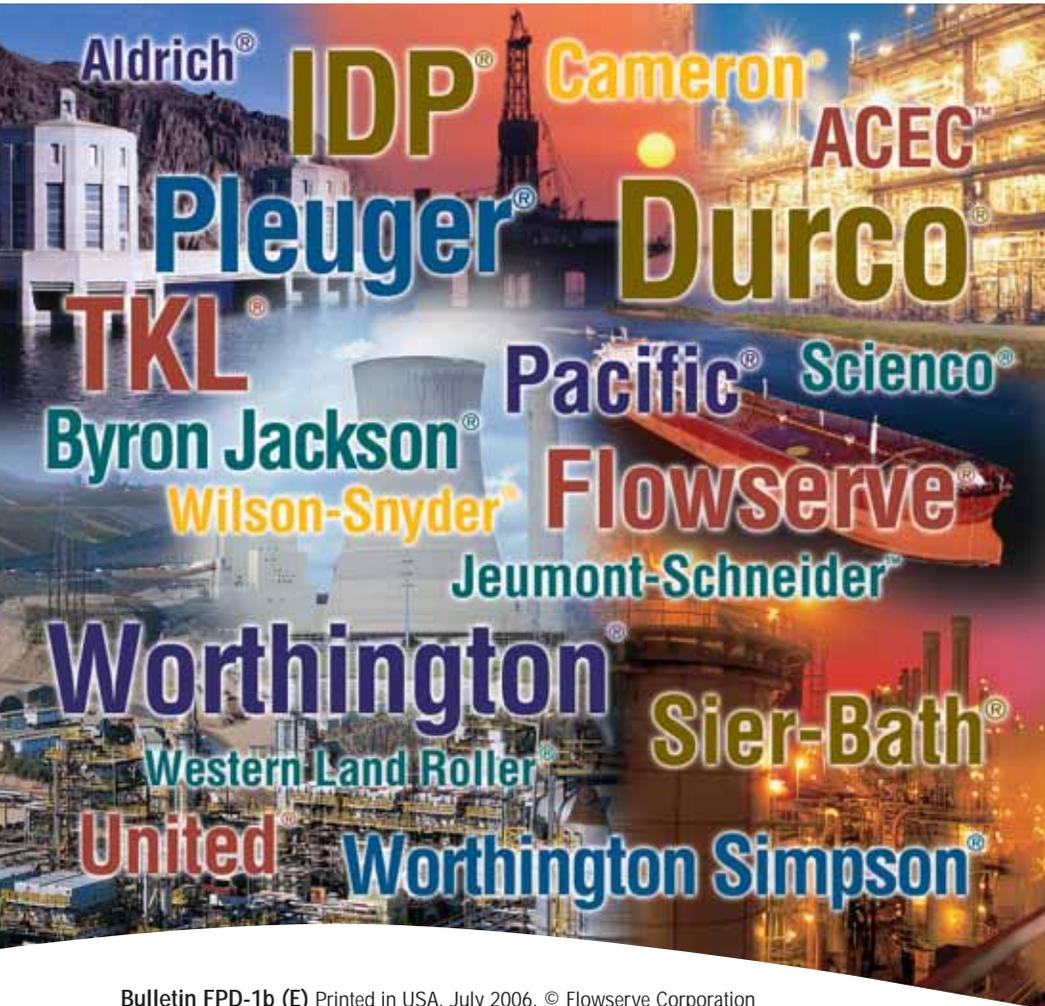


### ***Engineered Services***

Flowserve Engineered Services is dedicated to maximizing equipment performance and reliability-centered maintenance programs. Pump related services include:

- Startup and commissioning
- Diagnostics and prognostics
- Contract maintenance programs
- Routine and repair maintenance
- ANSI and ISO power end exchange program
- Mechanical seal exchange program
- Re-rates, upgrades and retrofits
- Spare parts inventory and management programs
- Training





**USA and Canada**

Flowserve Corporation  
5215 North O'Connor Blvd.  
Suite 2300  
Irving, Texas 75039-5421 USA  
Telephone: 1 972 443 6500  
Telefax: 1 972 443 6800

**Europe, Middle East, Africa**

Flowserve Corporation  
Via Rossini 90/92  
20033 Desio (Milan), Italy  
Telephone: 39 0362 6121  
Telefax: 39 0362 303396

**Latin America and Caribbean**

Flowserve Corporation  
6840 Wynnwood Lane  
Houston, Texas 77008 USA  
Telephone: 1 713 803 4434  
Telefax: 1 713 803 4497

**Asia Pacific**

Flowserve Pte. Ltd.  
200 Pandan Loop #06-03/04  
Pantech 21  
Singapore 128388  
Telephone: 65 6775 3003  
Telefax: 65 6779 4607

Bulletin FPD-1b (E) Printed in USA. July 2006. © Flowserve Corporation

*To find your local Flowserve representative:*

For more information about Flowserve Corporation,  
visit [www.flowserve.com](http://www.flowserve.com) or call USA 1 800 728 PUMP (7867)