Oil & Gas

Production

Pipeline

Offshore

Onshore

Synthetic Crude

Liquid Natural Gas
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 Oil & Gas Industry
For over a century and a half, Flowserve has pioneered virtually every significant advancement in petroleum-related pumping technology. The ability to understand the industry’s upstream needs and to anticipate its requirements makes Flowserve the supplier of choice for production, pipeline and liquified natural gas (LNG) pumping applications.

Heritage Names of Distinction
ACEC™ Centrifugal Pumps
Aldrich® Pumps
Byron Jackson® Pumps
Calder™ Energy Recovery Devices
Cameron® Pumps
Durco® Pumps
Flowserve® Pumps
IDP® Pumps
Jeumont-Schneider™ 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
**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. This provides the following benefits:

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

**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 Bearings Single-Stage
- Between Bearings Multistage
- Vertical
- Submersible Motor
- Rotary
- Reciprocating
- Nuclear
- Specialty

**Available Configurations**

- Sealed and Sealless
- Axially and Radially Split
- Volute and Diffuser
- Close-Coupled and Spacer-Coupled
- Single- and Double-Casing

**Dynamic Technologies**

Few if any pump companies can match the capabilities in hydraulic and mechanical design or in materials engineering that Flowserve possesses. 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
Offshore production presents a host of unique pumping challenges as the hunt for oil and gas has led to deep and often violent seascapes. This has made production much more arduous and hazardous. Flowserve offers extensive products and services to satisfy the pumping needs and specific requirements of offshore platforms and floating production, storage and offloading facilities (FPSOs). These include:

- Pumps fully compliant with API 610 latest editions and customer specifications
- Highly engineered, robust and reliable pumps adapted to offshore space and weight concerns, operating and environmental conditions
- Extended pump mean time between planned maintenance with authorized maintenance service wherever required
Meeting New Challenges

New exploration and extraction processes require creative pumping solutions. Flowserve is in the forefront of subsea technology with the application of integrated multiphase pumping and seabed processing systems. In the evolving practice of multiphase pumping, Flowserve is the only manufacturer offering the safety and reliability of shaft seals to API 682.

With its extraordinary experience and capabilities in hydraulic design, submersible motor technology and materials engineering, Flowserve is prepared for new challenges. Whether in the depths of the ocean or in the bowels of the earth, Flowserve pumps are offering solutions to customer needs.

Production and Pipeline

Flowserve produces a complete line of performance-proven pumps for all offshore oil services. These include: submersible motor pumps for sea water lift, ballast rig water services; process pumps to move and handle oil, gas and water; high-pressure pumps for sea water injection; high-capacity, high-pressure pumps for crude oil transportation; and utility and fire protection pumps.

Offshore pipelines are carrying an increasing amount of the world’s oil and gas. Pumps for these services must be robust and unfailingly reliable. Flowserve offers pumps for every conceivable pipeline application as well as for storage and transfer, including special cargo stripper pumps for loading and unloading barges and supertankers.
Oil- and gas-well drilling continues at a high level of activity worldwide but with ever-increasing difficulties of location, landscape and depth. It is these types of challenges which have made Flowserve a leader in the development and application of advanced pumping technologies for oil and gas applications.

Flowserve has made significant contributions to these advancements by designing the first centrifugal pumps for oil-field production along with automatic mainline and booster pipeline stations. Flowserve pioneered secondary recovery through high-pressure water injection and first applied submersible motor pumps in crude oil and LPG storage caverns.
Production and Pipeline
Flowserve provides a broad range of performance-proven, fully compliant API 610 and API 676 pumps designed for oil-field upstream and downstream production facilities. These include: pumps for the surface and subsea handling of multiphase (oil-gas-water) services; high-capacity vertical and horizontal pumps required for pipeline transportation and high-pressure water injection services; gas-oil separation plant (GOSP) equipment; extraction pumps for steam assisted gravity drainage (SAGD); and virtually all ancillary production related applications.

Flowserve is a leading manufacturer of petroleum pipeline pumps. The reliability of its single and multi-stage pumps has made them the products of choice for unattended mainline operation in some of the world’s most inhospitable environments. Low NPSH pumps, in both horizontal and vertical configurations, are offered for booster-station service. And no other manufacturer offers the breadth of pumps for transportation, transfer, storage and cargo stripping.
With new process technologies and techniques, obtaining synthetic crude from the vast tar sand reserves is now economically feasible. To accomplish this, energy producers need pumping flexibility and reliability in both bitumen mining-extraction and the more traditional oil production and pipeline services. And, of course, these pumps must perform in often hostile and quite remote environments.

These processes require fully API 610 compliant as well as rugged and reliable Flowserve industrial pumps.

**General Applications**
- Mining – Hard metal slurry and transport pumps
- Extraction – Axially split, multistage pumps for steam assisted gravity drain (SAGD); hard metal froth pumps; low shear, single-stage process pumps; hard metal tailings pumps
- Pipeline – API process and pipeline pumps
Converting natural gas leaving the wellhead into liquefied natural gas (LNG) is not only good conservation policy but excellent and profitable business policy as well. Regardless of the process used to recover LNG – absorption, straight refrigeration or cryogenic liquid expansion – Flowserve has the liquid turbine expanders, charge and process pumps, service and utility pumps, and specialty pumps to accomplish the tasks.

**General Applications**

- Charge and process – Petroleum process pumps; between bearings, multistage, single- and double-casing axially split, horizontal pumps; single-stage, horizontal pumps; vertical, process, can pumps
- Cryogenic – Vertical and horizontal cryogenic pumps, liquid turbine expanders
- Desulfurization – Single and multistage pumps
- Pipeline and transportation – Between bearings single and multistage, horizontal pumps; double-casing, horizontal pumps; vertical, process can pumps
- Safety and utility – Between bearings, single-stage, axially split, horizontal pumps; vertical turbine and circulator pumps
Flowserve oil and gas pumps are fully compliant with API 610 current edition standards.

• Sea water lift – Submersible motor pumps or vertical line shaft pumps
• Source water – Submersible motor pumps; vertical, deep well turbine pumps
• Water injection – Between bearings, multistage single- and double-casing pumps; vertical double-casing pumps
• FPSO positioning – Specialty thruster pumps; vertical double-casing pumps
• Water treatment – Submersible motor pumps
• Utility – Single-stage, double-suction, axially split, horizontal pumps; vertical in-line process pumps
• Safety and fire fighting (UL approved package) – Single-stage, double-suction, axially split, horizontal pumps; vertical turbine pumps
• Separation – Multiphase pumps; single-stage process pumps; high-pressure, multistage pumps; vertical process pumps; vertical turbine pumps; vertical circulators; and rubber lined or hard metal slurry pumps
• Gas treating – High-pressure, between bearings multistage pumps (BB3 and BB5) and single-stage process pumps
Deep Well Submersible Motor Pumps
Designed to meet subsurface, deep well or high-pressure boosting needs. Liquid ends and water-filled submersible motors to 1830 m (6000 ft) submergence

Operating Parameters
• Flows to 68 000 m³/h (300 000 gpm)
• Heads to 670 m (2200 ft)
• Speeds from 2000 to 3600 rpm
• Motor sizes to 5000 kW (6700 hp)

Between Bearings, Single-Stage Pumps (API-BB1)
Horizontal, axially split, single-stage, double-suction centrifugal pump. Pump configurations include a vertical mounted option and selected sizes of bottom-suction models. Both API and non-API designs are available

Operating Parameters
• Flows to 41 000 m³/h (180 000 gpm)
• Heads to 150 m (500 ft)
• Pressures to 17 bar (250 psi)
• Temperatures to 120°C (250°F)
Vertical Turbine Pumps (API-VS1, API-VS6)
Multistage with above or below surface discharge, enclosed or semi-open impellers, open or enclosed lineshafts, single or double casing

Operating Parameters
• Flows to 5680 m³/h (25 000 gpm)
• Heads to 700 m (2300 ft)
• Sizes 150 mm (6 in) to 1200 mm (48 in)
• Settings to 365 m (1200 ft)

Multistage, Double-Casing, Diffuser and Volute Design Pumps (API-BB5)
Single- and double-suction first-stage pumps for high-pressure services including water injection. Fully compliant with API 610, latest edition

Operating Parameters
• Flows to 4000 m³/h (18 000 gpm)
• Heads to 4300 m (14 000 ft)
• Pressures to 400 bar (6000 psi)
Multistage, Axially Split Pumps (API-BB3)
Between bearings, axially split, double volute, side suction, side discharge, multistage design. For water injection and disposal, and liquid CO₂ injection.

Operating Parameters
• Flows to 2950 m³/h (13 000 gpm)
• Heads to 2130 m (7000 ft)
• Pressures to 275 bar (4000 psi)
• Temperatures to 205°C (400°F)

Horizontal, Overhung Process Pumps (API-OH2)
End suction-top discharge, overhung, centerline mounted configuration. API 682 seal chamber; fully compliant with current edition of API 610 standards.

Operating Parameters
• Flows to 2000 m³/h (9000 gpm)
• Heads to 350 m (1100 ft)
• Temperatures from -160°C (-250°F) to 450°C (850°F)
• Pressures to 80 bar (1160 psi)

Vertical In-line Process Pumps (API-OH3, API-OH4, API-OH5)
Designed for simplified piping and space savings with in-line suction and discharge nozzles. API 682 seal chamber; fully compliant with current edition of API 610 standards.

Operating Parameters
• Flows to 6800 m³/h (28 000 gpm)
• Heads to 460 m (1100 ft)
• Pressures to 100 bar (1160 psi)
• Temperatures to 425°C (850°F)
Flowserve pipeline pumps are fully compliant with API 610 current edition standards.

- Pipeline and transportation (in series or parallel) –
  Mainline and booster; horizontal, between bearings
  single and multistage process pumps; vertical
  process pumps
- Storage and transfer – Horizontal, between bearings,
  single-stage, process pumps; vertical process
  pumps; submersible motor pumps; vertical, in-line
  process pumps
- Terminal – Vertical in-line and vertical process pumps
- On- and offloading – Specialty stripper pumps

Single-Stage, Axially Split Pumps
(API-BB1)
Axially split, double-volute case, double-
suction pumps for pipeline service and related
heavy-duty requirements

**Operating Parameters**
- Flows to 41 000 m³/h (180 000 gpm)
- Heads to 150 m (500 ft)
- Pressures to 17 bar (250 psi)
- Temperatures to 120°C (250°F)

Multistage, Axially Split Pumps
(API-BB3)
Between bearings, axially split, double-volute,
side-suction, side discharge, multistage
design. For high-pressure, heavy-duty
pipeline applications

**Operating Parameters**
- Flows to 2950 m³/h (13 000 gpm)
- Heads to 2130 m (7000 ft)
- Pressures to 275 bar (4000 psi)
- Temperatures to 205°C (400°F)
**Vertical Turbine, Double-Casing Pump**  
(API-VS6)  
High-pressure, heavy-duty, diffuser type, single or multiple stage pump for continuous duty in pipeline booster and transfer services

**Operating Parameters**  
- Flows to 13 600 m³/h (60 000 gpm)  
- Heads to 1100 m (3500 ft)  
- Pressures to 100 bar (1500 psi)  
- Temperatures to -195°C (-320°F) to 425°C (800°F)

**Vertical In-line Pumps**  
(API-OH3, API-OH4, API-OH5)  
Single-suction, double-suction, in-line design for high flow, limited NPSHA. Tank farm, transfer and pipeline booster services

**Operating Parameters**  
- Flows to 6800 m³/h (28 000 gpm)  
- Heads to 460 m (1100 ft)  
- Pressures to 100 bar (1160 psi)  
- Temperatures to 425°C (850°F)
Hard Metal Slurry Pumps
Horizontal, single-stage, end-suction design with vertical tangential discharge nozzles for tar sand extraction services including froth and tailings applications.

*Operating Parameters*
- Flows to 10,000 m³/h (44,000 gpm)
- Heads to 90 m (300 ft)
- Pressures to 10 bar (150 psi)
- Temperatures to 120°C (250°F)

Twin-Screw Pumps
Twin-screw, double-suction design with API 682 seal chamber for pipeline services and for loading and unloading of oil storage tanks and tanker vessels

*Operating Parameters*
- Flows to 2550 m³/h (11,200 gpm)
- Pressures to 100 bar (1450 psi)
- Temperatures to 450°C (850°F)
- Viscosities to 200,000,000 ssu

Multiphase Pumps
Twin-screw, double-suction design with API 682 seal chamber for multiphase services (oil-gas-water) onshore, offshore and subsea

*Operating Parameters*
- Flows to 1520 m³/h (6,700 gpm)
- Pressures to 100 bar (1450 psi)
- Temperatures to 150°C (300°F)
- Viscosities to 200,000,000 ssu

Specialty Applications
Cryogenic Liquid Expanders
Double-casing, vertical turbine expanders for severe sub-zero temperatures in LNG production

**Operating Parameters**
- Temperatures to -180°C (-290°F)
- Inlet pressures to 70 bar (1000 psi) (higher if required)
- Generator sizes to 2250 kW (3000 hp)

Cryogenic Pumps
A full line of pumps, both vertical and single multistage horizontal, for low temperature service in LNG storage and transport. Available in standard designs

**Operating Parameters**
- Vertical Turbine Pumps
  - Temperatures from -198°C (-325°F) to -45°C (-50°F)
  - Discharge pressures to 150 bar (2160 psi)
  - Motor sizes to 1120 kW (1500 hp)
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