

Aftermarket Parts and Services

Repair and Maintenance • Replacement Parts and Components



SERVICES AND SOLUTIONS

For the Global Infrastructure Markets

Flowserve Services and Solutions focuses on providing customers with uncompromising technical service and engineering support, wherever and whenever needed. Dedicated to delivering the highest quality support, Flowserve Services and Solutions integrates hydraulic, mechanical and materials engineering knowledge with creative equipment, system and business solutions.

A worldwide network of Quick Response Centers staffed by highly skilled engineers and technicians is available around the clock, seven days a week to respond to customer queries, to evaluate and troubleshoot problems and to provide reliable solutions with quantifiable business results.

INTEGRATED SOLUTIONS THAT SUPPORT THE COMPLETE LIFE CYCLE

Typically, 90% of the total life cycle cost (LCC) of a flow management system is accumulated after the equipment is purchased and installed. Flowserve offers a comprehensive suite of services and solutions designed to provide customers with unprecedented value and cost savings throughout the life span of the system.

- **Aftermarket Parts and Services**
 - Repair and maintenance
 - Replacement parts and components
- **Engineering and Technical Services**
 - Engineering support
 - Technical assessments
 - Equipment performance improvements
- **Education and Training**
 - Customer site
 - Learning Resource Center
 - Online
- **Asset Management and Optimization**
 - Business assessments
 - Asset data management
 - Asset optimization solutions





A COMMITMENT TO EXCELLENCE



As one of the world's leading manufacturers of fluid motion and control equipment, Flowserve is keenly aware that the key to customer satisfaction and loyalty is unmatched aftermarket service. To this end, Flowserve has dedicated considerable resources to addressing its customers' aftermarket needs.

Investments in well-equipped Quick Response Centers, mobile service fleets and advanced manufacturing technologies along with the unrivaled expertise of its engineers, technicians and craftsmen enable Flowserve to address virtually every service requirement for process equipment, on- or off-site, regardless of OEM.



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- Machining and repair welding
- Piping services
- Mechanical upgrades and retrofits
- Installation and start-up
- Push-pull services
- Preventive and scheduled maintenance
- Turnkey maintenance
- Troubleshooting, equipment testing and non-destructive examination
- Supervision and project management
- Scheduled inspections and outage services

Replacement Parts and Components Page 10

- Standard OEM replacement parts and components
- Quick response programs
- Rapid prototyping



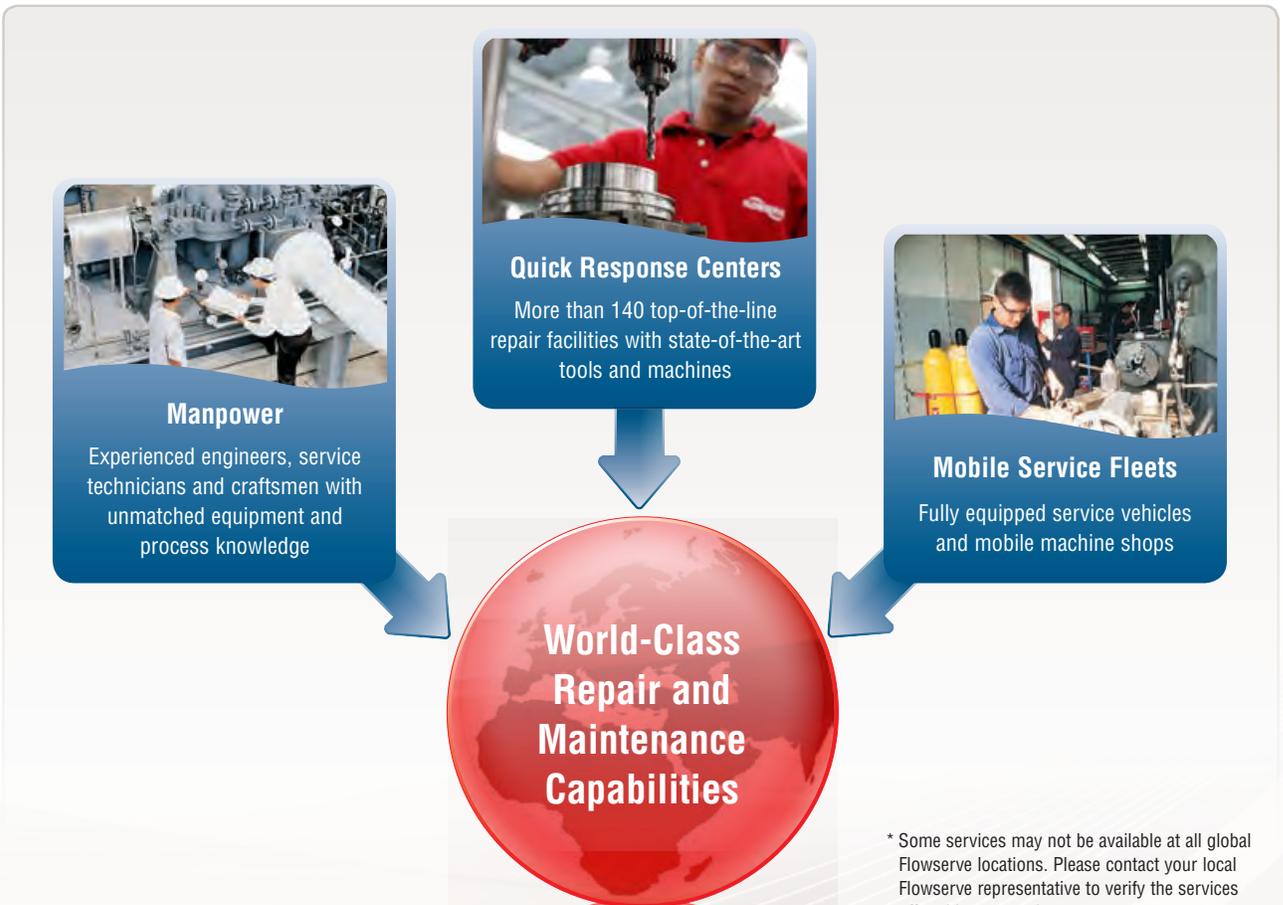
REPAIR AND Maintenance*



WORLD-CLASS SERVICES AND CAPABILITIES

Through Flowserve, plant managers and operators have access to one of the largest repair and maintenance organizations in the industry. Supported by a global network of quick response centers, a fleet of fully equipped mobile service vehicles and hundreds of highly qualified project managers, engineers and technicians, customers can rely on Flowserve to properly repair and maintain their critical flow management equipment, regardless of OEM.

Broad machining capabilities, advanced welding and material overlay services, progressive testing and inspection techniques, push/pull support, stocking and cost-saving equipment overhaul programs are all integral parts of the Flowserve portfolio. Whether performed on- or off-site, customers are ensured high-quality repair and maintenance practices that focus on optimizing equipment performance, prolonging equipment life and reducing costs.





DEDICATED LOCAL SUPPORT – ON- AND OFF-SITE



A Global Network of Quick Response Centers

Flowserve has a global network consisting of more than 140 Quick Response Centers that is designed to support customers with local parts, repairs and service for process equipment, regardless of OEM. The goal of these facilities is to help customers improve the operational performance of their equipment while lowering their total cost of ownership.

Located in all regions of the world, Flowserve Quick Response Centers are fully tooled and staffed to handle all facets of equipment maintenance and repair, including:

- Machining and repair welding
- Upgrades, retrofits and rerates
- Preventive and scheduled maintenance
- Parts and component stocking and supply
- Equipment repair, analysis and testing

Many Quick Response Centers also offer a full menu of on-site services, including installation and commissioning, troubleshooting, scheduled inspection and project management.



A Mobile Service Fleet

Flowserve has invested heavily in a fleet of service vehicles and containers to ensure timely response to customers, regardless of location. Specially equipped with the right tools for any repair or maintenance task, these trucks help Flowserve technicians quickly and reliably perform even complex repairs on critical equipment. Downtime is minimized so plants are up and running as swiftly as possible.

Flowserve has designed its mobile fleet for flexibility and quick response:

- Class 1 trucks are equipped with medium-duty tooling for emergency response.
- Class 2 trucks are heavy-duty with a full line of tooling for field service of both small and large process equipment.
- Specialty tool containers
- Turnkey project office containers

Additionally, specialty trucks have been developed to meet the particular needs of:

- Pipeline pumps
- Hydraulic decoking systems
- Ebullated catalyst bed reactor pumps
- Azimuthing thrusters



REPAIR AND MAINTENANCE OFFERINGS



Machining and Repair Welding

Flowserve machinists, artisans and welders are second to none and can repair most types of equipment, including pumps, motors, compressors, agitators, valves and seals. Flowserve Quick Response Centers are equipped with top-of-the-line tools and machines to ensure each repair is performed promptly and to the highest quality standards.

Flowserve also recognizes that it is often costly and impractical, if not impossible, to move complex, heavy or cumbersome equipment to a maintenance facility for repair. For this reason, Flowserve has developed extensive field machining and welding capabilities. Mobile machine shops and services vehicles allow Flowserve technicians to perform complex repairs on-site so costs can be kept low.

Machining

With a network of highly skilled machinists, well-equipped Quick Response Centers, a fleet of mobile machine shops and 24-hour emergency service, Flowserve provides unparalleled machining capabilities, including:

- Lathe work
- Milling
- Stud drilling
- Flange facing
- Line boring
- Shaft keyways
- Seal face grinding and lapping

Repair Welding

Skilled at numerous techniques and processes, Flowserve welders are certified to all local, national and international standards. Services include:

- Component repairs and modifications
- Pump and motor pedestal modifications
- Baseplate frame modifications
- Lube system modifications



Piping Services

Pipe strain contributes to the early failure of bearings and seals and causes poor and unreliable performance in rotating equipment. According to some estimates, 80% of chronic pump failures involve pipe strain. Flowserve technicians can survey system connections to determine the source of strain and then develop and implement corrective action to eliminate it.



Mechanical Upgrades and Retrofits

Unreliable and leaking pumps can be refurbished to “as-new” condition via a variety of mechanical upgrade and retrofit options. The goal is to improve reliability and availability by updating pumps to the latest industry standards. Options include:

- ISO 13709/API 610 latest edition upgrades – Convert old overhung process pumps to current API standards. Includes new power end, ISO 21049/API 682 seal chamber and cartridge mechanical seals.
- ASME and ISO power end exchange programs – Quick, cost-effective upgrades of chemical process pumps.
- Other available mechanical upgrades and retrofits include:
 - Increased rotor stiffness (Superstraight™ shaft material)
 - Bearing housing and bearings
 - ISO 21049/API 682 seal chambers
 - Mechanical seal upgrades (single, tandem, double)
 - Dry gas seal retrofits
 - Coupling
 - Wear ring



Installation and Start-Up

Equipment installation and start-up can be problematic if careful attention is not paid to following the correct procedures. To ensure new equipment yields the specified performance and provides long, reliable service, Flowserve adheres to the industry’s most rigorous standards for installation and start-up. Whether for mission critical assets or for ancillary support systems, best practices are followed and all details are fastidiously managed.

- Foundation preparation and baseplate grouting
- Pipe and pump bolt-up, alignment and inspection
- Flush and lubrication system installation and testing
- Control systems and electronics function verification
- Pump and motor pre-rotation checks
- Laser alignment
- Safety inspections
- Start-up and operating procedure development



Push-Pull Services

Removing an installed piece of equipment is no easy task. Maintaining equipment integrity without compromising personnel safety can be a hard balance to strike. With vast equipment knowledge and a large fleet of support vehicles, Flowserve is well fitted to handle equipment removal, dismantling and decontamination services while protecting plant personnel from physical and environmental hazards.



Preventive and Scheduled Maintenance

Strict adherence to maintenance and repair best practices extends mean time between repair (MTBR) and helps to control operating costs over the long run. Flowserve has the expert manpower, tools and capabilities needed to keep equipment in peak condition.

- Pumps
- Valves
- Mechanical seals
- Motors
- Shafts
- Bearings
- Suction strainers
- Piping



Turnkey Maintenance

Flowserve recognizes that maintaining process equipment is not the primary objective of its customers, but it is necessary to achieve their goals. By augmenting customer-owned resources with its industry-leading technical experts, advanced engineering tools and top-of-the-line Quick Response Centers, Flowserve provides turnkey maintenance services that keep equipment operating optimally from cradle to grave.

Contract Maintenance Services

Flowserve repair and maintenance services are available on a project-by-project basis or by contract. Flowserve contract maintenance programs reduce total operating expenses while ensuring resources are efficiently deployed to meet maintenance and repair requirements. By supervising maintenance and repair activities, Flowserve enables customers to focus on core production activities.

Contracts are tailored to meet customer needs and may include the following services:

- Equipment removal and installation
- Mechanical overhauls, repairs, machining and balancing
- Preventive maintenance programs
- Scheduled inspections
- Vibration and noise monitoring and analysis
- Lubrication analysis and service



- Motor amperage monitoring
- Component evaluations – visual, dimensional and non-destructive examinations
- Labor resource management
- Parts maintenance services



Troubleshooting, Equipment Testing and Non-Destructive Examination

Chronic maintenance issues can accumulate to have a significant negative impact on equipment availability and operating costs. If left unchecked maintenance problems such as undersized bearings, misapplied mechanical seals and systems, material incompatibility and off-design operation can erode plant profitability.

Flowserve engineers and technicians can work on-site with plant personnel or independently to troubleshoot problematic equipment and components. By reviewing operating data, performing non-destructive examinations and conducting on-site performance tests, they can identify the root causes and recommend and implement corrective actions.



Supervision and Project Management

With today's lean staffs, plants often do not have sufficient resources in-house to oversee the regular and ongoing activities necessary to keep complex equipment and systems operating at their best. Moreover, specific equipment, system or application expertise is often required.

Whether the project is large scale or small, Flowserve on-site project managers and engineers help customers successfully see projects to completion. Typical engagements include:

- Equipment removal and handling
- Equipment transportation
- Maintenance activities
- Equipment installation
- Start-up and commissioning



Scheduled Inspections and Outage Services

Flowserve has extensive equipment knowledge, system experience and technical resources to provide integrated inspection and outage services. Field service teams offer comprehensive and rapid assistance to ensure maintenance, upgrade and inspection services are completed to the highest standards, on time and within budget.



REPLACEMENT PARTS and Components



QUALITY PARTS, FAST

The Flowserve parts distribution network includes more than 140 stocking locations across the globe. Flowserve manufacturing centers, service centers and authorized distributors are strategically located to rapidly respond to virtually any process pump part inquiry. Through quick response programs, rapid prototyping and other innovative approaches, Flowserve is able to supply customers with the quality parts they need to keep their operations running smoothly and profitably.

The Flowserve Quality Advantage

The use of replicated or locally machined parts can compromise mechanical integrity, hydraulic efficiency and personnel safety.

Quality parts from Flowserve offer significant benefits to customers. As an OEM, Flowserve with its engineering and manufacturing operations understands the critical elements involved in designing and producing high-quality parts. Whether cast or machined, Flowserve manufactured parts and components result in superior performance, lower total operating costs and increased personnel safety.

- Flowserve casting quality is superior. Poor surface finish, internal shrinks, tolerance deviations and non-compliant compositions are commonly found in non-OEM parts. These result in poor hydraulic efficiency, high power consumption, premature failure and increased operating costs.



- Flowserve parts incorporate the latest design changes that are routinely implemented to improve operating efficiency and extend equipment life.
- Customers benefit from ongoing research and development of new materials, overlay techniques and mechanical and hydraulic improvements.



REPLACEMENT PARTS AND COMPONENT OFFERINGS



Standard OEM Replacement Parts and Components

Quality OEM parts and components for the entire range of Flowserve products are readily available from a worldwide network of manufacturing centers, service centers, quick response centers and stocking centers.

All Flowserve parts and components are manufactured to meet or exceed the latest design standards and material specifications. With Flowserve, customers are ensured the highest quality parts and components for reliable operation and lowest equipment ownership costs.



Quick Response Programs

Flowserve quick response programs provide customers with rapid delivery of parts and components to minimize equipment or plant downtime. Standard parts and components can be supplied same day or next day; special parts can be delivered in days instead of weeks.

Available quick response programs include:

- Shafts
- Impellers
- Wear rings
- Mechanical seals
- Auxiliary systems



Rapid Prototyping

Flowserve can re-engineer and produce non-Flowserve parts and components for equipment that is now obsolete or where the original equipment manufacturer cannot be located. By integrating powerful laser scanning technology with advanced modeling software, the Flowserve Components Technology Group (CTG) can develop a highly accurate part that is then quickly produced with rapid prototyping techniques. State-of-the-art mechanical, hydraulic and materials upgrades may be incorporated as well. CTG's combination of technical expertise and global facilities makes it the ideal technical resource for users of critical pumping equipment and other rotating machinery.



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