RELIABLE FLOW MANAGEMENT SOLUTIONS
FOR OIL & GAS
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FLOW MANAGEMENT SOLUTIONS

Upstream, midstream and downstream, the oil and gas industry faces a complex set of demands, from accommodating extreme operating conditions, to managing budgets and profitability, to running safe, environmentally sound facilities.

Your success depends on having a dynamic partner with the global resources, industry expertise and local knowledge to support you — wherever and whatever the challenge.

Pentair Valves & Controls is the industry’s partner of choice, providing flow management solutions specially designed for the oil and gas industry. We are pioneers and industry leaders in flow isolation and control, pressure management and automation. In all our efforts, we seek to enhance safety, reduce risk and deliver efficiency.

Innovative Solutions
For more than a century, industry-leading solutions from Pentair Valves & Controls have been pivotal in the development of oil and gas frontiers. Today, we offer the industry one of the largest, most complete portfolios of specialized, patented products and brands.

Our oil and gas offering is focused on delivering:
- High operational reliability
- Low maintenance
- Long service life

Industry Experience
Our 140 years of experience has enabled us to develop superior application expertise:
- Over the past 20 years, we have filed 900 patents.
- Our customer base includes the largest oil and gas companies and engineering, procurement and construction (EPC) firms in the world.

Our flow management solutions provide:

Best-in-class products and solutions
- The first triple offset valve (TOV) with true zero leakage performance, which has become the preferred TOV in cryogenic applications and won more than $500 million USD in projects.
- Butterfly valves with a 70% lower carbon footprint and a cycle life of 2.5 times that of competing products.
- Attemperators that allow for shorter pipe distances, thus reducing installation and operating costs due to 50% reduction in evaporation rates.
- Choke valves with 4 times longer cycle life, as well as lower maintenance costs, in shale applications (compared with competing products).
- Knife gate valves for oil sands applications that last 17 times longer than competing valves.
- Hydraulic actuators with record closing time, as well as impact damage prevention in emergency applications.
- High-pressure/temperature globe valves that are in-line repairable and typically save $10,000 USD each in maintenance costs over the life of the valve versus competing products.

Technical and engineering support
- Our team of 900+ technical sales members and 1,000+ applications and customer service specialists deliver this expertise to our customers.
The oil and gas industry is a challenging, highly technical, highly integrated industry. As exploration and production go to more remote and extreme environments, and as refineries become increasingly adaptable, you need a flow control partner you can trust.

That’s why Pentair Valves & Controls experts are at work throughout the oil and gas industry worldwide, helping increase safety and reliability, reduce downtime and protect the environment.
Onshore and offshore, upstream operations demand exceptional safety and performance. In the industry’s most extreme applications, from shale stimulation to production facilities — including complex floating liquefied natural gas (FLNG) and floating production, storage and offloading (FPSO) vessels — success requires advanced technologies, experience and a global support infrastructure.

FLNG and FPSO vessels are critical assets for enabling production. Pentair has a long history of developing the components that are essential to the efficient, affordable operation of these complex operations. Our technology and engineering expertise provide integrity, reliability, ease of maintenance and global support.

Key to these applications and other onshore and offshore production operations are high-integrity pressure protection systems (HIPPS) and emergency shutdown (ESD) capabilities that protect personnel and the environment while helping to mitigate financial and operational risk. Pentair is an industry-leading resource for HIPPS and ESD technologies, turnkey solutions and global service. Our scope of technology includes valves, manifolds, actuators and controls, enclosures, transmitters and logic solvers.

In shale development applications ranging from gas lift to pump truck service and gas processing, effective valve design and selection must consider the demands of high pressures and volumes as well as abrasive media and corrosive environments. Pentair enables and optimizes these applications with multiple valve configurations using many specialized technologies.

For hydraulic fracturing operations, Pentair solutions include resilient seated butterfly valves to control and isolate abrasive fluids. At the well site, choke valves with rotating disks and tungsten carbide components provide longer service life and tighter shut-off. In gas dehydration applications, triple offset valves (TOVs) employ innovative cam-actuated sealing to lower abrasion and achieve zero leakage.

High-pressure, high-temperature (HPHT) production applications present significant challenges to valve performance, including sealing systems and metallurgical properties. Pentair pioneered HPHT technology and recently introduced highly specialized trunnion-mounted ball valves for new extremes, including HIPPS and ESD systems.

Pentair flow management solutions are used in a wide range of upstream applications, including:

- Shale stimulation and production processes
- Subsea and topside isolation and control systems
- Emergency shutdown (ESD) systems
- High integrity pressure protection systems (HIPPS)
- Floating production storage and offloading (FPSO) systems
- Overpressure protection
- Valve position monitoring and automation
- Leak detection systems on platforms
- Separation and storage level indication
- Downhole heating and tracing
- Instrumentation isolation and calibration
EXTREME NORTH SEA ENVIRONMENTS DEPEND ON ADVANCED VALVE TECHNOLOGY

One of the earliest offshore HPHT reservoirs depended on Pentair’s development of specialized ball valves to handle the 15,000 psi [1,034 barg] and 360°F [182°C] conditions. To meet safety and regulatory demands, the platform control system needed to incorporate an ESD system that would initiate various levels of production interruption and process isolations. This system incorporated 60 ball valves between the gas field and the platform. Reliability was a primary objective.

Since the installation, the North Sea production system has not experienced a single valve failure. New field extension will also install Pentair’s advanced trunnion-mounted ball valves.
Severe service, large diameters and high-pressure applications present challenges to many midstream oil and gas operations. In addition, every undertaking, from new construction to ongoing maintenance, should reduce costs, improve performance and ensure that environment, health and safety (EHS) priorities are achieved.

For pipelines, Pentair’s unique combination of manufacturing capabilities and expertise in automated packages and integrated solutions is a key resource for large-diameter, high-pressure valve applications.

Our global project management capabilities and technical expertise provide solutions supported by a broad scope of technologies specifically designed for main isolation valves, pumping stations, compression stations, pig traps, storage facilities and metering skids.

From the world’s first liquefied natural gas (LNG) tanker in 1959 to today’s modern LNG facilities, Pentair has been a leading partner to the industry in developing the unique valves and control equipment necessary for these specialized applications. Our plant cryogenic expertise has been instrumental in developing LNG plant designs, production methods and test equipment.

In LNG plants, Pentair is key to building larger liquefaction trains and terminals that require large-diameter valves for extreme temperatures. Our solutions include:

- Valves up to 112 inches (2,845 mm) in diameter, plus the actuators and controls required for their automation.
- Complete cryogenic portfolio for temperatures as low as -425°F (-254°C).

In pipelines and LNG applications, we are leaders in flow safety. In addition to providing world-class spring and pilot operated pressure relief valves, we offer:

- Complete safety instrumented systems (SIS), such as ESD valves.
- Full packaged HIPPS.
- Products that are suitable for Safety Integrity Level 3 (SIL 3) environments.
- Solutions to perform partial stroke test in your valves.

Pentair midstream flow management typically involves:

- Flow isolation and control for pipelines and LNG facilities
- Leak detection
- Midstream ESD systems
- Automation and control
- Pressure relief, tank protection valves and tank blanketing
- Automatic recirculation valves for pump protection
- Partial stroke testing and diagnostics
ENGINEERING NEW SOLUTIONS FOR PIPELINE PROJECT SUCCESS

Pentair was approached by a major U.S. engineering company with special requirements for trunnion-mounted ball valves for a major pipeline project in India. The requirements for Pentair included:

- Using valves that met the ASME VIII Div 2 standard
- Proving through calculation that the pressure containment met the requirements of safety
- Engineering a balanced design that offered maximum strength and minimum deformation, maintaining the highest levels of quality without increasing delivery time

Pentair offered a new design with a primary metal, secondary soft seat engineered to meet the client’s requirements.

The client was very satisfied with Pentair’s ability to translate the technical requirements into a complete solution using Raimondi ball valves and Biffi electric actuators. As a result, Pentair was called upon to provide technical input throughout the multistage project.
The refineries succeeding in today’s marketplace are those dedicated to building their capabilities and improving their efficiencies. Evolving markets necessitate upgrades, retrofits, expansions and new construction. Environment, health and safety priorities are critical and performance demands are high.

Pentair helps these dynamic facilities increase throughput and reliability, extend run times and reduce maintenance by providing one of the industry’s widest range of pressure relief, quarter-turn valves and actuators for severe service isolation and overpressure protection.

Our service and turnaround capabilities provide shop and field service, asset and parts supply management, and training to help ensure that our customer’s applications/operations meet the most demanding performance requirements.

When the use of HPHT hydrogen in refining resulted in corrosion, embrittlement and blistering issues, Pentair leveraged our metallurgy expertise to develop specialized valve technology that significantly improves safety and performance while reducing environmental risk.

Pentair’s innovative TOV with zero leakage technology integrates metallurgy, design, manufacturing and gasket technology to achieve the high performance standards demanded by hydrogen processes.

We help our customers deal with overpressure protection not only with our highly engineered pressure relief valves but also with our complete safety instrumented systems, such as ESD valves and full packaged HIPPS.

Valve monitoring and automation help to improve safety, efficiency and regulatory compliance, but the cost and complexity of wired systems are a major limitation to their use. To help refineries, Pentair provides wireless valve monitoring technology that eliminates the need for wired infrastructure. The wireless systems are a low-cost, high-performance way to extend monitoring benefits to a much greater valve population.

Pentair’s customized, bundled valve and control solutions include:

- High-temperature hydrogen applications
- Critical isolation valves
- Overpressure protection valves and safety instrumented systems
- Valve position monitoring and automation
- Leak detection systems on tank farms
- Instrumentation isolation and calibration
- Partial stroke testing and diagnostics
- Flame and detonation arrestment
IMPROVING INFRASTRUCTURE AND PERFORMANCE SAFETY

A large refinery in Brazil started a program for significant upgrades to existing facilities and expansion of the hydrotreatment capabilities. These improvements required a large number of valves and control systems — particularly valves able to handle hydrogen at high temperature and pressure — meeting high standards of safety and performance.

Pentair leveraged its wide product portfolio and supplied ESD valves and actuators with Vanessa TOV and Biffi packages. To help expand the hydrotreatment units, Pentair turned to the advanced metallurgy, packaging features and true zero leakage performance of Vanessa TOV to replace existing gate valves and completed the packages with Morin actuators.

The successful installation and continuing expert maintenance services have cemented Pentair’s reputation for excellence and efficiency at this refinery, and have led to a variety of additional orders for subsequent projects.
Triple Offset Valves
Metal seated rotary process valves provide bi-directional, zero leakage shut-off, suitable for a wide range of pressures and temperatures. Vanessa

Pressure Relief Valves
Pilot operated and direct spring operated pressure relief valves suitable from vacuum to high pressure and from cryogenic to high temperature applications. Anderson Greenwood, Crosby, Varec

Choke Valves
For the control of high-pressure drop and contaminated fluids. Vonk

Ball Valves
A complete range of ball valves, with both full and reduced bore, suitable for services and utilities in pipeline applications. Available certified and tested for cryogenic service. FCT, Raimondi, KTM, Hindle, Keystone, Richards, NeoTecha, MCF

Subsea Ball Valves
Top-entry, side-entry bolted valves; fully welded and dual ball designs for subsea manifolds, PLET and PLEM sleds, pipelines and flow lines. Testing facilities capable of simulating pressure conditions up to 12,000 feet [3658 meters]. FCT

Butterfly Valves
High-performance and resilient seated butterfly valves for demanding service conditions, including both high pressures and temperatures. Keystone, NeoTecha

FLOW CONTROL PRODUCTS FOR EVERY STAGE OF THE PROCESS
Actuation
A comprehensive range of electric and piston actuators, ideal for efficient on-off or modulating control of quarter-turn and linear valves.
Biffi, Morin, Keystone

Positioners and Controls
A range of pneumatic and electro-pneumatic positioners for proportional operation and advanced digital control of actuated valves.
Westlock Controls

Instrumentation Equipment
Hand valves, gauge valves and manifolds for instrument isolating, draining, calibrating and venting service.
Anderson Greenwood Instrumentation Products

Gate Valves
Gate valves manufactured to provide the highest performance in the widest spectrum of oil and gas applications.
Dewrance, Fasani, Hancock, Raimondi

Check Valves
Check valves including swing/tilting; dual plate; axial and lifting ball designs, suitable for backflow prevention in hazardous applications.
Fasani, Raimondi, Dewrance, Hancock, Sempelt, Prince, NeoTecha

Attemperators
Complete line of solutions specifically developed to inject process fluids into process gases under extreme conditions for LNG and refining applications.
Narvik-Yarway
At Pentair Valves & Controls, superior service on a global scale is more than just a job — it’s our mission. That’s why we provide local, factory-owned services and inventory, supplemented by independent channel partner organizations around the world.

Our local facilities represent the industry expertise and local knowledge that have made us an industry leader. They also provide repair services and stock extensive inventory, including Anderson Greenwood, Crosby, Keystone, KTM and many more brands — all available for same-day shipment. Our wide-reaching network and 24/7 accessibility make us uniquely capable of providing superior service — when and where you need us.

**Asset management:** The tracking of assets is critical for knowing the history of repairs, dimensions, modifications and revalidation dates — all a part of a superior asset management system. We have developed a web-based solution that provides these plus real-time tracking of assets through the repair process.

**Calibration and testing:** Pentair’s service facilities provide state-of-the-art calibration, leakage and operational testing on a wide variety of industrial products, including valves, actuators, positioners and related equipment.

**Commissioning:** We provide commissioning services for all Pentair products. Even if Pentair products are added to other manufacturers’ products in the field, we should be your first choice to make certain that the combined, assembled product meets all requirements.

**Diagnostics:** As a manufacturer, we know what to expect in terms of function and performance, and we’re uniquely qualified to diagnose valve and actuator performance issues, perform comprehensive root cause analysis and undertake erosion and corrosion analysis, and then make sound recommendations.

**In-house services:** Using state-of-the-art production and service facilities around the globe, we provide superior controlled environments, factory-trained maintenance and repair services. We are able to effectively and efficiently meet your service and repair needs using our expertise, original equipment and designers, and the best tools and equipment.

**Installation:** As the manufacturer of many well-known products and the owner of many well-known brands, we know how these products should be installed so they function as intended. Where installations must be performed by licensed, approved experts, we can subcontract those activities as needed and oversee the entire installation on your behalf.

**Maintenance and repair:** We deliver true factory service solutions worldwide. With our skills, knowledge and experience, we can service pressure relief, butterfly, gate, globe and check valves, as well as actuators and a host of other products.

**Onsite Services:** Delivering factory-trained teams of mobile technicians 24/7/365, our fleet of fully stocked service vehicles enables us to provide world-class aftermarket services anywhere you need them.

**Training:** We offer factory training services including technical and maintenance training at your location or in our own facilities. As a leader in valves and controls, we are your experts on Pentair products. We can even customize a training program for your particular needs and situation.
INTEGRATING FOR OPTIMIZATION

Three refineries and seven chemical plants along the U.S. Gulf Coast are being serviced via a five-year agreement covering management, repair and storage of more than 5,000 pressure relief valves. A key factor in the program is the integration of Pentair engineers and technicians with facility operating personnel to optimize repair scheduling and use of the operator’s existing inventory for lower costs and improved performance.

PREVENTIVE VALVE MAINTENANCE

A refinery originally signed a five-year preventive maintenance contract. That contract is currently in its 14th year.

At the onset, an intensive investigation was conducted to assess the probability and consequence of failure. Service intervals were then analyzed and redefined based on the inputs. Problem valves were identified and analyzed, and issues were addressed.

Replacement of these problem valves improved the safety and performance of the plant. The average service interval went from 26 to 43 months, saving the refinery $2 million USD in service costs. By 2006, 50 percent of the valves required inspection only every 36 months or less. By 2011, this was further reduced to 20 percent.
GLOBAL SUPPORT

Pentair service locations
Country-based mobile/customer site capabilities

Service Locations

United States
- Anchorage, Alaska
- Baton Rouge, Louisiana
- Bolingbrook, Illinois
- Bridgeport, New Jersey
- Corona, California
- Everett, Washington
- Mansfield, Massachusetts
- Pasadena, Texas
- Port Arthur, Texas
- Stafford, Texas

Canada
- Burlington, Ontario
- Calgary, Alberta
- Edmonton, Alberta
- Fort McMurray, Alberta
- Grande Prairie, Alberta
- Midale, Saskatchewan
- Varennes, Quebec
- Whitecourt, Alberta

Latin America
- Buenos Aires, Argentina
- Coatzaoculos, Mexico
- Guadalajara, Mexico
- Macae, Brazil
- Santiago, Chile
- Sao Paulo, Brazil
- Sorocaba, Brazil

Africa
- Alberton, South Africa
**Europe and Middle East**
- Aberdeen, Scotland
- Armentieres, France
- Basell Wesseling, Germany
- Breda, The Netherlands
- Briga Novarese, Italy
- Dubai, UAE
- Etten-Leur, The Netherlands
- Fiorenzuola d’Arda, Italy
- Heerle, The Netherlands
- Ingolstadt, Germany
- Korschenbroich, Germany
- Ludwigshafen, Germany

**Lugagnano Val d’Arda, Italy**
- Malmo, Sweden
- Marienhagen, Germany
- Peitz, Germany
- Pembroke, England
- Redcar, England
- Rescaldina, Italy
- Saint-Juery, France
- Vitrolles, France
- Walkden, England

**Asia**
- Beijing, China
- Chiba, Japan
- Chubu, Japan
- Chugoku, Japan
- Hokkaido, Japan
- Kashima, Japan
- Kuantan, Malaysia
- Kurashiki, Japan
- Kyushu, Japan
- Mumbai, India
- Osaka, Japan
- Quangang, China

**Rayong, Thailand**
- Shanghai, China
- Singapore
- Songkhla, Thailand
- Tokai, Japan
- Tokyo, Japan
- Visakhapatnam, India

**Pacific**
- Auckland, New Zealand
- Brisbane, Australia
- Collie, Australia
- Gladstone, Australia
- Hamilton, New Zealand
- Kalgoorlie, Australia
- Karratha, Australia
- Newcastle, Australia
- New Plymouth, New Zealand
- Nowra, Australia
- Perth, Australia
- Sale, Australia
- Sydney, Australia