Emerson Innovation Center

For Fisher® Technology Development

FISHER®

EMERSON™
Process Management

THE CONTROL VALVE YOU CHOOSE MATTERS WHEN YOU HAVE TO ACHIEVE MORE EFFICIENT, PRODUCTIVE, AND SAFER PLANT OPERATION.

The process industry is changing. Facilities are bigger and demand larger, highly engineered control valves for more severe applications.

At Emerson, we have a staff of talented engineers who are passionate about developing Fisher® control valves for the ever-changing process control industry. Our engineers were the:

- First to develop the proven digital plant architecture, PlantWeb™.
- First flow test lab in the process control industry.
- First to develop authoritative capacity and sizing data charts.
- First to use rotary valves as process control valves.
- First to commercialize quick-change, cage-style trim.
- First to develop aerodynamic noise prediction techniques and procedures.
- First to receive N-stamp certification and to manufacture automatic control valves for nuclear power plants.
- First to develop digital valve controllers and performance diagnostics for improved control and predictive maintenance.
- First to develop special control valve sizing procedures for non-ideal fluids, non-Newtonian fluids, and out-gassing fluids.
- First to provide a method for customers and consulting engineers to accurately predict plant noise generated by control valves.
- First to provide dedicated material expertise in the industry.

We're proud of our reputation for taking up challenges so that *It's Never Been Done Before* simply becomes *Consider it Solved*.

When you buy Fisher control valves, you get the applications experience that comes from over 130 years of work in the industry. Plus you get the benefit from millions of dollars of research invested in solving the issues important to you.

Fisher product specifications are, in many cases, more stringent than the industry accepted standards set by regulatory agencies. Our attention to and evaluation of product quality is necessary to bring you Fisher technologies of the highest reliability and performance.

Using Fisher technology is the best way to achieve efficient, productive, and safer plant operation and this can be demonstrated by a visit to the Emerson Innovation Center for Fisher Technology.

QUALIFYING CASTINGS

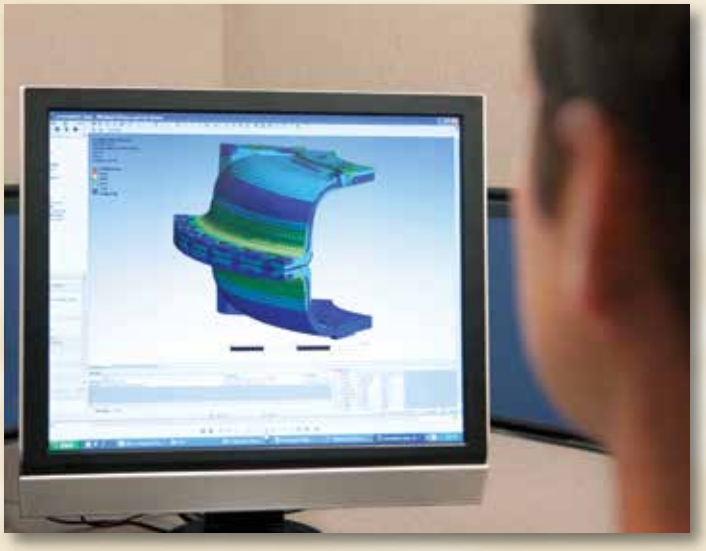
Casting quality is frequently cited as a safety issue. Global sourcing of castings has heightened customer awareness and concern about the integrity of these castings.

Emerson enforces a comprehensive quality specification for its Fisher control valves that must be met by all suppliers of pressure-containing and structural metal castings. These requirements exceed those specified by ASME, ISO, and EN.

Emerson requires casting suppliers to submit all weld procedures for approval to ensure they meet requirements of ASME Section IX and Pressure Equipment Directive (PED).

In addition, samples must be submitted to the Emerson materials lab for metals that are especially problematic to cast and heat treat, such as duplex stainless steel and high-nickel alloys.

GOING BEYOND CODES



Minimal stress on all features of a pressure vessel greatly improves fatigue life and therefore, safety. Simply meeting minimum wall thickness requirements is not sufficient.

Using advanced finite element analysis (FEA) models, our engineers analyze complex geometries in control valve designs to locate stress concentrations. A cross sectional look at the finite element analysis model of an actuator illustrates areas of varying stress levels as shown by the color gradient. Design modifications to minimize stresses can be quickly implemented before prototyping or production tryouts.

In addition to meeting minimum wall thickness specified in standards, every Fisher structural design undergoes a proof hydrostatic test to verify that the stress does not exceed the code allowable stress and to validate the FEA model.

Fisher control valves are used in safety-critical areas of nuclear power plants and it is imperative that they work when called upon. They undergo rigorous qualification testing to satisfy the requirements of ASME QME-1, IEEE382, IEEE344, and IEEE323.

IMPROVING OPERATIONAL SAFETY

Processes that involve toxic or highly flammable fluids rely upon safety instrumented systems. Lack of knowledge of valve position or operation threatens worker safety, causes environmental concerns, and potentially damages operating equipment.

Emerson has developed digital valve controllers to meet customers' emergency shutdown requirements. As part of the emergency shutdown valve package, the Fisher digital valve controller enables automated partial stroke testing while the valve remains online. Diagnostics reporting provides automated pass/fail results, an audit trail, and time stamp.

Fisher SIS digital valve controllers have been certified by TÜV Product Services (Germany) to be in accordance with IEC61508 for use in safety instrumented systems up to safety integrity level 3.

In addition to SIS technologies, Fisher and TopWorx® wireless position monitoring technologies provide operators with the status of their valves. Position monitoring enables safe startups and shutdowns, reduces unintentional releases, and eliminates the need for visual inspection.

LIMITING EMISSIONS

Leaking chemicals and gases can be harmful to health and to the environment. Accordingly, stringent regulations are in place to control the amount of fugitive emissions released into the atmosphere.

Fisher control valve packing technologies ensure compliance with standards and customer expectations. These technologies offer excellent emission control capabilities and were tested and certified by these international certification organizations: Cetim (ISO 15848-1 Class B), Yarmouth (FCI/ANSI 91-1), and TÜV (TA-Luft).

The helium mass spectrometer counts each atom of helium detected through the sniffer probe and calculates a leak rate. For the Fisher control valve shown above, the total accumulated leakage over one year would be equivalent to a bubble the size of a golf ball.

Emerson has multiple packing technologies that are so unique and novel that they are patented. Fisher packing technologies are methodically developed with rigorous test techniques. These are regarded by our customers as best-in-class packing that not only comply with emissions standards, but improve malodorous and harmful plant environments.

Where zero emissions are required, Fisher bellows technologies are available in corrosion-resistant materials.

QUIETING NOISE

Process plants require controlled noise levels to protect employees. Reduced fenceline noise levels are also necessary to maintain good relationships with adjacent, populated areas.

Fisher noise attenuation technologies enable effective noise-reducing control valves and provide installed predicted noise levels consistently, for compliance with regulatory limits.

Supported with a 4,738 m^2 (51,000 ft^2) facility and a unique 2,415 m^2 (26,000 ft^2) sound chamber, Emerson can accurately quantify noise from piping and vents. Test programs are conducted on Fisher control valves, valve trim, silencers, diffusers, and spargers as well as tees, elbows, reducers, and expansions to determine their contribution to overall noise.

Accelerometers and pressure transducers are used to measure pipewall vibration and sound level.

Acoustics expertise is utilized at all stages, from product development to application, quotation, and as-installed performance. Experts are available to analyze the entire plant environment and solve noise problems beyond the control valve.

DIAGNOSING CONTROL VALVES LOCALLY

Process equipment maintenance must be planned, yet it is difficult to know which equipment needs maintenance. Since control valves are the primary elements in the loop that actually adjust the process, their performance is fundamental.

Since their introduction, Fisher digital valve controllers have changed the way plants monitor control valves. Features such as auto calibration; linkage-less, non-contact feedback; and on-line performance diagnostics provide unsurpassed real-time plant performance. More than 50 patents have been awarded for the product line.

Hazardous areas or hard-to-reach locations present barriers to locally verifying proper control valve performance. In the past, local diagnostics required technicians to use laptops in the field.

Emerson mobile technology offers a solution to this longstanding problem through the use of handheld field communicators. This tool of choice for maintenance technicians has been expanded to include control valve diagnostics. Fisher application software allows the extension of the technology to other handheld platforms, such as PDAs and smartphones. Catwalks, ladders, or other difficult locations no longer present a barrier to maintenance technicians. Diagnostic tests can now be run with ease and mobility.

PROTECTING COMPRESSORS

In order to operate more efficiently, liquefied natural gas plants prefer to run turbo compressors close to the surge limit line. The margin for error to avoid equipment damage during surge events is very narrow.

Antisurge valves must be responsive in order to protect critical and costly compressors from damage during transients. They also must be accurate to allow operation at peak efficiency.

Technologies incorporated in Fisher antisurge valves are unmatched by any other manufacturer. Fisher precision actuation technology enables a full stroke up to 50.8 cm (20 in) in less than one second and better than 1% positioning accuracy for even very large control valves.

Setup and tuning can be performed remotely and in minutes. Without Fisher technology it can take hours. Factory acceptance testing to Fisher specification FGS 4L11 typically eliminates the need for any tuning changes after installation.

Fisher digital valve controllers use special, antisurge-specific control and tuning algorithms for robust, stable, high performance control.

The FGS 4L11 factory acceptance test is becoming an LNG industry standard. This performance standard is being applied to critical process control in all industries.

QUALIFYING MATERIALS

Equipment constructed from a material incompatible with the process environment may damage operating equipment or cause a plant shutdown.

Fisher material technologies offer a significant reliability improvement over generic grades. Material formulations are developed, specified, and controlled for metals, elastomers, and plastics in Fisher control valves.

A fully-equipped materials lab is staffed by Emerson technologists who verify that materials and coatings will perform to expectations physically and mechanically. If materials and suppliers do not meet our stringent standards, they are rejected.

Emerson technologists are industry leaders, developing new global standards and identifying new materials that will solve difficult customer problems. They are the ones the industry turns to when materials don't perform as expected.

Elastomers are highly documented as the cause of downtime in plants. Off-the-shelf elastomers cannot meet climate extremes and require extensive qualification. Dynamic mechanical analysis has been performed on each Fisher elastomer formulation to investigate the high and low temperature.

WITHSTANDING VIBRATION

High vibration from process plant operation can shorten equipment service life, damage critical components, and cause deterioration or total loss of control.

Fisher control valves are designed and tested for robustness in vibration applications. Emerson engineers qualify products to industry vibration standards and then go farther. For instance, Fisher products are subjected to additional testing for millions of cycles at their resonant (worst case) frequency to assure performance in your process plant.

Fisher products, by design, are enhanced to improve vibration robustness. Wear points are eliminated in Fisher instrumentation with linkage-less, non-contact position feedback. Integral mountings make brackets and external tubing obsolete.

MODERNIZING UNITS

Stopping production and turning off profits in order to modernize process units is not economically feasible.

A hot cutover allows plants to switch to digital without taking the process down. The ability of Fisher digital valve controllers to function in two operating modes, pressure and travel, has multiple benefits for hot cutovers. Fisher digital valve controllers' unique pressure control capability keeps control valves at set point as you switch to digital instrumentation.

Personnel can locate the digital valve controller on the control valve, make a fieldbus connection, and configure it to the pressure control mode to perform as a fieldbus-to-pressure transducer, providing input to the existing pneumatic positioner. Then, when the control room is ready, the digital valve controller can be easily switched to travel control, replacing the pneumatic positioner.

SURVIVING EXTREME TEMPERATURES

Whether driven by process temperatures or climate extremes, control valves need to operate as specified. LNG control valves are tested at cryogenic temperatures of -196°C (-321°F).

REMOTE MOUNT SOLUTIONS

A refinery valve used in catalytic reforming is tested at 704°C (1300°F). Remote mount solutions for instrumentation decouple the electronics from the process environment for extended temperature range.

TROUBLESHOOTING CONTROL VALVES

While control valves are on-line and in service, Fisher digital valve controllers can detect, capture, and trend more than 200 fault conditions and provide recommended actions.

HIGH CYCLE TESTING

The cycle life of Fisher control valves is verified. To meet Emerson's pressure swing adsorption quality standard, cycle counts must exceed one million.

REDUCING PROCESS VARIABILITY

Reducing process variability is key to improving product quality. Excessive variability is the direct result of control equipment—such as control valves—failing to achieve required performance levels.

To minimize variability, Emerson engineers perform comprehensive tests on complete control valve assemblies during new product development. These control valve assemblies are subjected to on-line, dynamic performance testing to evaluate their ability to reduce variability. These tests replicate how customers actually use control valves in the field.

Fisher products have historically set the standard for dynamic performance. Emerson is dedicated to continuous improvement of existing products. New products must exceed the performance of the products they replace. Best-in-class flow lab facilities and control experts enable us to meet these challenges.

REDUCING AIR OR GAS CONSUMPTION

High consumption of compressed air or natural gas by instruments means high energy costs for plants.

Emerson engineers developed technology in the instrument product line that reduces steady-state air or gas consumption to 1/10th that of previous products for significant energy and economic savings. This technology is so novel that it is patented.

Emerson technologists use state-of-the-art analysis tools and laboratories to maximize instrument control performance while minimizing air consumption.

ACCURATE ENGINEERING

Sizing coefficients for Fisher control valves are based on actual flow tests performed by Emerson engineers. It is not necessary to apply conservative sizing practices; therefore, project costs are reduced.

Every Fisher control valve design undergoes thorough and extensive flow testing. Test engineers determine sizing coefficients, stem force or hydrodynamic torque requirements, and investigate actual performance.

Real processes often operate under conditions that are beyond the scope of industry standards. Enhanced control valve application technology has been developed that helps ensure that correct valve sizes are specified for all application conditions. Examples include non-ideal gases, multi-phase flow, and out-gassing fluids. Correct valve sizes help ensure safe and trouble-free operation, avoiding adjustments during startup.

Test engineers operate three flow labs on three continents giving Emerson engineers access to flow lines up to NPS 36 and 240 bar (3,500 psig).

SPECIFICATION AND PROCUREMENT TIME

An ISA data sheet has 120 fields that must be agreed upon between the control valve specifier, supplier, and end user. Control valves are designed for each unique installation and require an intense exchange of information.

Fisher Specification Manager software helps you manage your control valve specification data. It enables seamless import/export data exchange with Intergraph's SmartPlant Instrumentation®

INTEGRATION

Emerson recognizes that process plants are interconnecting products from different suppliers and that true interoperability is essential.

Emerson tests different hardware and firmware versions of Fisher control valves, digital valve controllers, and software to assure no loss of functionality or data. Fisher products are connected to various communication protocols, automation systems, multiplexers, wireless gateways, and Windows® operating systems. Testing a variety of Fisher control valve and instrument revisions confirms that current and legacy devices integrate properly into user interface tools.

INSTALLATION TIME AND COST

Reduced installation time and cost result in faster time to market. With Fisher control valves, you will realize significant savings.

- Industry-leading wireless products can eliminate wiring all together.
- FOUNDATION™ fieldbus reduces field wiring expense.
- Realize reduced commissioning time with ease-of-use features such as auto calibration and tuning for Fisher digital valve controllers.
- Fisher digital valve controllers with non-contact, linkage-less feedback allow for reduced mounting and calibration time.
- Fisher software allows commissioning of all control valves from the maintenance engineer's workstation.
- Factory acceptance testing documented by FGS 4L11 reduces on-site tuning for compressor control and other critical applications.

Testing ensures flexibility of control valve installation orientation. Fisher rotary control valves can be mounted in either horizontal or vertical position without compromising cycle life.

Fisher technology development capabilities extend worldwide with engineers and labs in North America, Europe, and Asia. We have subject matter expertise in the following fields:

- Accelerated testing
- Acoustics
- Advanced modeling
- Codes and standards
- Control theory
- Design of experiments
- Embedded firmware design
- Fluid behavior and thermodynamics
- Low power electronics
- Materials
- Seismic analysis
- Statistics
- Structural analysis
- Test automation
- Vibration
- Wireless

WORLDWIDE LABS INCLUDE:

- Acoustics Lab
- Calibration Lab
- Cycle Test Lab
- Experimental Stress Analysis Lab
- Firmware Development Lab
- Flow Lab
- Hot Air Testing Lab
- Instrument Endurance Lab
- Instrument Environmental Lab
- Instrument Electronics Lab
- Instrument Firmware Test Lab
- Instrument Integration Test Lab
- Instrument Manufacturing Lab
- Instrument Marketing Lab
- Instrument Mechanical Lab
- Instrument Product Evaluation Lab
- Instrument Research Lab
- Instrument Technical Support Lab
- Instrument User Interface Lab
- Materials Lab
- Optimized Digital Valve Lab
- PlantWeb Demonstration Lab
- Performance Differentiation Lab
- Prototype Development Lab
- Seismic Lab
- Vent Testing Lab
- Vibration Lab

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