



SERVICES AND SOLUTIONS

Education and Training

Customer Site • Learning Resource Center • Online



Experience In Motion

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





EDUCATIONAL RESOURCES TO ENHANCE WORKFORCE COMPETENCY

Flowserve Education and Training provides companies around the world with a wide range of innovative programs focused on helping plant operators, reliability specialists, engineers and maintenance personnel deepen their understanding of flow management equipment and systems. Training programs from Flowserve are ideal for organizations seeking:

- Maximized plant asset availability and equipment reliability
- Increased mean time between repair (MTBR)
- Workforce development for increasing proficiency in the installation, design, operation, maintenance and repair of flow management equipment and systems

Whether customers require basic training or customized programs, Flowserve offers an unparalleled global network of training experts and facilities to accommodate any request. Customers can choose the location, course content and program formats that optimize the use of human and financial resources and deliver the most effective results.



***Customer Site* Page 4**

Flowserve Educational and Training resources provide the design, development and delivery of training tailored specifically around the people, equipment and processes at a customer's location. Unlike off-the-shelf solutions, trainers deliver individualized instruction on the concepts, processes and equipment needed to maximize employee performance in the customer's environment.



***Learning Resource Center*..... Page 8**

Often it is more effective for customers to send key associates to a central location for intensive focused training. To enable this, Flowserve has committed to the construction and support of the industry's largest and most sophisticated network of Learning Resource Centers. These state-of-the-art facilities ensure participants receive a balanced combination of hands-on training and instruction in the principles of equipment operation, maintenance and reliability.



***Online*..... Page 10**

Pumping and system fundamentals have been pre-packaged in an online format that allows engineers, operators and other associates to learn the basics before investing in more extensive instructor-led courses. Web-based modules allow for self-paced study of important topics and online testing and data tracking ensure comprehension of the most important principles.

CUSTOMER SITE Education and Training



Flowserve Education and Training resources are often most effectively deployed at the customer location. Customers enjoy the time savings and convenience of on-site instruction. More importantly, on-site training allows Flowserve trainers to incorporate real examples from the customer’s environment to drive home important principles. This allows trainees the opportunity to immediately discuss learned techniques and practices in the context of everyday issues and apply these principles under the guidance of Flowserve experts.

Driven by Customer Goals

While customers may select from a menu of standard course offerings, customer training is frequently tailored to address specific requirements based on audience or flow management system issues. A Flowserve Education and Training expert can help develop a program that addresses specific customer goals.





BRINGING THE LAB TO THE CUSTOMER – REMOTE AND PORTABLE TECHNOLOGIES

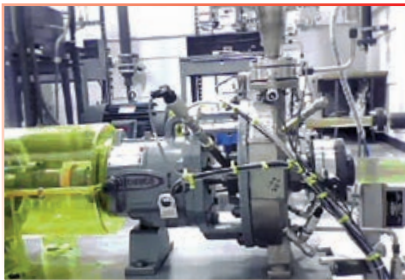


Portable acrylic pump system

To optimize the customer site learning experience, Flowserve trainers can utilize portable acrylic pump systems as well as remote hydraulic lab technology. Live demonstrations in person and via the Web provide trainees immediate real-world feedback of important hydraulic principles.

Seeing Is Believing

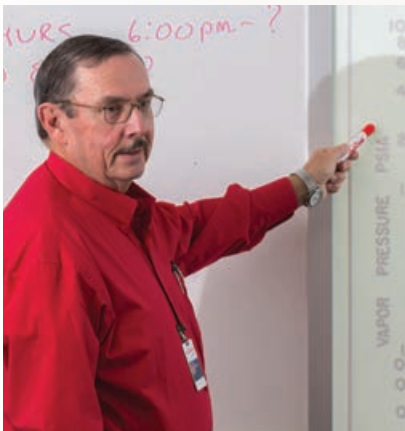
Flowserve utilizes acrylic pumps, valves and system components to expose the inner workings of a flow management system. By simulating a variety of operating scenarios – from suction throttling to air entrainment – trainees can better understand the cause-effect relationships of operating practices and system disruptions. Mobile units can be used at the customer site and, in some cases, customers have purchased these models for permanent use at their facilities.



Remote hydraulic lab

Laboratory Access Anywhere, Anytime

As appropriate, Flowserve training facilitators use the advanced hydraulic labs built at Flowserve Learning Resource Centers to demonstrate system operating principles. Using a Web-based remote operating platform, live demonstrations and simulations can be executed from the customer site while trainees watch equipment response and monitor operating parameters online.



About Flowserve Instructors

Flowserve training facilitators are among the global process industry's most proficient equipment and system experts. They are hand-selected for their industry expertise and complete rigorous training before becoming certified trainers. Re-certification of their training credentials is required on a systematic basis. Customers can expect a high-energy, interactive and challenging environment for all attendees. Typical instructor qualifications include:

- Typically 20+ years experience
- Flowserve training certification
- Multi-language capabilities

Flowserve training experts ensure an environment of accountability where attendees are encouraged to engage in educational activities and are required to participate in post-course testing. The testing enhances retention of learned material and provides managers with a valuable measure of training effectiveness.

CUSTOMER SITE EDUCATION AND TRAINING OFFERINGS



Custom Courses

Flowserve Education and Training experts will develop an entire specialized curriculum or customize an existing program to satisfy any training need. Because the training is customized, many process and equipment issues can be addressed as part of the course content. Examples of customized training delivered by Flowserve are listed here:

- Flowserve prepares maintenance and operator training specific to the hydraulic decoking systems it provides to major refineries. All course materials and hands-on experiences are refined to account for the specific equipment and operating parameters found at the customer site, resulting in a highly relevant and effective training regimen.
- For equipment installed at a new site or during an expansion, Flowserve often provides customized, item-specific training to personnel responsible for operating, maintaining and repairing the equipment. The training takes place using the actual equipment and Installation and Operating Manual prior to installation. The result is an improved startup, and longer MTBR due to proper operating and maintenance practices.
- Flowserve contracts with customers to rewrite customer training courses for pumps and mechanical seals at customer sites like refineries or power plants. Training experts revamp the existing training to incorporate site-specific specifications for operation and maintenance and to maximize retention. Ultimately, Flowserve trainers deliver the course material on a scheduled basis across all customer sites.

Many customers choose to engage with Flowserve for extended contracts to ensure all personnel are ultimately exposed to the principles that will drive a more efficient and profitable plant operation. Certifications can be provided to ensure personnel achieve customer-specified performance standards.

EDUCATIONAL CREDITS

Flowserve brings additional value to the customer workforce by offering Continuing Education Credit for many of the classes offered both at customer sites and Learning Resource Centers. Flowserve offers many classes which meet specific professional standards of instruction and content which enables registered students to receive Continuous Education Units (CEU) or Professional Development Hours (PDH). Course attendees who complete approved classes with a successful pass rate of 80% on the final exam qualify for credits.



Available Course Offerings

Depending upon the role of the student, Flowserve offers courses ranging from those for the generalist to those who have obtained engineering degrees. A comprehensive catalog of technical and maintenance courses provides plant engineers, operators, reliability experts and maintenance technicians with the training they need on the equipment they use every day — on location or at Flowserve Learning Resource Centers.

Track One: For Operations Personnel (OP)

This track is for persons involved in day-to-day operations and for those who do not have an engineering or related technical degree. Persons who want to understand more about pump and seal basics should sign up for these classes. For example, those involved in purchasing, training, human resources and safety or similar occupations would want to consider this track.

Track Two: For Maintenance Personnel (MP)

This track is for maintenance personnel. These persons would have experience in maintaining and servicing pumps and seals used in the processing systems of the plant. It would be helpful for enrollees to have a few years of hands-on involvement as well.

Track Three: For Reliability Personnel (RP) and Engineering Personnel (EP)

This track is for those who have an engineering degree or similar education and background. These offerings are advanced courses that do NOT cover pump and seal basics and assume the student already has an engineering foundation. Beginners should not sign up for these classes and are encouraged to look at the basics classes offered in Track One.

| Course Name ⁽¹⁾ | Description | Suggested Track |
|---|--|-----------------|
| Pump and Mechanical Seal Basics | Provides participants with the knowledge and skills needed to understand the basics of pumps and mechanical seals | Track One |
| Pump and Seal Operator Training | Teaches principles and procedures to optimize pump and seal life through proper startup, operation and shutdown | Track One |
| Vibration, Alignment and Balancing Basics | Imparts knowledge and increases understanding about rotating equipment health and how vibration analysis is used to determine condition of rotating machinery | Track One |
| Root Cause Analysis | Designed to provide detailed comprehension of how to perform RCA and achieve results through resolution | ALL |
| Pump and Mechanical Seal Principles | Provides the knowledge and skills to understand the basics of pumps, pumping systems and mechanical seals, with emphasis on design, operation and maintenance | Track Two |
| Pump and Mechanical Seal Reliability | Gives participants a better understanding of the interrelated functions of the centrifugal pump, mechanical seal and complete pumping system | Track Two |
| Single-Stage Pump Repair | Uses classroom setting and static lab to reinforce repair concepts with hands-on exercises | Track Two |
| Centrifugal Pump Fundamentals | Provides a detailed explanation of how a centrifugal pump is constructed and operated to achieve maximum reliability | Track Two |
| Mechanical Seal Fundamentals | Describes the basics of mechanical seal systems and the theory behind how they work, with emphasis on operation, effects of operating environment and support systems | Track Two |
| Entry-Level Vibration Training—ISO Category 1 Certification (ELVT) | Focuses on periodic, single channel data collection and analysis for condition-based maintenance programs while establishing the basis for understanding spectrum and waveform relationships | Track Two |
| Multistage Pump Repair | Instructs participants in proper procedures for preparation, rigging, disassembly, inspection and reassembly of multistage pumps | Track Two |
| Pump System Analysis | Provides an in-depth review of how to conduct system evaluations and calculations to optimize system performance | Track Three |

1. Available on-site at customer location and eligible for Continuous Education Credit

LEARNING RESOURCE CENTER Education and Training



Off-site training at one of the Flowserve global Learning Resource Centers allows trainees to focus on educational content without the distractions and interruptions of day-to-day work pressures. In addition, off-site training affords customers the opportunity to have personnel from similar roles converge at a centralized location to learn and exchange best practices. The collaborative environment generated at a Flowserve Learning Resource Center (LRC) is ideal for customers looking for new and better ways to operate their plants more effectively.



Flexible Programs to Meet Any Need

Whether customers require basic training or customized programs, Flowserve offers an unparalleled global network of training experts and facilities to accommodate any request. Customers can choose the Learning Resource Center most convenient to their operations and course content and program formats that optimize the use of personnel and financial resources.

Information on Custom and Standard Course offerings at Learning Resource Centers can be found on pages 6 and 7. Full course listings and registration information are available at www.flowserve.com.

Learning Resource Center Locations



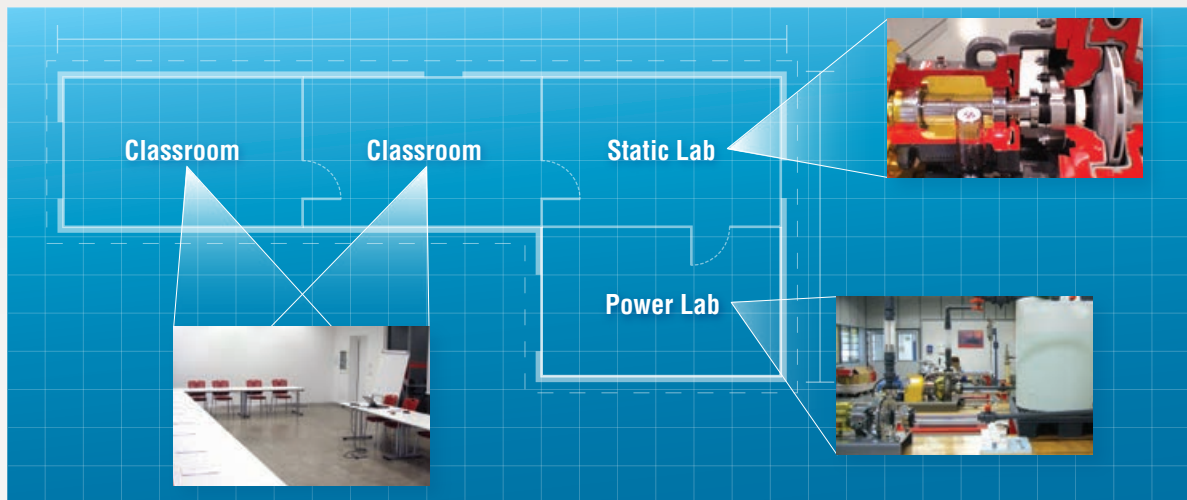


LEARNING RESOURCE CENTERS



Flowserve boasts the industry's largest, most sophisticated network of educational centers with facilities in North America, South America, Europe and Asia. The company is committed to continuous investment in strategically located facilities with the latest training technologies to ensure participants receive a balanced combination of hands-on training and instruction in the principles of operation. A complete listing of Flowserve Learning Resource Centers is available online at www.flowserve.com.

The LRC Training Blueprint



Classrooms

Typically sized to accommodate up to 20 participants, classrooms are designed to allow interactive discussion of theory and principles to build the foundation for hands-on instruction.

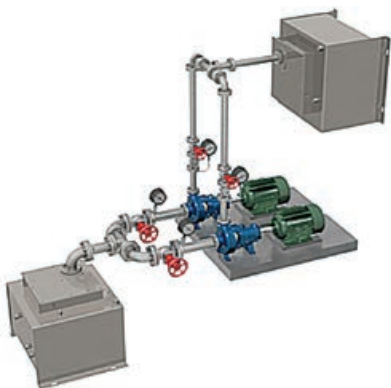
Static Lab

Static Labs are equipped with a wide range of equipment for conducting experiments and practical exercises related to hands-on repair, symptom identification of failure, material identification, selection, installation and other vital troubleshooting skills.

Power Lab

In Power Labs, process systems operate as they do in plants. Systems are filled with innovative see-through training aids such as glass flow meters, plexi-glass suction lines, extensive gauges, vibration monitoring equipment and unique clear acrylic pumps. Students learn first-hand how to prevent equipment failure and to operate systems more efficiently.

ONLINE Education and Training



In today's business environment where resources are short and time is limited, not every plant can afford the commitment of on-site and off-site training offerings. As such, Flowserve is leading the industry in the development of online course content related to process systems and equipment. Web-based training programs systematically lead participants through programs that include theory, real-life examples and easy-to-understand visuals to drive home important principles. To learn more and register for online training, visit www.flowserve.com/onlinetraining.

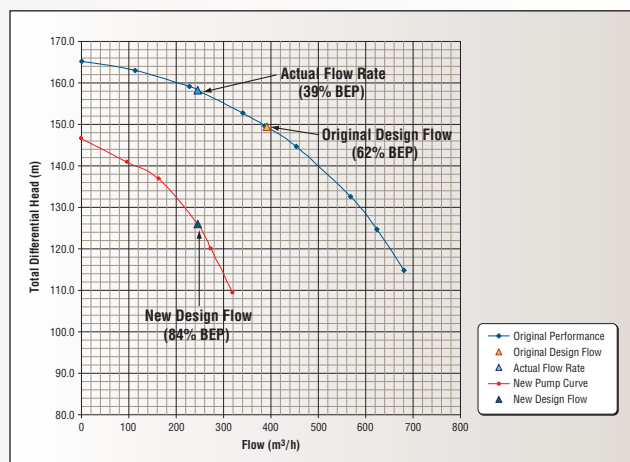
Why Online Training May Make Sense

While nothing can replace the enhanced learning that comes from classroom instruction and hands-on labs, online training provides an alternative for customers with pressures like:

- A rapidly expanding workforce requiring immediate exposure to process and equipment fundamentals
- Shrinking operational budgets that eliminate the possibility for travel or on-site facilitation
- Schedule constraints that don't allow for structured, multi-day courses
- Lack of pre-requisite exposure to leverage more advanced training

Self-paced or Expert-facilitated

Flowserve is continually developing online course content to meet a variety of customer needs. Pre-packaged training vignettes covering basic equipment fundamentals, hydraulic principles and complex process systems are immediately available through the Flowserve Learning Management System. Instructor-led courses featuring group webinars, online discussions and off-line assignments take online workforce development to the next level.



Online Access and Management Tools

The Flowserve iStore offers the convenience of online ordering for its Web and LRC-based training programs. Managers or individual participants can view available course offerings and purchase training seats using credit cards, purchase orders or P-cards. After an account is established, user credentials are automatically forwarded. Management tools allow participation and performance tracking to monitor workforce development progress and return on investment. Learn more at www.flowserve.com.



THE REAL IMPACT of Flowserve Education and Training

Asset Optimization Program Improves Personnel Capabilities

The Challenge: As part of a reliability initiative, a Middle Eastern petrochemical plant needed to improve the pump maintenance competencies of its plant millwrights. The plant was seeking concrete evidence of improved personnel capabilities and measurable results within its maintenance activities in a short time frame.

Solution: The plant contracted with Flowserve to deliver a six-month pilot program focused on two specific plant areas – utilities and off-site. The scope of the contract included:

- A site audit
- A six-month competency enhancement program with a full-time on-site Flowserve associate
- On-the-job assessments of personnel
- Classroom and hands-on instruction including a certified pump fundamentals course

Flowserve technicians also engaged in other activities related to repair workflows and data cleansing.

The result of the site audit identified key areas of potential improvement in millwright knowledge competency, while also identifying areas for improvement across the customer's total maintenance strategy. Other issues related to management systems, data integrity and record keeping were also identified as areas for cost savings and efficiency gains.

The Results: The consistent delivery of customized training and on-the-job coaching resulted in significant improvements in job assessment scores after just six months as illustrated in Figure 1. On-site oversight of planning and job procedures further contributed to the overall success of the program. The results included not only a more competent millwright group, but also a 16% reduction in unplanned work orders for those repairs handled by the newly trained millwrights (Figure 2).

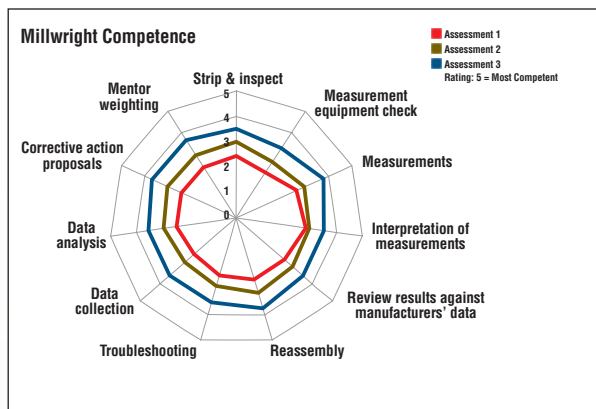


Figure 1

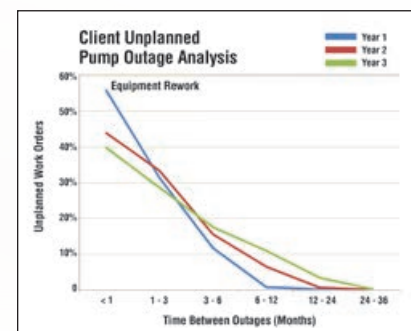


Figure 2



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Bulletin FSG-103e (E) March 2014. © 2014 Flowserve Corporation

To find your local Flowserve representative:

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