

Water Hammer and Surge Analysis Training Course

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Course Overview:

The course is a complete program designed to provide in-depth knowledge and practical skills in understanding and mitigating water hammer and surge phenomena in pipelines. This course covers essential topics such as water hammer, surge analysis, pipeline flow analysis, steady and unsteady flow in pipelines, inertia in fluid mechanics, elasticity of fluid and pipe wall, and resonance in pipelines. Participants will learn the application of the Joukowsky equation, numerical simulation of water hammer, accurate numerical surge analysis, and pipeline forces analysis. The course also delves into computerised surge analysis, manual calculations for surge control, energy storage in pipelines, and the use of air vessels, standpipes, surge tanks, flywheels, air valves, actuated valves, and swing check valves.

Target Audience:

- Pipeline Engineers
- Maintenance Managers
- Project Managers
- Pipeline Operators
- Water Resource Managers
- Fluid Mechanics Specialists

Targeted Organizational Departments:

- Engineering Departments
- Maintenance Teams
- Project Management Offices
- Operations Departments
- Safety and Compliance Units

Targeted Industries:

- Oil and Gas
- Water Supply and Treatment
- Energy
- Manufacturing
- Environmental Engineering

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Course Offerings:

By the end of this course, participants will be able to:

- Analyse and mitigate water hammer and surge phenomena.
- Apply the Joukowsky equation for surge analysis.
- Conduct numerical simulation and computerised surge analysis.
- Implement manual calculations and surge control measures.
- Design and utilize energy storage solutions in pipelines.
- Evaluate and apply various types of valves for surge control.
- Perform detailed pipeline forces analysis.
- Apply practical surge control measures in real-world scenarios.

Training Methodology:

This courseemploys a blend of interactive learning methods, including case studies, group discussions, hands-on exercises, and simulations. Participants will engage in real-world scenarios to analyse and mitigate water hammer and surge phenomena. The course includes feedback sessions and practical applications to reinforce learning and ensure participants gain a thorough understanding of the concepts and techniques covered.

Course Toolbox:

- Workbooks
- Reading Materials
- Online Resources
- Checklists and Templates
- Case Study Examples

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Course Agenda:

Day 1: Introduction and Fundamentals of Water Hammer

- **Topic 1:** Introduction to Water Hammer and Surge Analysis
- **Topic 2:** General - The Problem of Water Hammer
- **Topic 3:** Steady and Unsteady Flow in a Pipeline
- **Topic 4:** Fundamentals of Water Hammer
- **Topic 5:** Inertia in Fluid Mechanics
- **Topic 6:** Elasticity of Fluid and Pipe Wall
- **Reflection & Review:** Reflecting on the key concepts of water hammer and surge analysis introduced today.

Day 2: Advanced Water Hammer Concepts

- **Topic 1:** Resonance in Pipelines
- **Topic 2:** The Joukowsky Equation
- **Topic 3:** Scope of the Joukowsky Equation
- **Topic 4:** Numerical Simulation of Water Hammer
- **Topic 5:** Accuracy of Numerical Surge Analysis
- **Topic 6:** Forces Acting on Pipelines as a Result of Water Hammer
- **Reflection & Review:** Reviewing advanced concepts and their practical implications.

Day 3: Surge Analysis Techniques

- **Topic 1:** Computerised Surge Analysis
- **Topic 2:** Technical Procedure for Surge Analysis
- **Topic 3:** Interaction between Ordering Party and Surge Analyst
- **Topic 4:** Advantages of Rules of Thumb and Manual Calculations
- **Topic 5:** Energy Storage in Pipelines
- **Topic 6:** Air Vessels for Surge Control
- **Reflection & Review:** Evaluating different surge analysis techniques and tools.

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Day 4: Surge Control Measures

- **Topic 1:** Standpipes and One-Way Surge Tanks
- **Topic 2:** Flywheels in Fluid Systems
- **Topic 3:** Air Valves in Pipeline Systems
- **Topic 4:** Actuated Valves for Surge Control
- **Topic 5:** Swing Check Valves in Pipelines
- **Topic 6:** Case Study: Long-Distance Water Supply System
- **Reflection & Review:** Assessing surge control measures and their effectiveness.

Day 5: Practical Applications and Case Studies

- **Topic 1:** Case Study: Stormwater Conveyance Pipeline
- **Topic 2:** Model Parameters for Surge Analysis
- **Topic 3:** Calculation of Actual Duty Data and First Results
- **Topic 4:** Implementation of Surge Control Measures
- **Topic 5:** Advanced Water Hammer Case Studies
- **Topic 6:** Additional Literature and Resources for Further Learning
- **Reflection & Review:** Summarizing the course learnings and practical applications.

How This Course is Different from Other Water Hammer and Surge Analysis Courses:

The course sets itself apart by offering a complete and practical approach to understanding and mitigating water hammer and surge phenomena in pipelines. This course combines theoretical knowledge with hands-on exercises, real-world case studies to provide participants with the skills and confidence to apply surge analysis techniques in their professional roles. The inclusion of detailed numerical simulations, accurate surge analysis methods, and a focus on both manual and computerised surge control measures ensures that participants gain a holistic understanding of the subject. Additionally, the course covers a wide range of surge control techniques, from energy storage solutions to various types of valves, making it an all-encompassing training program for professionals in the field.

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- Crisis Management and Business Continuity Training Courses
- Data Analytics Training and Data Science Courses
- Digital Government & Public Service Training Courses
- Education and Learning Development Training Courses
- Environment & Sustainability Training Courses
- Facilities and Real Estate Training Courses
- Finance and Accounting Training Courses
- Governance, Risk and Compliance Training Courses
- Healthcare Management Training Courses
- Heritage Conservation and Museum Management Training Courses
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- IT Security Training & IT Training Courses
- Leadership and Management Training Courses
- Legal Training, Procurement and Contracting Courses
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- NGO, Humanitarian and Development Management Training Courses
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- Personal & Self-Development Training Courses

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- Secretarial and Administration Training Courses
- Shipping, Maritime and Ports Training Courses

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