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COURSE BROCHURE

Fluid Flow and Heat Transfer for Plant Equipment Training Course

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Fluid Flow and Heat Transfer for Plant Equipment is a 1-week training course for process, mechanical and maintenance engineers who size lines, judge pumps and rate exchangers, and each participant builds a Hydraulic and Thermal Duty Workbook for one plant circuit. Energy prices, ageing equipment and tighter emission targets now push plants to recover every kilowatt lost to friction and fouling. Jupiter Prime Training runs this course on fluid flow and heat transfer.

Why Fluid Flow and Heat Transfer for Plant Equipment Matters Now

Operations teams want more throughput from existing pipework, energy managers want lower pumping and steam use, and integrity engineers want fewer unplanned cleanings. A plant that reads pressure drop and heat duty correctly can debottleneck with an impeller trim or cleaning instead of new equipment; one that guesses runs pumps far from the best efficiency point BEP and loses heat recovery as deposits build on tubes and shells. The course rests on the Darcy-Weisbach friction model, the log mean temperature difference LMTD method and the effectiveness-NTU method.

Who Gains Most from Fluid Flow and Heat Transfer for Plant Equipment

- Engineers who specify line sizes, control valves and pump duties for unit modifications
- Rotating equipment specialists who judge pump operating points and recirculation problems
- Maintenance engineers who plan exchanger cleaning, retubing and insulation repair
- Process engineers who monitor exchanger performance and furnace or cooler duty
- Energy and utilities engineers who track steam, cooling water and pumping power

Unit support groups gain most when process, rotating and maintenance engineers attend together.

Fluid Flow and Heat Transfer for Plant Equipment Capabilities

Participants turn friction factors and film coefficients into defensible numbers for real pipe runs.

- Calculate pressure drop across straight pipe, fittings and valves — line sizing for unit modifications
- Specify a pump duty point against a plotted system curve — rotating equipment selection
- Assess laminar, transitional and turbulent regimes from Reynolds number — exchanger and line design choices
- Apply LMTD and effectiveness-NTU to rate an existing exchanger — operations debottlenecking
- Weigh fouling resistance against cleaning interval and lost duty — maintenance turnaround planning

- Communicate hydraulic and thermal margins in plain terms — plant managers and energy committees

Key Fluid Flow and Heat Transfer for Plant Equipment Terms

- Reynolds number — the ratio of inertial to viscous forces that shows whether pipe flow is laminar or turbulent.
- Friction factor — the Darcy-Weisbach coefficient linking roughness and regime to head loss.
- System curve — head the piping needs against flow, combining static lift and friction.
- Net positive suction head — suction pressure margin above vapour pressure that prevents cavitation.
- Overall heat transfer coefficient — the combined conductance of films, wall and deposits setting duty per unit area.
- Fouling factor — the added thermal resistance of scale or biofilm on exchanger surfaces.

Fluid Flow and Heat Transfer for Plant Equipment Day by Day

Day 1: Fluid Properties and Flow Regimes

- Density, Viscosity and Temperature Effects — Selecting Property Data for Calculations
- Reynolds Number and Regime Mapping — Laminar or Turbulent Design Assumptions
- Continuity and Bernoulli Energy Balance — Velocity and Head Along a Line
- Two-Phase and Slurry Flow Indicators — Recognising Where Simple Methods Fail
- Process Flow Diagram Line Lists — Choosing the Circuit for Study

Day 2: Pressure Drop in Plant Piping

- Darcy-Weisbach Equation and Moody Chart — Frictional Loss in Straight Pipe
- Fitting and Valve Resistance Coefficients — Minor Losses in Real Layouts
- Control Valve Flow Coefficient — Valve Authority and Sizing Margins
- Economic Velocity Ranges — Line Size Against Pumping Energy
- Water Hammer and Surge Basics — Protecting Lines During Valve Closure

Day 3: Pumps and System Curves

- Centrifugal Pump Performance Curves — Head, Efficiency and Power at Duty
- System Curve Construction — Static Head Plus Friction Across Flow Range
- Operating Point and Best Efficiency Point — Throttling, Trimming or Speed Control
- Net Positive Suction Head Margin — Cavitation Risk at Suction Conditions
- Parallel and Series Pump Arrangements — Meeting Variable Plant Demand

Day 4: Conduction, Convection and Exchanger Rating

- Conduction Through Walls and Insulation — Heat Loss and Surface Temperature
- Film Coefficients and Nusselt Correlations — Shell-Side and Tube-Side Performance
- LMTD Method With Correction Factors — Rating Shell and Tube Exchangers
- Effectiveness-NTU Method — Predicting Outlet Temperatures at New Flows
- Air Coolers and Plate Exchangers — Matching Exchanger Type to Duty

Day 5: Practising the Hydraulic and Thermal Duty Workbook

- Fouling Resistance Trending From Plant Readings — Cleaning Interval Decisions
- Pressure Drop Recalculation for the Chosen Circuit — Debottlenecking Options
- Pump Operating Point Check Against Measured Flow — Energy Saving Measures
- Exchanger Duty Rating With Current Fouling — Turnaround Scope Justification
- Hydraulic and Thermal Duty Workbook — Circuit Summary for Plant Leadership

Applying Fluid Flow and Heat Transfer for Plant Equipment After the Course

- Rebuild one pump's system curve and compare it with field flow and discharge pressure.
- Trend the overall coefficient of one fouling-prone exchanger and propose a cleaning interval.

Fluid Flow and Heat Transfer for Plant Equipment Questions FAQ

What is fluid flow and heat transfer for plant equipment, and why does it matter now?

It is the applied calculation of pressure drop, pump duty and exchanger heat transfer in operating plants. It matters now because energy cost and ageing equipment make friction and fouling expensive.

Which roles gain most from fluid flow and heat transfer for plant equipment?

Process, mechanical, rotating and maintenance engineers gain most. You benefit if you size lines, check pumps, plan exchanger cleaning or track utility consumption.

How does fluid flow and heat transfer for plant equipment differ from a thermodynamics or pump maintenance course?

It sits between them. Thermodynamics stays with cycles and theory, pump maintenance covers seals and alignment, while this subject links hydraulics and exchanger rating to operating decisions.

What do you bring back from fluid flow and heat transfer for plant equipment?

You bring back a worked duty file for one real circuit. It holds the pressure drop, system curve, pump operating point, exchanger rating and fouling trend.

Fluid Flow and Heat Transfer for Plant Equipment: The Way Forward

The Hydraulic and Thermal Duty Workbook first informs whether a struggling circuit needs a pump change, a line change or an exchanger cleaning. Process and maintenance engineers use it to set turnaround scope and energy measures. After its first use, revisit fouling assumptions and measured flows as feed and season change.