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Course Name

Pumps & Pumping System Optimization

Sector Name

Mechanical Engineering

Document Type

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Pumps & Pumping System Optimization

Course Introduction

Pump problems are not always pump problems. Low flow, excessive power consumption, cavitation, vibration, unstable operation, or repeated component damage can originate from the interaction between the pump and the wider piping system rather than from the pump itself. When equipment is evaluated in isolation, organizations may repeatedly adjust, repair, or replace pumps without addressing the hydraulic conditions responsible for poor performance.

Boost Consulting & Training offers this course to develop a system-based engineering approach to pump performance and optimization. Participants explore pump characteristics, system resistance, operating points, NPSH, cavitation, flow control, series and parallel operation, efficiency, and common performance problems. The course emphasizes using operating data and hydraulic behavior to determine whether performance issues originate from pump selection, system conditions, control methods, or the interaction between them.

The **main concept of this course** is to optimize pump performance by treating the pump and its connected system as one interacting hydraulic system rather than as separate engineering elements.

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Target Audience

- ✓ Mechanical and process engineers
- ✓ Pump and rotating equipment engineers
- ✓ Plant and technical engineers
- ✓ Engineers and supervisors responsible for pumping system performance

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Learning Objectives

- ✓ Explain the operating principles and characteristics of common industrial pumps.
- ✓ Interpret pump and system curves to determine actual operating conditions.
- ✓ Evaluate the effect of system resistance and operating changes on pump performance.
- ✓ Identify the causes and consequences of cavitation and inadequate suction conditions.
- ✓ Diagnose common hydraulic and mechanical indicators of poor pumping performance.
- ✓ Evaluate different methods of controlling pump flow and capacity.
- ✓ Assess pump efficiency and identify avoidable energy losses.
- ✓ Apply a structured approach to optimize complete pumping system performance.

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Course Outline

✓ Day 01

Understanding Pump and System Behavior

Reading Pump Performance

- ✓ Understand flow, head, power, efficiency, and their relationships in pump operation.
- ✓ Interpret pump performance curves across different operating conditions.
- ✓ Recognize the significance of the Best Efficiency Point and operation away from the preferred range.

Understanding the Hydraulic System

- ✓ Examine static head, friction losses, pressure requirements, and system resistance.
- ✓ Understand how piping configuration and flow changes affect the system curve.
- ✓ Develop a **Pump and System Performance Map** for practical installation.

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Course Outline

✓ Day 02

Finding the Real Operating Point

Matching Pump and System Curves

- ✓ Determine the actual operating point from the interaction between pump and system characteristics.
- ✓ Evaluate how valve position and system resistance shift pump operation.
- ✓ Identify mismatched pump-system conditions that create inefficient or unstable performance.

Evaluating Changing Operating Conditions

- ✓ Analyze the effects of speed, impeller diameter, and system modifications on pump performance.
- ✓ Apply affinity relationships to predict changes in flow, head, and power.
- ✓ Complete an **Operating Point Challenge** under changing process requirements.

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Course Outline

✓ Day 03

Controlling Cavitation and Suction Problems

Understanding Suction Performance

- ✓ Examine NPSH available and required and their influence on pump operation.
- ✓ Identify suction-side conditions that reduce performance or create instability.
- ✓ Evaluate the effects of temperature, pressure, elevation, piping losses, and fluid properties.

Diagnosing Cavitation

- ✓ Recognize hydraulic, acoustic, vibration, and physical indicators associated with cavitation.
- ✓ Distinguishing cavitation from other conditions producing similar equipment symptoms.
- ✓ Conduct a **Pump Suction Investigation** to identify and correct a developing cavitation problem.

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Course Outline

✓ Day 04

Improving Pumping System Efficiency

Selecting Effective Flow Control

- ✓ Compare throttling, bypass control, variable speed operation, and other capacity-control approaches.
- ✓ Evaluate how each control method changes energy consumption and pump operating conditions.
- ✓ Select control approaches according to system demand and operating characteristics.

Optimizing Multiple-Pump Operation

- ✓ Analyze pumps operating in series and parallel configurations.
- ✓ Determine how additional pumps change system flow and individual pump operating points.
- ✓ Run a **Pumping System Optimization Exercise** involving variable demand and multiple operating options.

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Course Outline

✓ Day 05

Diagnosing and Optimizing Real Pump Performance

Investigating Poor System Performance

- ✓ Diagnose low flow, insufficient head, excessive power, unstable operation, and declining efficiency.
- ✓ Separate hydraulic causes from mechanical and operational contributors.
- ✓ Use operating measurements and system evidence to test possible causes before intervention.

Making Pump Optimization Decisions

- ✓ Evaluate changes to pump selection, speed, impeller, piping, controls, or operating practices.
- ✓ Compare optimization options according to performance improvement, energy impact, and practical feasibility.
- ✓ Complete a **Pump System Performance Case** that moves from operating data and hydraulic diagnosis to an optimized pumping solution.

Pumps & Pumping System Optimization

Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
Dec. 7, 2026	Dec. 11, 2026	5 days	4250.00 \$	UAE , Dubai

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