



45<sup>TH</sup> **TURBOMACHINERY** & 32<sup>ND</sup> **PUMP SYMPOSIA**  
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GEORGE R. BROWN CONVENTION CENTER

# Pumping System Optimization

## Energy Efficiency and Bottom-Line Savings

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# Introduction

- **Pump Systems Matter (PSM)** – is a non-profit educational organization established by the Hydraulic Institute, and leading utilities and energy efficiency organizations, to educate the industry on the benefits to pump systems optimization and energy efficiency to improve bottom-line savings of end-user companies. For information and registration details on educational offerings visit the Pump Systems Matter website at [www.PumpSystemsMatter.org](http://www.PumpSystemsMatter.org)
- **Hydraulic Institute** The mission of the Hydraulic Institute is to be a value-adding resource to member companies, engineering consulting firms, and pump users worldwide by developing and delivering comprehensive industry standards, expanding knowledge by providing education and tools for the effective application, testing, installation, operation, maintenance, and performance optimization of pumps and pumping systems, and by serving as a forum for the exchange of industry information. For more information on the Hydraulic Institute, its member companies and its Standards Partners, visit [www.Pumps.org](http://www.Pumps.org)

# Workshop Learning Objectives

**As a result of this workshop, the participants will better understand:**

- The benefits of improving the performance of pumping systems
- System optimization and basic pump system interaction
- How to screen pumping systems for good system improvement candidates
- How to identify and implement basic performance improvement opportunities
- Life cycle cost analysis (Management perspective)
- Motor and Drive Interaction
- Identify, justify and specify variable frequency drives
- Understand potential issues that one must be aware of when applying a VFD
- Working knowledge of VFD Specifications
- Effectively communicate the benefits of Life Cycle Costing to Management
  - Making the Business Case

# Agenda

- **Why Efficient Pumping Systems are Important**
- **How a rotodynamic (centrifugal, mixed flow, and axial flow) pump works**
- **Basic pump design**
  - NPSHa Vs NPSHr
- **Pump Affinity Rules**
  - Change of Rotational Speed
  - Change of Impeller Diameter
- **The Pump Curve**
  - Reading a Pump Curve
  - Plotting a Pump Curve

# Agenda

- **Pumping System Fundamentals; the impact on total system efficiency**
  - Motor
  - Drive (Variable Speed)
  - Piping
  - Valves
  - End User Equipment
- **Steps to Improves System Efficiency**
  - Existing System
  - System Problems
  - Assessing system
  - Plotting a System Curve
  - Diagnostics and Data Collection
  - Using the Data to Identify Opportunity
  - When to Use a VFD

# Agenda

- **Life Cycle Costing**
  - Calculating Cost of Ownership
  - Elements of Life Cycle Costing
- **Investment Justification and Decision Making (Building a Business Case)**
  - ROI
  - Case Study / Level Three Assessment
  - **Electrical System**
    - Electrical System Grounding
      - Grounding considerations
      - Grounding of control system
      - Grounding of motor
  - **Conclusion**