

Selection and Operation of Pumps for Practical Applications

Course Objectives:

Pumps are the main fluid (liquids) moving and handling elements in pipelines, power plants, industrial and engineering facilities and any fluid flow system. Pumps are designed and constructed to handle specific range of flow rate, temperature, pressure or head, corrosion, and mechanical stress. The designer must select and specify the proper pump type and size to give the best service for the safe and economic requirements. Availability, efficiency and the extended reliable performance of pumping systems and many industrial applications and power generation plants are greatly influenced by accurate selection and efficient operation and proper maintenance of pumps.

This Course has been designed to give participants the following knowledge and skills to:

- Understand the basic terminology and fundamental backgrounds. This shall include the basics of fluid flow in pumping systems and the friction losses and system performance relations in pipelines and pumping systems.
- Understand Pump classifications, various functions, materials, sizes, geometry considerations and flow characteristics through each type.
- Understand how to select the proper pump size for a given flow rate ((centrifugal versus PDP).
- Review the Theory of Turbo-pumps and examine various components of centrifugal pumps.
- Examine Pump Performance and Flow-Head relations and analyze pump operation in both parallel and series configurations.
- Examine types of pump drives, pump control and surge valves in pumping systems
- Examine installation steps, operation, maintenance, testing and monitoring procedures of pumping systems.
- Diagnose and analyze various pumps problems including cavitations in pumps, mechanical seals (types and construction). Examine various troubles of mechanical seals.
- Understand Water Hammer in pumping systems and methods of protection.

Instructional & Beneficial Methods:

This program will provide the skills and practical knowledge with the necessary theoretical background to identify various types of pumping systems and flow control and handling components used in all engineering applications. It will also cover the main functions of Positive displacement pumps and control valves and the related Flow-Head characteristics. Latest designs and techniques to do correct selection and sizing to improve reliability and performance are discussed.

By use of an extensive number of color-full images and graphics presentations blending application experience, technical developments and sufficient simplified theory, the topics are interactively discussed and justified to pass on working knowledge, ability and confidence in day to day working environment. Recollection and further development after the course are aided by detailed documents with clear concise information encouraging practical use whenever necessary during the individual's heavily loaded daily workplace program.

Who Should Attend:

Engineers and Field Personnel involved with maintenance, operation, selection installation and maintenance as well as plant reliability, condition monitoring and for the day to day servicing and operational efficiency. Also plant and maintenance engineers, process engineers and maintenance managers. It is also be invaluable to supervisors who are involved in pump and compressor maintenance activities.

The Instructor:

Dr. Soliman is an Associated professor of fluid mechanics in Mechanical Power Engineering Department – Cairo university. He has a Ph.D. degree, 1989 from university of California, USA and

has a long teaching and research experience in the area of fluid flow, turbo-machines, and gas dynamics and has many research papers published at international conferences and journals. Dr. Soliman has had many years' experience in organizing and lecturing training courses for engineers in Egypt and Gulf area. In short, Dr. Soliman is considered a distinguished experts in the field of fluid mechanics and turbo-machinery.

Course Content:

Chapter [1]: Introduction, movie (types of pumps & control valves, functions, selection)

Chapter [2]: Fundamentals (hydraulic considerations, construction, ratings, materials)

Chapter [3]: Pump Installation steps:

Preparation for Shipment, Care of Equipment in the Field, Pump Location, Foundations,

Mounting of Vertical Wet-Pit Pumps, Alignment, Grouting, Doweling of Pump and Driver

Chapter [4]: Pump piping system:

PIPING: Suction Piping, Discharge Piping, Piping Strains, Expansion Joints,

Suction Strainers, Venting and Draining, Warm-Up Piping, Surge Chambers, Instrumentation

Chapter [5]: Pump Operation:

OPERATION, Operation of Centrifugal Pumps at Reduced Flows, Priming,

Final Checks Before Start-Up, Starting and Stopping Procedures,

Auxiliary Services on Standby Pumps, Restarting Motor-Driven Pumps After Power Failure,

Chapter [6]: Pump Maintenance:

Daily Observation of Pump Operation, Semiannual Inspection, Annual Inspection

Complete Overhaul, Spare and Repair Parts, Records of Inspections and Repairs

Chapter [7]: Pump Problems:

Diagnosis of Pump Problems, Recommended spare parts,

Check chart for centrifugal pump problems, Possible causes of problems

Diagnosis from appearance of stuffing box packing in centrifugal pumps,

Vibration symptoms and causes in centrifugal pumps

Check chart for rotary pump problems, Check chart for reciprocating pump problems,

Check chart for steam-pump problems

Chapter [8] Pump Testing Procedures:

CLASSIFICATION OF TESTS; Units Used in Pump Testing, ACCURACY AND TOLERANCES

TEST REQUISITES, Operating Conditions, Cavitation Tests

Chapter [9]: Water Hammer protection devices (and some practical movies)

- Course Review
- Case Studies, Group Exercises & Discussions
- Course Evaluation, Course Summary