

2 DAYS PROGRAM

FUNDAMENTALS OF PUMPS AND COOLING TOWERS

Date : 11 & 12 Jun 2025 (Wed & Thu)

**Venue : Dorsett Grand Subang Hotel,
Selangor**

COURSE OBJECTIVES:

This training program is designed to provide an understanding of engineering related problems related to industry globally and a clear sense of what is required to effectively structure, establish measurements and solve problems. Participants will learn the goals and deliverables behind the solutions. Methodology as well as the most commonly used tools within each phase will be discussed. Participants will also learn how to support a problem solving initiative within their organization.

WHO SHOULD ATTEND:

Facilities engineers, maintenance engineers, design engineers and any one who would like to widen their knowledge on the theory of pumps.

Past Participants

Universiti Teknologi Malaysia, Penang Port Sdn.Bhd. Cement Industries of Malaysia Berhad, Politeknik Mukah (Sarawak), Petlin Malaysia Sdn Bhd, TNB, SYABAS, Bintulu Port, Sime Austral etc.

MEASUREMENT TOOLS:

Quiz and exercises.

LEARNING OUTCOMES:

On successful completion of this course, the participant should be able to:-

- Understand the benefits and implications of pump and Cooling Towers engineering problem solving program, and relate the concepts to the overall business mission and objectives.
- Think about his/her organization as a collection of processes, with inputs that determine the output.
- Recognize the engineering problem solving model used to improve processes.
- Recognize the organizational factors that are necessary groundwork for a successful engineering problem solving program.
- Integrate the engineering problem solving program effort with other process improvement initiatives.
- Learn the various types of centrifugal pumps and Cooling Towers, their functions and terminologies used;
- Understand the design methodologies for centrifugal pumps and Cooling Towers;
- Understand the various maintenance methods for centrifugal pumps and Cooling Towers; and
- Understand the application of centrifugal pumps and Cooling Towers in various industries.



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COURSE INTRODUCTION AND OVERVIEW:

It can rightly be claimed that no machine and very few tools have had as long a history in the service of man as the pump, or have filled as broad a need in his life. Every process which underlies our modern civilization involves the transfer of liquids from one level of pressure or static energy to another. Pumps have played an essential role in our life ever since the dawn of civilization. Worldwide developments in pump theory, design and applications have continued to emerge, and these have begun to affect the outlook of pump engineers and users. Pumps have continued to grow in size, speed and energy level, revealing new problems that are being addressed by innovative materials, mechanical and hydraulic design approaches.

A Cooling Tower is a heat rejection device which extracts waste heat to the atmosphere through the cooling of a water stream to a lower temperature. Cooling towers may either use the evaporation of water to remove process heat and cool the working fluid to near the wet-bulb air temperature or, in the case of closed circuit dry cooling towers, rely solely on air to cool the working fluid to near the dry-bulb air temperature.

Common applications include cooling the circulating water used in oil refineries, petrochemical and other chemical plants, thermal power stations and HVAC systems for cooling buildings. The main types of cooling towers are natural draft and induced draft cooling towers. The classification is based on the type of air induction into the tower.

Cooling towers vary in size from small roof-top units to very large hyperboloid structures that can be up to 200 meters tall and 100 meters in diameter, or rectangular structures that can be over 40 meters tall and 80 meters long. The hyperboloid cooling towers are often associated with nuclear power plants, although they are also used to some extent in some large chemical and other industrial plants. Although these large towers are very prominent, the vast majority of cooling towers are much smaller, including many units installed on or near buildings to discharge heat from air conditioning.

Pumps and Cooling Towers have their fair share of engineering problems in industry.

The said problems could be classified into:-

- Problems which could be identified and solved immediately, with little or no financial implications or loss in production and a drop in quality levels;
- Problems which could be identified and cannot be solved immediately, with little or no knowledge of its implications;
- Problems which recur frequently and cannot be solved permanently etc;

Some of the reasons for these are due to:-

- Incompetent staff;
- A vast variety of equipment;
- Many moving (sliding, reciprocating, rotating) components etc.

This course is industry designed, to provide a broad understanding of the improvement methodology, concepts, and process. The methodology is presented with case studies and examples drawn from service, business process and manufacturing applications. The integration of maintenance is also addressed. With a heavy practice orientation, as much as a third of your time will be spent working through interactive practical exercises and assessments.

TRAINING METHODOLOGY:

- The latest educational methods and strategies will be utilized.
- The course is designed to maximize delegate participation.
- Questions and answers are encouraged throughout and at the daily wrap-up sessions. This gives participants the opportunity to discuss with others and the presenter their specific problems and appropriate solutions.
- The course shall be conducted through lectures, case studies, group discussions and exercises to reinforce participant's learning.

DAY 1

Introduction to Pumps

- Introduction
- Definition of head and related calculations
- Definition of capacity and related calculations, flow velocity
- Piping design:- Parts 1, 2, 3 and 4

Net Positive Suction Head and Specific Speed in Pumps

- Types of pumps
- Calculation of NPSH
- Suggested remedies for NPSH, and cavitation.

Pump and System Characteristic Curves

- Various types of system curves
- Information required to plot system curve
- The various types of pump curves for the various types of pumps.

Power, Efficiency and Electrical Requirements for Pumps

- Power requirements
- Motor selection
- Power consumption and energy savings
- Types of motors
- Torque and power factor

Variable Speed Systems for Pumps

- Reasons for using variable speed systems
- Energy savings under constant and fluctuating flow demand.

Affinity Laws in Pumps

- The relationship between pump speed, flow, power, head and impeller diameter
- Analysis of the pump composite performance curve

DAY 2

Cooling Tower Fundamentals

- Main Features
- Components of a cooling tower
- Measured Parameters
- Performance Parameters
- Selecting a cooling tower

Cooling Tower Performance

- Thermodynamics of Air Water Systems
- Evaporative Cooling
- Enthalpy of Wet air
- Heat and Mass Transfer in water air system

Cooling Tower Water Treatment

- Scale Formation
- Corrosion
- Fouling
- Hardness
- Biofouling
- Control of Concentration
- Bleed Control

Cooling Tower Types

- Parallel vs. Series Flow
- Induced Draft, Cross Flow
- Natural Draft
- Hyperbolic Cooling Tower

Cooling Tower Maintenance

- Legionella Awareness
- Frequency of Cleaning/Disinfection
- Sterilization
- Areas of Performance
- High Risk Facilities
- Survey of Process Risk
- Monitoring and Inspection
- Preventive Actions

Question & Answer Session

End of Program