PUMPS TECHNOLOGY AND PUMPING SYSTEMS: EFFECTIVE OPERATION, MAINTENANCE AND TROUBLESHOOTING COURSE

Training Dates:	As per schedule	**Training Venue:**	Kuala Lumpur, Malaysia.
Basic Fee:	RM3,450.00 + SST per participant (this includes course materials, meals, refreshment and attendance certificate)		

DURATION

Three (3) Days (21 Hours)

TARGET GROUP

- Maintenance and production staff – engineer, supervisor, foreman and technician
- Procurement and inventory executives
- Senior plant and control room operators
- Consultant, contractor and pump supplier
- Sale and application engineers

TARGETED INDUSTRY/INDUSTRIES

Oil & Gas, Petrochemicals, Power Plant, Renewal Energy Plant, Co-Generation Plant, Palm Oil Mills and Refineries, Plywood Industries, and all industries that using compressed air systems and mechanical driven.

CERTIFICATION

N/A

COURSE OBJECTIVE

- To acquire information and familiarization on pumps and pumping systems, and their technology and applications
- To provide a wide range of knowledge on pump technology, their components and related equipment
- To demonstrate useful information on pump design and selection, pump testing and performance and pump and piping (system) matching (curves)
- To interpret on pump cavitation and cavitation damages
- To explore best practices and guideline on pump installation
- To enhance skill in operating and maintenance aspects of pumping systems
- To troubleshoot pump malfunction, problems and issues related to piping systems

COURSE OUTCOMES

At the end of the course, all participants are expected able to:

- Identify the proper set up of pump and pumping systems
- Operate the pump effectively
- Monitor pump operational aspects for optimum performance
- Identify malfunction and failures of pump systems and its components
- Conduct pump preventive maintenance, repair and troubleshooting

TRAINING METHODOLOGY

- Lecture
- Classroom discussions
- Short video presentation
- Case study

COURSE CONTENTS

MODULE 1 : INTRODUCTION TO PUMPS AND PUMPING SYSTEMS

- What are pumps?
- Duty, function and types of pump applications
- Installation of pumping systems, associated fittings and effecting factors
- Pump family and their working principle
- Hydrokinetic pumps and components – centrifugal, axial and mixed flow
- Positive displacement pumps and components - gear, lobe, screw, vane and piston
- Metering and vacuum pumps, special types and duty of pumps

MODULE 2 : COMPONENTS OF CENTRIFUGAL PUMPS AND THEIR TECHNOLOGY

- Type and effect of casings: volute and vortex
- Impeller: types and constructions
- Split casing, double suction pump
- Multistage pumps – vertical and horizontal installation
- Submersible pumps – applications and advantages
- Seal and packing: types, arrangement and installation
- Bearing and lubrication strategies
- Wear rings and leakage joints
- The effect of balancing devices (piston and disc)
- Installation of shaft, sleeve and eye ring

MODULE 3 : CENTRIFUGAL PUMPS: PERFORMANCE AND TESTING

- Testing requirements (factory and on-site) and procedures
- Pump curves – Head (H), Efficiency (η), BHP, NPSH vs Flow rate (Q)
- Reading pump performance and charts
- Testing and determination of Net Positive Suction Head (NPSH)
- Requirement of **$NPSH_R$** and **$NPSH_A$** for cavitation
- **TUTORIAL**: Calculation on pump performance

MODULE 4 : PUMP DESIGN AND SELECTION, PUMP AND PIPING CURVES

- Application of affinity laws in pumps
- Specific speed and its application
- Impeller design and specifications
- Matching of pump and piping system - operating point
- Effect of valve regulation to operating point
- Application of energy equation in pumping system
- Friction losses in piping system
- Application table and chart to determine k factor for fittings
- **TUTORIAL**: Basic design calculation

MODULE 5 : CAVITATION, AIR AND VAPOUR LOCK

- Cavitation in pump and relation to suction head
- Effects of cavitation to the pump performance
- Effect of **$NPSH_R$** and **$NPSH_A$** to pump cavitation
- Guidelines in prediction and prevention of pump cavitation
- Cavitation damage and pump failures
- Air pocket and vapour lock and their related problems
- Procedures in releasing vapour and air locks
- **TUTORIAL**: Estimation and basic estimation on cavitation

MODULE 6 : POSITIVE DISPLACEMENT PUMPS

- Type and applications
- Design, function and construction
- Selection and operational parameters
- Performance and testing of pumps
- **TUTORIAL**: Basic calculation on pump performance

MODULE 7 : BEST PRACTICE IN PUMP COMMISSIONING, START-UP AND OPERATION

- Preparation for commissioning
- Start-up approach and procedures for several types of pump installations
- Requirement and procedure for pump priming and venting
- Observation and monitoring of pump operation
- Normal and emergency shutdown practices
- Minimum flow requirements

MODULE 8 : PUMP AND PIPING SYSTEMS: MAINTENANCE AND TROUBLESHOOTING

- Pump maintenance: breakdown, predictive, preventive and TPM
- Best practice and guidelines in pump installation
- Suction system and its effects
- Cavitation in pump and cavitation damage
- Air pocket and vapour lock, and procedures to release vapour and air locks
- Bearing and lubrication
- Pump failure and repair

MODULE 9 : PLANT VISIT AND EQUIPMENT INSPECTION (For In-house program only)

- Plant visit and inspection
- Discussion on operational aspect of pumps
- Revision on maintenance practices and scheduling

QUESTION AND ANSWER SESSION

ABOUT THE INSTRUCTOR

Ir. Associate Professor Yahaya bin Ramli, graduated with Masters of Science in Fluid Power Systems from University of Bath, United Kingdom and is both a Registered Professional Engineer (Mechanical) with Board of Engineers Malaysia (BEM) and a Corporate Member of The Institution of Engineers, Malaysia (IEM).

He has extensive field experience with several companies such as Felda Berhad (Plant Superintendent), Petronas Gas Berhad (Project Management Executive and Production Supervisor) and Sobena Offshore Inc (Assistant Plant Manager). Currently, he is a senior lecturer in University of Technology Malaysia at Faculty of Mechanical Engineering and he did a lot of research in thermo fluids technology.

He also active delivering the technical courses such as; pump technology, compressor systems, boiler and steam systems, valve maintenance, compressed air system and etc.