COURSE OVERVIEW ME1106
Dynamic Pumps

Course Title
Dynamic Pumps

Course Date/Venue
Session 1: June 23-27, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: December 07-11, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
ME1106

3.0 CEUs (30 PDHs) AWARD

Course Duration/Credits
Five days/3.0 CEUs/30 PDHs

Course Description

This practical and highly-interactive course includes various practical sessions and exercises. Theory learnt will be applied using our state-of-the-art simulators.

This course is designed to provide delegates with a detailed and up-to-date overview on Dynamic Pumps. It covers the fundamental concepts of pumps comprising of head, flow rate efficiency and other key terms; the dynamic pumps and positive displacement pumps; the significance, applications, components and working principle of dynamic pumps; the centrifugal pumps, axial flow pumps, mixed/radial flow pumps and multi-stage pumps; the specific speed of dynamic pumps including pump geometry and performance; the pump performance curve; and the pump operation using operating point and best efficiency point.

Further, the course will also discuss the system curves and its impact on pump performance; the causes, effects and prevention of cavitation in dynamic pumps; the materials used in dynamic pumps covering cast iron, stainless steel, bronze and their application; the seal and bearing types and maintenance; and the causes, effects, and mitigation techniques of pump vibration and noise.

During this interactive course, participants will learn the efficient and prolonged pump operation using routine pump maintenance; the advance pump control systems and their benefits; the advantage, disadvantage and use-cases of parallel and series pump operation; the common pump problems and troubleshooting by addressing leaks, inefficiencies and other issues; optimizing energy savings in dynamic pumps, and the future trends in dynamic pump design and operation.

Course Objectives

Upon the successful completion of this course, each participant will be able to:-

- Apply and gain an in-depth knowledge on dynamic pumps
- Discuss the fundamental concepts of pumps covering head, flow rate efficiency and other key terms
- Classify dynamic pumps and positive displacement pumps as well as explain the significance, applications, components and working principle of dynamic pumps
- Determine centrifugal pumps, axial flow pumps, mixed/radial flow pumps and multi-stage pumps
- Identify the specific speed of dynamic pumps including pump geometry and performance
- Recognize pump performance curve and optimize pump operation using operating point and best efficiency point
- Recognize system curves and its impact on pump performance
- Explain the causes, effects and prevention of cavitation in dynamic pumps
- Identify the materials used in dynamic pumps covering cast iron, stainless steel, bronze and their application
- Recognize seal and bearing types and maintenance as well as the causes, effects, and mitigation techniques of pump vibration and noise
- Ensure efficient and prolonged pump operation using routine pump maintenance
- Discuss advance pump control systems and their benefits as well as the advantage, disadvantage and use-cases of parallel and series pump operation
- Apply common pump problems and troubleshooting by addressing leaks, inefficiencies and other issues
- Optimize energy savings in dynamic pumps and discuss the future trends in dynamic pump design and operation

Exclusive Smart Training Kit - H-STK®

*Participants of this course will receive the exclusive "Haward Smart Training Kit" (**H-STK®**). The **H-STK®** consists of a comprehensive set of technical content which includes **electronic version** of the course materials conveniently saved in a **Tablet PC**.*

Who Should Attend

This course covers systematic techniques and methodologies on dynamic pumps for plant and maintenance engineers, process engineers, maintenance personnel, supervisors and reliability specialists working in refineries and petrol filling stations. The course is also highly valuable to senior maintenance technical staff who are involved with pumps, their operation and their maintenance.

Course Certificate(s)

Internationally recognized certificates will be issued to all participants of the course who completed a minimum of 80% of the total tuition hours.

Certificate Accreditations

Certificates are accredited by the following international accreditation organizations: -

- British Accreditation Council (BAC)

  Haward Technology is accredited by the **British Accreditation Council** for **Independent Further and Higher Education** as an **International Centre**. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited international centre, Haward Technology meets all of the international higher education criteria and standards set by BAC.

- The International Accreditors for Continuing Education and Training (IACET - USA)

  Haward Technology is an Authorized Training Provider by the International Accreditors for Continuing Education and Training (IACET), 2201 Cooperative Way, Suite 600, Herndon, VA 20171, USA. In obtaining this authority, Haward Technology has demonstrated that it complies with the **ANSI/IACET 2018-1 Standard** which is widely recognized as the standard of good practice internationally. As a result of our Authorized Provider membership status, Haward Technology is authorized to offer IACET CEUs for its programs that qualify under the **ANSI/IACET 2018-1 Standard**.

  Haward Technology's courses meet the professional certification and continuing education requirements for participants seeking **Continuing Education Units** (CEUs) in accordance with the rules & regulations of the International Accreditors for Continuing Education & Training (IACET). IACET is an international authority that evaluates programs according to strict, research-based criteria and guidelines. The CEU is an internationally accepted uniform unit of measurement in qualified courses of continuing education.

  Haward Technology Middle East will award **3.0 CEUs** (Continuing Education Units) or **30 PDHs** (Professional Development Hours) for participants who completed the total tuition hours of this program. One CEU is equivalent to ten Professional Development Hours (PDHs) or ten contact hours of the participation in and completion of Haward Technology programs. A permanent record of a participant's involvement and awarding of CEU will be maintained by Haward Technology. Haward Technology will provide a copy of the participant's CEU and PDH Transcript of Records upon request.

Course Instructor(s)

This course will be conducted by the following instructor(s). However, we have the right to change the course instructor(s) prior to the course date and inform participants accordingly:

Mr. Andrew Ladwig is a **Senior Process & Mechanical Engineer** with over **25 years** of extensive experience within the **Oil & Gas**, **Refinery**, **Petrochemical & Power** industries. His expertise widely covers in the areas of **Ammonia Manufacturing & Process Troubleshooting**, **Distillation Towers**, **Crude Oil Distillation**, **Fundamentals of Distillation** for Engineers, **Distillation** Operation and Troubleshooting, **Advanced Distillation** Troubleshooting, **Distillation** Technology, Vacuum **Distillation**, **Ammonia Storage & Loading** Systems, **Ammonia Plant** Operation, Troubleshooting & Optimization, **Ammonia Recovery**, **Ammonia Plant Safety**, Hazard of **Ammonia Handling**, Storage & Shipping, **Operational Excellence** in **Ammonia Plants**, **Fertilizer Storage** Management (Ammonia & Urea), **Fertilizer Manufacturing** Process Technology, **Sulphur Recovery**, Phenol Recovery & Extraction, **Wax Sweating & Blending**, **Petrochemical & Fertilizer** Plants, **Nitrogen Fertilizer** Production, **Petroleum Industry Process** Engineering, **Refining Process & Petroleum Products**, **Refinery Planning & Economics**, Safe **Refinery Operations**, **Hydrotreating & Hydro-processing**, **Separators** in **Oil & Gas** Industry, **Gas Testing & Energy** Isolations, Gas Liquor Separation, **Industrial Liquid Mixing**, **Wax Bleachers**, **Extractors**, **Fractionation**, Operation & Control of **Distillation**, Process of **Crude ATM & Vacuum Distillation** Unit, **Water Purification**, **Water Transport** & Distribution, **Steam & Electricity**, **Flame Arrestors**, **Coal Processing**, **Environmental Emission Control**, R&D of **Wax Blending**, **Wax** Molding/Slabbing, **Industrial Drying**, Principles, Selection & Design, **Process Safety** Design, Certified **Process Plant** Operations, Control & Troubleshooting, **Operator** Responsibilities, **Storage Tanks Operations** & Measurements, **Tank Design**, Construction, Inspection & Maintenance, **Atmospheric Tanks**, **Process Plant** Troubleshooting & Engineering Problem Solving, **Process Plant Performance**, Efficiency & Optimization, Continuous Improvement & Benchmarking, **Process Troubleshooting** Techniques, Oil & Gas Operation/Introduction to **Surface Facilities**, **Pressure Vessel** Operation, **Plant & Equipment Integrity**, **Process Equipment** Performance & Troubleshooting, **Plant Startup & Shutdown**, **Startup & Shutdown** the Plant While Handling Abnormal Conditions, **Flare & Relief** System, **Process Gas Plant** Start-up, Commissioning & Problem Solving, **Process Liquid** and **Process Handling & Measuring** Equipment. Further, he is also well-versed in **Compressors & Turbines** Operation, Maintenance & Troubleshooting, **Heat Exchanger** Overhaul & Testing Techniques, Balancing of **Rotating Machinery** (**BRM**), **Pipe Stress** Analysis, **Valves & Actuators** Technology, Inspect & Maintain **Safeguarding Vent & Relief System**, Certified Inspectors for **Vehicle & Equipment**, Optimizing **Equipment Maintenance** & Replacement Decisions, Certified Maintenance Planner (**CMP**), Certified Planning and Scheduling Professional (**AACE-PSP**), **Material Cataloguing**, Specifications, Handling & Storage, **Steam Trap** Design, Operation, Maintenance & Troubleshooting, **Steam Trapping & Control**, **Column**, **Pump** Technology, **Pump** Selection & Installation, **Centrifugal Pumps** Troubleshooting, **Pumps** Design, Selection & Operation, **Pump & Exchangers**, Troubleshooting & Design, **Rotating Equipment** Operation & Troubleshooting, **Control & ESD** System, **Detailed Engineering Drawings**, Codes & Standards, **Budget** Preparation, Allocation & Cost Control, Root Cause Analysis (**RCA**), **Production Optimization**, Permit to Work (**PTW**), Project Engineering, **Data** Analysis, **Process Hazard** Analysis (**PHA**), **HAZOP** Study, Sampling & Analysis, **Training** Analysis, **Job Analysis** Techniques, Storage & Handling of **Toxic Chemicals & Hazardous Materials**, **Hazardous Material** Classification & Storage/Disposal, **Dangerous Goods**, Environmental Management System (**EMS**), Supply Chain, Purchasing, Procurement, **Logistics** Management & **Transport** & **Warehousing** & **Inventory**, **Risk** Monitoring Authorized Gas Tester (**AGT**), Confined Space Entry (**CSE**), Personal Protective Equipment (**PPE**), Fire & Gas, First Aid and Occupational Health & Safety.

During his career life, Mr. Ladwig has gained his practical experience through his various significant positions and dedication as the **Mechanical Engineer**, **Project Engineer**, **Reliability & Maintenance Engineer**, **Maintenance Support Engineer**, **Process Engineer**, **HSE Supervisor**, **Warehouse Manager**, **Quality Manager**, **Business Analyst**, **Senior Process Controller**, **Process Controller**, **Safety Officer**, **Mechanical Technician**, **Senior Lecturer** and **Senior Consultant/Trainer** for various companies such as the Sasol Ltd., Sasol Wax, Sasol Synfuels, just to name a few.

Mr. Ladwig has a **Bachelor's** degree in **Chemical Engineering** and a **Diploma** in **Mechanical Engineering**. Further, he is a **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and has delivered various trainings, workshops, seminars, courses and conferences internationally.

Training Methodology

All our Courses are including **Hands-on Practical Sessions** using equipment, State-of-the-Art Simulators, Drawings, Case Studies, Videos and Exercises. The courses include the following training methodologies as a percentage of the total tuition hours:-

30% Lectures
20% Practical Workshops & Work Presentations
30% Hands-on Practical Exercises & Case Studies
20% Simulators (Hardware & Software) & Videos

In an unlikely event, the course instructor may modify the above training methodology before or during the course for technical reasons.

Course Fee

US$ 5,500 per Delegate + **VAT**. This rate includes H-STK® (Haward Smart Training Kit), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.

Accommodation

Accommodation is not included in the course fees. However, any accommodation required can be arranged at the time of booking.

Course Program

The following program is planned for this course. However, the course instructor(s) may modify this program before or during the course for technical reasons with no prior notice to participants. Nevertheless, the course objectives will always be met:

Day 1

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***History & Evolution of Pumps*** *Tracing the Development of Pumps Over Time*
0930 – 0945	*Break*
0945 - 1045	***Fundamental Concepts*** *Head, Flow Rate, Efficiency, and Other Key Terms*
1045 - 1145	***Classification of Pumps*** *Introduction to Dynamic, Positive Displacement, and Other Types*
1145 - 1230	***Introduction to Dynamic Pumps*** *Their Significance and Applications*
1230 - 1245	*Break*
1245 - 1330	***Components of a Dynamic Pump*** *Impellers, Casings, Shafts, etc*
1330 - 1420	***The Working Principle of Dynamic Pumps*** *The Basics of Fluid Dynamics Involved*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Centrifugal Pumps*** *Design, Working Principle, and Applications*
0930 – 0945	*Break*
0945 - 1045	***Axial Flow Pumps*** *Characteristics and Where They are Used*
1045 - 1145	***Mixed/Radial Flow Pumps*** *Combining Features of both Centrifugal and Axial*
1145 - 1230	***Multi-Stage Pumps*** *Pumps with Multiple Impellers*
1230 – 1245	*Break*
1245 - 1420	***Specific Speed of Dynamic Pumps*** *Understanding Pump Geometry and Performance*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Pump Performance Curves*** *Understanding Head Versus Flow Rate*
0930 - 0945	*Break*
0945 - 1045	***Operating Point & Best Efficiency Point*** *Optimizing Pump Operations*
1045 – 1145	***System Curves*** *Understanding the System's Impact on Pump Performance*
1145 – 1230	***Affinity Laws*** *How Speed and Diameter Changes Affect Pump Performance*
1230 – 1245	*Break*
1245 - 1420	***Cavitation in Dynamic Pumps*** *Causes, Effects, and Prevention*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

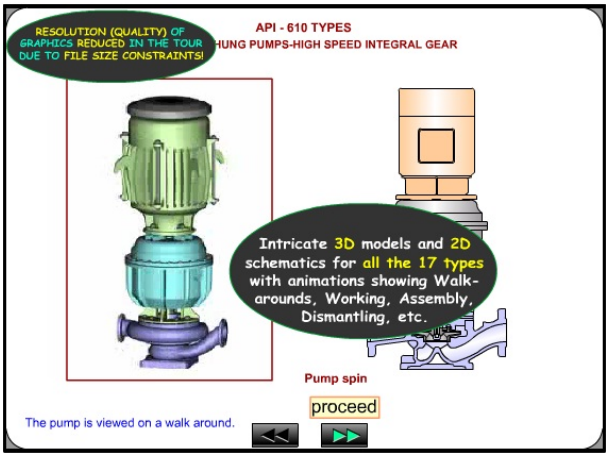
0730 – 0930	***Materials Used in Dynamic Pumps*** *Cast Iron, Stainless Steel, Bronze, and their Applications*
0930 - 0945	*Break*
0945 - 1045	***Seal Types & Maintenance*** *Mechanical Seals, Packing, and their Upkeep*
1045 – 1145	***Bearing Types & Maintenance*** *Ensuring Longevity of Pump Bearings*
1145 – 1230	***Pump Vibration & Noise*** *Causes, Effects, and Mitigation Techniques*
1230 – 1245	*Break*
1245 - 1420	***Routine Pump Maintenance*** *Steps to Ensure Efficient and Prolonged Pump Operation*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Four*

Day 5

0730 – 0930	***Advanced Pump Control Systems*** *VFDs (Variable Frequency Drives) and their Benefits*
0930 – 0945	*Break*
0945 - 1045	***Parallel & Series Pump Operation*** *Advantages, Disadvantages, and Use-Cases*
1045 – 1145	***Common Pump Problems & Troubleshooting*** *Addressing Leaks, Inefficiencies, and other Issues*
1145 – 1230	***Energy Efficiency in Dynamic Pumps*** *Optimizing for Energy Savings*
1230 – 1245	*Break*
1245 – 1345	***Future Trends in Dynamic Pump Design & Operation***
1345 – 1400	***Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulator (Hands-on Practical Sessions)

Practical sessions will be organized during the course for delegates to practice the theory learnt. Delegates will be provided with an opportunity to carryout various exercises using our state-of-the-art simulator "Centrifugal Pumps and Troubleshooting Guide 3.0".



Centrifugal Pumps and Troubleshooting Guide 3.0

Course Coordinator

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