



COURSE OVERVIEW RE0148(OR1)-4D Machinery Diagnostics & System 1 Fundamentals

Course Title

Machinery Diagnostics & System 1 Fundamentals

Course Date/Venue

September 02-05, 2024/Al Aziziya Hall,
The Proud Hotel Al Khobar, Al Khobar, KSA

Course Reference

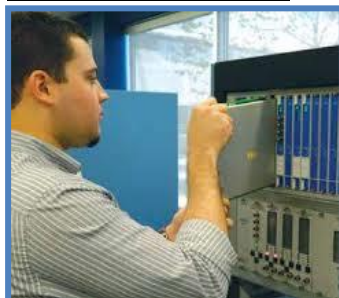
RE0148(OR1)-4D

Course Duration/Credits

Four days/2.4 CEUs/24 PDHs



Course Description



This practical and highly-interactive course includes real-life case studies and exercises where participants will be engaged in a series of interactive small groups and class workshops.

This course provides an overview of all significant aspects and considerations of machinery diagnostics and system 1 fundamentals. The course shall help participants to understand how fundamentals of machine design and behaviour are reflected in vibration measurements, reduce machine vibration data into usable plots and explain which plots are best to use in different stages of machine diagnostics; and the causes, effects and indicators of typical malfunction including recognition of problems such as unbalance, misalignment, rubs, shaft cracks and fluid induced instabilities.

During this interactive course, participants will learn how to use system 1 software tools and plots to apply in practice, knowledge gained through machinery diagnostics session and how to get the most out of system 1 software in terms of machinery condition monitoring and diagnostics; and optimize system 1 in terms of software alarms, clearance boundaries, baseline data, compensation, information data storage and backups along with periodic administrative tasks.

Course Objectives

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

- Apply and gain a comprehensive knowledge on machinery diagnostics and systems 1 fundamentals
- Discuss the Bentley conventions of machinery diagnostics
- Identify the fundamentals of rotor response during phase measurement
- Carryout preloads and position measurements





- Apply steady state and transient plots interpretation for various faults including unbalance, misalignment, rubs, fluid induced instabilities, etc.
- Give various samples of real-life case studies for steam turbines, centrifugal compressors, gas turbines, pumps motors and etc.
- Discuss system 1 and the vibration signal fundamentals including Bentley rack 3500/TDI basics
- View, manage, customize and monitor information including alarm and events on system 1 display
- Describe plot session, plot groups and collection groups as well as steady state and transient plots
- Optimize system 1 covering clearance boundaries, software alarms, baseline compensation and etc.
- Employ system 1 information data storage, backups and periodic administrative tasks and reports

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 provides an overview of all significant aspects and considerations of machinery diagnostics and system 1 fundamentals for senior engineers, inspectors, technicians and predictive maintenance employees

Training Methodology

This interactive training course includes the following training methodologies as a percentage of the total tuition hours:-

- 30% Lectures
- 20% Workshops & Work Presentations
- 20% Case Studies & Practical Exercises
- 30% Videos, Software & Simulators

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



Course Fee

US\$ 4,500 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 Certificate(s)

Internationally recognized certificates will be issued to all participants of the course.

Certificate Accreditations


Certificates are accredited by the following international accreditation organizations: -

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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 **2.4 CEUs** (Continuing Education Units) or **24 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.

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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.



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, Certified Process Plant Operations, Control & Troubleshooting, Operator Responsibilities, Storage Tanks Operations & Measurements, 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, 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), Tank Design, Construction, Inspection & Maintenance, Material Cataloguing, Specifications, Handling & Storage, Steam Trap Design, Operation, Maintenance & Troubleshooting, Steam Trapping & Control, Column, 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.

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: Monday, 2nd September 2024

0730 – 0800	<i>Registration & Coffee</i>
0800 – 0815	<i>Welcome & Introduction</i>
0815 – 0830	PRE-TEST
0830 – 0945	<i>Introduction to Machinery Diagnostics: Bently Conventions</i>
0945 - 1000	<i>Break</i>
1000 – 1100	<i>Phase Measurement: Fundamentals of Rotor Response</i>
1100 – 1200	<i>Preloads & Position Measurements</i>
1200 - 1215	<i>Break</i>
1215 - 1300	<i>Steady State & Transient Plots Interpretation for Various Faults including Unbalance, Misalignment, Rubs, Fluid Induced Instabilities & Etc.</i>
1300 – 1420	<i>Hands-On Training/Demonstration of Various Faults: Unbalance, Misalignment, Rubs & Etc., Rotor-Kit & It's Diagnostics & Interpretation (Client to Provide Rotor-Kit & ADRE/DAIU if Required)</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day One</i>

Day 2: Tuesday, 3rd September 2024

0730 – 0900	<i>Real Life Case Studies for Steam Turbines, Centrifugal Compressors, Gas Turbines, Pumps, Motors & Etc.</i>
0900 – 0915	<i>Break</i>
0915 – 1100	<i>Real Life Case Studies for Steam Turbines, Centrifugal Compressors, Gas Turbines, Pumps, Motors & Etc. (cont'd)</i>
1100 – 1245	<i>System 1 Overview & Vibration Signal Fundamentals Including Bently Rack 3500/TDI Basics</i>
1245 - 1300	<i>Break</i>
1300 -1420	<i>System 1 Overview & Vibration Signal Fundamentals Including Bently Rack 3500/TDI Basics (cont'd)</i>
1420 – 1430	Recap
1430	<i>Lunch & End of Day Two</i>

Day 3: Wednesday, 4th September 2024

0730 – 0900	<i>System 1 Display: How to View/Manage/Customize/Monitor Information, Alarms & Events</i>
0900 -0915	<i>Break</i>





0915 - 1030	<i>System 1 Display: How to View/Manage/Customize/Monitor Information, Alarms & Events (cont'd)</i>
1030 - 1130	<i>Plot Sessions, Plot Groups & Collection Groups</i>
1130 - 1245	<i>Steady State & Transient Plots</i>
1245 - 1300	<i>Break</i>
1300 - 1420	<i>System 1 Optimization: Clearance Boundaries, Software Alarms, Baseline Compensation & Etc</i>
1420 - 1430	<i>Recap</i>
1430	<i>Lunch & End of Day Three</i>

Day 4: Thursday, 5th September 2024

0730 - 0930	<i>System 1 Optimization: Clearance Boundaries, Software Alarms, Baseline Compensation & Etc. (cont'd)</i>
0930 - 0945	<i>Break</i>
0945 - 1200	<i>System 1 Information Data Storage, Backups & Periodic Administrative Tasks</i>
1200 - 1330	<i>System 1 Reports</i>
1330 -1345	<i>Break</i>
1345 - 1400	<i>Course Conclusion</i>
1400- 1415	<i>POST-TEST</i>
1415 - 1430	<i>Presentation of Course Certificates</i>
1430	<i>Lunch & End of Course</i>

Practical Sessions

This practical and highly-interactive course includes real-life case studies and exercises:-



Course Coordinator

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