

COURSE OVERVIEW LE0537 Advanced Transformer Oil Analysis

Course Title

Advanced Transformer Oil Analysis

Course Date/Venue

November 24-28, 2024/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference

LE0537

Course Duration/Credits

Five days/3.0 CEUs/30 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.



The fault free operation of power transformers is a factor of major economic importance and safety in power supply utilities and industrial consumers of electricity. In the current economic climate, Industries/Supply Utilities tighten their control on capital spending and make cutbacks in maintenance, an increased awareness is placed on the reliability of the existing electric power supply. Down time is at a premium. Often, the loading is increase on present units, as this will defer purchasing additional plant capacity. Th us, the stress on the transformer increases. The net total effect of the thermal, electrical and mechanical stress brought on by increased service needs to be monitored to ensure reliability.



Regular sampling and testing of insulation oil taken from transformers is a valuable technique in a preventative maintenance program. If a proactive approach is adopted based on the condition of the transformer oil, the life of the transformer can be extended.

Transformer oil testing is a proven loss prevention technique that shall be a part of any condition based predictive maintenance program. Essentially, an early warning system, transformer oil testing allows management to identify maintenance priorities, plan work assignment schedules, and order necessary parts and materials.

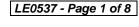




















In this course, you will start by refreshing the basic of transformers, transformer oil properties and specification and you will learn if your transformer oil is within specifications and the principle of the analysis method used for the transformer oil analysis and their relevant standard methods used.

This course will also cover the working principles of transformers including its applications, operation and performance parameters; the chemistry of transformer oil, characteristic properties and specification, physical properties, electrical properties, storage, handling and transport as well as compatibility and contaminants; the insulating of oils, fluids and gases; the principles of transformer oil testing instrumentation; the transformer oil testing; and the presentation of results.

Course Objectives

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

- Apply and gain an in-depth knowledge on transformer oil analysis
- Discuss the working principles of transformers including its applications, operation and performance parameters
- Describe the chemistry of transformer oil, characteristic properties and specification, physical properties and stability characteristics
- Identify the electrical properties and carryout proper storage, handling and transport
- Recognize the compatibility and contaminants and deterioration of insulating oil testing
- Carryout combustible gas analysis and insulating liquid sampling procedures
- Employ principles of transformer oil testing instrumentation covering UV/VIS spectrophotometers, spectrophotometer architecture, sources, filters and detectors
- Identify the design and performance criteria of instrumentation, fourier transform instruments and filter instrumentation
- Discuss atomic absorption spectroscopy, flame ASS, nebulizer/burner systems, atomization, interferences and graphite furnace ASS
- Determine gas chromatographs, selection of carrier gases and gas chromatography columns
- column stationary Explain phases, injectors and detectors and gas chromatography-mass spectrometry
- Illustrate electrochemical techniques, electrodeless (non-contact) measurement and pH probes, calibration, measurement and maintenance
- Employ transformer oil testing and results presentation

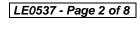
















Exclusive Smart Training Kit - H-STK®



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, sample video clips of the instructor's actual lectures & practical sessions during the course conveniently saved in a Tablet PC.

Who Should Attend

This course provides an overview of all significant aspects and considerations of transformer oil analysis for for engineers and other technical staff who need a sound understanding of transformer oil analysis.

Training Methodology

All our Courses are including Hands-on Practical Sessions using equipment, Stateof-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 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:-

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.



British Accreditation Council (BAC)

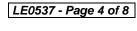
Haward Technology is accredited by the British Accreditation Council for Independent Further and Higher Education as an International Centre. BAC is the British accrediting body responsible for setting standards within independent further and higher education sector in the UK and overseas. As a BAC-accredited 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. Karl Thanasis, PEng, MSc, MBA, BSc, is International Expert in Analytical Laboratory & Senior Mechanical & Maintenance Engineer with over 30 years of extensive industrial experience. His wide expertise includes Transformer, Transformers Oil Testing, Insulating Oil, Distribution of Data, Laboratory Equipment, Laboratory Quality Management Systems, Water Analysis & Reporting, Water Sampling & Testing, Water Analyzer, Internal Quality Control for Microbiologists, Analytical Techniques, Piping &

Pipeline, Maintenance, Repair, Shutdown, Turnaround & Outages, Maintenance & Reliability Management, Mechanical Maintenance Planning, Scheduling & Work Control, Advanced Techniques in Maintenance Management, Predictive & Preventive Maintenance, Maintenance & Operation Cost Reduction Techniques, Reliability Centered Maintenance (RCM), Machinery Failure Analysis, Rotating Equipment Reliability Optimization & Continuous Improvement, Material Cataloguing, Mechanical & Rotating Equipment Troubleshooting & Maintenance, Root Cause Analysis & Reliability Improvement, Condition Monitoring, Root Cause Failure Analysis (RCFA), Steam Generation, Steam Turbines, Power Generator Plants, Gas Turbines, Combined Cycle Plants, Boilers, Process Fired Heaters, Air Preheaters, Induced Draft Fans, All Heaters Piping Work, Refractory Casting, Heater Fabrication, Thermal & Fired Heater Design, Heat Exchangers, Heat Transfer, Coolers, Power Plant Performance, Efficiency & Optimization, Storage Tank Design & Fabrication, Thermal Power Plant Management, Boiler & Steam System Management, Pump Operation & Maintenance, Chiller & Chiller Plant Design & Installation, Pressure Vessel, Safety Relief Valve Sizing & Selection, Valve Disassembling & Repair, Pressure Relief Devices (PSV), Hydraulic & Pneumatic Maintenance, Advanced Valve Technology, Pressure Vessel Design & Fabrication, Pumps, Turbo-Generator, Turbine Shaft Alignment, Lubrication, Mechanical Seals, Packing, Blowers, Bearing Installation, Couplings, Clutches and Gears. Further, he is also versed in Wastewater Treatment Technology, Piping System, Water Movement, Water Filtering, Mud Pumping, Sludge Treatment and Drying, Aerobic Process of Water Treatment that includes Aeration, Sedimentation and Chlorination Tanks. His strong background also includes Design and Sizing of all Waste Water Treatment Plant Associated Equipment such as Sludge Pumps, Filters, Metering Pumps, Aerators and Sludge Decanters.

Mr. Thanasis has acquired his thorough and practical experience as the Project Manager, Plant Manager, Area Manager - Equipment Construction, Construction Superintendent, Project Engineer and Design Engineer. His duties covered Plant Preliminary Design, Plant Operation, Write-up of Capital Proposal, Investment Approval, Bid Evaluation, Technical Contract Write-up, Construction and Subcontractor Follow up, Lab Analysis, Sludge Drying and Management of Sludge Odor and Removal. He has worked in various companies worldwide in the USA, Germany, England and Greece.

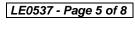
Mr. Thanasis is a Registered Professional Engineer in the USA and Greece and has a Master and Bachelor degrees in Mechanical Engineering with Honours from the Purdue University and SIU in USA respectively as well as an MBA from the University of Phoenix in USA. Further, he is a Certified Internal Verifier/Trainer/Assessor by the Institute of Leadership & Management (ILM) a Certified Instructor/Trainer and has delivered numerous trainings, courses, seminars, workshops and conferences worldwide.















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: Sunday, 24th of November 2024

Day I.	Sunday, 24 Of November 2024
0730 - 0800	Registration & Coffee
0800 - 0815	Welcome & Introduction
0815 - 0830	PRE-TEST
0830 - 0930	Working Principles of Transformers
	Applications of Transformer • Principles of Operation • Definition of a Few Basic Parameters of Transformer • Performance Parameters
0930 - 0945	Break
0945 - 1100	Insulating Oil
	Chemistry of Transformer Oil • Characteristic Properties and Specification •
	Physical Properties • Stability Characteristics
1100 – 1230	Insulating Oil (cont'd)
	Electrical Properties • Storage, Handling and Transport of Transformer Oil •
	Compatibility and Contaminants
1230 - 1245	Break
1245 - 1420	Insulating Oils, Fluids & Gases
	Deterioration of Insulating Oil • Insulating Oil Testing • Combustible Gas
	Analysis of Insulating Oil • Less Flammable Insulating Fluids • Insulating
	Liquid Sampling Procedures
1420 - 1430	Recap
1430	Lunch & End of Day One

Day 2: Monday, 25th of November 2024

Day Z.	Monday, 25 Of November 2024
0730 - 0930	Principles of Transformer Oil Testing Instrumentation
	UV/VIS Spectrophotometers • Spectrophotometer Architecture • Sources,
	Filters and Detectors
0930 - 0945	Break
0945 – 1100	Principles of Transformer Oil Testing Instrumentation (cont'd)
	IR Instrumentation • Instrumentation: Design and Performance Criteria •
	Fourier Transform Instruments • Filter Instrumentation
1100 - 1230	Principles of Transformer Oil Testing Instrumentation (cont'd)
	Atomic Absorption Spectroscopy • Introduction • Flame AAS •
	Nebulizer/Burner Systems • Atomisation and Interferences • Graphite
	Furnace AAS
1230 - 1245	Break
1245 - 1420	Principles of Transformer Oil Testing Instrumentation (cont'd)
	ICP - OES: Inductively Coupled Plasma - Optical Emission Spectroscopy •
	Principals of Optical Emission Spectroscopy • Atomic Spectroscopy Sources •
	Techniques and Instruments • Analytical Performance • Applications of
	ICP-OES
1420 - 1430	Recap
1430	Lunch & End of Day Two

















Day 3: Tuesday, 26th of November 2024

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Principles of Transformer Oil Testing Instrumentation (cont'd) Gas Chromatographs • Selection of Carrier Gases • Gas Chromatography Columns • Column Stationary Phases • Injectors and Detectors • Gas
Chromatography – Mass Spectrometry
Break
Principles of Transformer Oil Testing Instrumentation (cont'd) Gas Chromatographs • Selection of Carrier Gases • Gas Chromatography Columns • Column Stationary Phases • Injectors and Detectors • Gas Chromatography – Mass Spectrometry
Principles of Transformer Oil Testing Instrumentation (cont'd) Gas Chromatographs • Selection of Carrier Gases • Gas Chromatography Columns • Column Stationary Phases • Injectors and Detectors • Gas Chromatography – Mass Spectrometry
Break
Principles of Transformer Oil Testing Instrumentation (cont'd) Electrochemical Techniques • Principals of Conductivity • Immersed Electrodes – 2 an 4 Electrode Cells • Electrodeless (Non-contact) Measurement • pH Probes – Theory, Calibration, Measurement and Maintenance
Recap
Lunch & End of Day Three

Day 4: Wednesday, 27th of November 2024

<u> </u>	Trounecady, 21 Criticion 2021
0730 - 0930	Transformer Oil Tests
	Appearance • Color • Corrosive Sulphur • Density • Specific Gravity
0930 - 0945	Break
0945 – 1100	Transformer Oil Tests (cont'd)
	Dielectric Breakdown Voltage • Dissolved Gas Analysis • Furfural and
	Related Compounds • Interfacial Tension
1100 – 1230	Transformer Oil Tests (cont'd)
	Kinematic Viscosity • Oxidation Stability • Sediment, Sludge
1230 - 1245	Break
1245 - 1420	Transformer Oil Tests (cont'd)
	Suspended Particles in Oil, Visual • Water Content
1420 - 1430	Recap
1430	Lunch & End of Day Four

Day 5: Thursday, 28th of November 2024

0730 - 0930	Transformer Oil Tests (cont'd)
	Trace Analysis • PCB's
0930 - 0945	Break
0945 – 1100	Results Presentation
	Statistic Basics • Distributions of Data
1100 – 1230	Results Presentation (cont'd)
	Significant Figures • Introduction to Measurement Uncertainty
1230 - 1245	Break
1245 – 1345	Results Presentation (cont'd)
	Using Confidence Limits • Outlier Testing
1345 - 1400	Course Conclusion
1400 – 1415	POST-TEST
1415 - 1430	Presentation of Course Certificates
1430	Lunch & End of Course



















Practical Sessions

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



<u>Course Coordinator</u>
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