COURSE OVERVIEW RE0170
Failure Modes, Effects & Criticality Analysis (FMECA)

Course Title
Failure Modes, Effects & Criticality Analysis (FMECA)

Course Date/Venue
August 18-22, 2025/Glasshouse Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

3.0 CEUs (30 PDHs) AWARD

H-STK© INCLUDED

Course Reference
RE0170

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 participants with a detailed and up-to-date overview of Failure Modes, Effects & Criticality Analysis (FMECA). It covers the reliability-centered maintenance (RCM), failure modes and effects analysis (FMEA) and FMECA methodology and standards; the types of failures in power equipment, system hierarchies and functional breakdown; the team formation, FMECA planning, failure modes and assessing failure effects; the severity ratings, occurrence ratings and estimation techniques; and the detection ratings and control measures, calculating risk priority number (RPN), criticality analysis basics and quantitative criticality assessment.

During this interactive course, participants will learn the risk matrix and risk assessment models, ranking and prioritizing actions and linking FMECA with maintenance strategy; the FMECA reporting and documentation, FMECA for electrical systems, mechanical and rotating equipment and integration with safety and regulatory standards; the human errors as failure modes, task analysis and error likelihood, control room interface failures and training and procedural improvement; and when to use FMECA versus RCA, synergy between both techniques and using FMECA results to support RCA.

Course Objectives

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

- Apply and gain an in-depth know ledge on failure modes, effects & criticality analysis (FMECA)
- Discuss reliability-centered maintenance (RCM), failure modes and effects analysis (FMEA) and FMECA methodology and standards
- Identify the types of failures in power equipment, system hierarchies and functional breakdown
- Describe team formation and FMECA planning, identify failure modes and assess failure effects
- Assign severity ratings and apply occurrence ratings and estimation techniques
- Carryout detection ratings and control measures including calculating risk priority number (RPN), criticality analysis basics and quantitative criticality assessment
- Illustrate risk matrix and risk assessment models, ranking and prioritizing actions and linking FMECA with maintenance strategy
- Apply FMECA reporting and documentation, FMECA for electrical systems, mechanical and rotating equipment and integration with safety and regulatory standards
- Identify human errors as failure modes and carryout task analysis and error likelihood, control room interface failures and training and procedural improvement
- Recognize when to use FMECA versus RCA, synergy between both techniques and using FMECA results to support RCA

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 failure modes, effects and criticality analysis (FMECA) for reliability engineers, quality engineers, design engineers, maintenance engineers, systems engineers, project managers/product managers, manufacturing and process engineers, quality assurance (QA)/quality control (QC) professionals, maintenance and asset managers, operations and production managers and other technical staff.

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
Haward's 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**. Haward's certificates are internationally recognized and accredited by the British Accreditation Council (BAC). 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:

Dr. Tony Dimitry, PhD, MSc, BSc, is a **Senior Mechanical & Maintenance Engineer** with over **30 years** of industrial experience within the **Petroleum**, **Oil & Gas**, **Petrochemical**, **Nuclear & Power** industries. His expertise covers Revising **Engineering Drawings**, **Engineering Drawings & Diagrams**, **AutoCAD & GIS Support**, Retailed **Engineering Drawings**, Codes & Standards, **Mechanical Diagrams** Interpretation, Reading **Engineering Drawings**, **Process & Project Drawings**, **Engineering Drawings** Interpretation, **Piping Layouts & Isometrics**, **P&ID** Reading & Interpretation, Glass Reinforced Epoxy (**GRE**), Glass Reinforced Pipes (**GRP**), Glass Reinforced Vent (**GRV**), **Mechanical Pipe Fittings**, **Flange Joint Assembly**, Adhesive Bond Lamination, **Butt Jointing**, **Joint & Spool Production**, **Isometric Drawings**, **Flange Assembly** Method, **Fabrication & Jointing**, Jointing & Spool Fabrication, **Pipe Cuttings**, **Flange Bolt Tightening** Sequence, **Hydro Testing**, **Failure Analysis Methodologies**, Machinery Root Cause Failure Analysis (**RCFA**), **Preventive Maintenance** & **Condition Monitoring**, Reliability Centred Maintenance (**RCM**), Risk Based Inspection (**RBI**), Root Cause Analysis (**RCA**), **Planning & Managing Plant Turnaround**, **Scheduling Maintenance**, **Data Archive Maintenance**, **Master Milestone Schedule** (**MMS**), Piping & Mechanical **Vibration Analysis**, Preventive & Predictive Maintenance (**PPM**) **Maintenance**, Condition Based Monitoring (**CBM**), Risk Based Assessment (**RBA**), Planning & Preventive Maintenance, **Maintenance** Management (**Preventive**, **Predictive**, **Breakdown**), **Reliability** Management, Rotating Equipment, Scheduling & Cost Control, **Maximo** Foundation, **Maximo** Managing Work, **Asset Management Best Practices**, **Resource Management**, **Inventory Set-up & Management**, **Work Management**, Automatic & Work Flows & Escalations, **Vibration Analysis**, **Heat Exchanger**, **Siemens**, **Gas & Steam Turbine Maintenance**, **Pumps & Compressors**, **Turbo-Expanders**, **Fractional Columns**, **Boilers**, **Cryogenic Pumps** for **LNG**, **Electromechanical Maintenance**, **Machinery Alignment**, **Lubrication Technology**, **Bearing & Rotary Machine**, **Blower & Fan**, **Shaft Repair**, **Safety Relief Valves**, **Pipelines**, **Piping**, **Pressure Vessels**, **Process Equipment**, **Diesel Engine & Crane Maintenance**, **Tanks & Tank Farms**, **Pneumatic System**, **Static Equipment**, **FMEA**, **Corrosion**, **Metallurgy**, **Thermal** and **Electrical Modelling** of **Battery Problems**. He is also well-versed in various simulators such as i-**Learn Vibration**, **AutoCAD**, **Word Access**, **Aspen One**, **Fortran**, **VB**, **C ANSYS**, **ABAQUS**, **DYNA3D**, **Ceasar**, **Caepipe**, **MS Project**, **Primavera**, **MS Excel**, **Maximo**, **Automation Studio** and **SAP**. Currently, he is the **Maintenance Manager** of the PPC Incorporation wherein he is responsible for the maintenance and upgrading of all **Power Station** components.

During his career life, Dr. Dimitry held a significant position such as the **Operations Engineers**, **Technical Trainer**, **HSE Contracts Engineer**, **Boilers Section Engineer**, **Senior Engineer**, **Trainee Mechanical Engineer**, **Engineer**, **Turbines Section Head**, **Professor**, **Lecturer/Instructor** and **Teaching Assistant** from various multinational companies like **Chloride Silent Power Ltd.**, **Technical University of Crete**, **National Nuclear Corporation**, **UMIST Aliveri Power Station** and **HFO Fired Power Station**.

Dr. Dimitry has **PhD**, **Master** and **Bachelor** degrees in **Mechanical Engineering** from the **Victory University of Manchester** and the **University of Newcastle**, **UK** respectively. Further, he is a **Certified Instructor/Trainer,** a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**) and an associate member of the American Society of Mechanical Engineers (**ASME**) and Institution of Mechanical Engineers (**IMechE**). He has further delivered various trainings, seminars, courses, workshops 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.

Course Program

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

Day 1: Monday, 18th of August 2025

0730 – 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Reliability-Centered Maintenance (RCM)*** *Definition and Objectives of RCM • Importance of System Reliability in Power Networks • Comparison Between RCM and Traditional Maintenance • RCM Process Flow and Integration with FMECA*
0930 – 0945	*Break*
0945 – 1030	***Basic of Failure Modes & Effects Analysis (FMEA)*** *What Is FMEA and its Purpose • Basic Terminologies (Failure Mode, Effects, Severity, etc.) • FMEA versus FMECA • Historical Development and Applications in the Power Sector*
1030 – 1130	***FMECA Methodology & Standards*** *MIL-STD-1629A and IEC 60812 Overview • Step-by-Step Methodology • Documentation and Reporting Structure • Roles and Responsibilities in the FMECA Process*
1130 – 1215	***Types of Failures in Power Equipment*** *Electrical Failure Modes (Transformers, Breakers, Relays) • Mechanical Failure Modes (Pumps, Motors, Turbines) • Environmental and Operational Failures • Hidden and Intermittent Failures*
1215 – 1230	*Break*
1230 – 1330	***System Hierarchies & Functional Breakdown*** *System, Subsystem and Component Level Definitions • Functional Decomposition Techniques • Identifying Boundaries and Interfaces • Use of Block Diagrams and P&IDs*

1330 – 1420	***Team Formation & FMECA Planning*** *Assembling a Multidisciplinary FMECA Team • Planning and Scheduling FMECA Studies • Defining Scope and System Boundaries • Data Gathering and Historical Failure Records*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day One*

Day 2: **Tuesday, 19th of August 2025**

0730 – 0830	***Identifying Failure Modes*** *Failure Modes from Functional Block Diagrams • Types of Failure Causes (Design, Material, Operational) • Use of Fault Trees and Historical Data • Case Examples in Substations and Transmission Lines*
0830 – 0930	***Assessing Failure Effects*** *Local versus Higher-Level Effects • System Safety and Performance Impacts • Risk of Cascading Failures • Effect of Failures on Control Systems*
0930 – 0945	*Break*
0945 – 1100	***Assigning Severity Ratings*** *Severity Scoring Criteria • Impact on Safety, Environment, Service and Cost • Scoring Tables and Justifications • Sector-Specific Severity Considerations for Power Systems*
1100 – 1215	***Occurrence Ratings & Estimation Techniques*** *Failure Rate Sources (Field Data, OEM Specs, MTBF) • Assigning Likelihood of Failure • Use of Weibull Analysis and Reliability Data • Examples from Circuit Breakers and Switchgear*
1215 – 1230	*Break*
1230 – 1330	***Detection Ratings & Control Measures*** *Assessing Existing Controls and Diagnostics • Instrumentation and Condition Monitoring Tools • Scoring Detection Effectiveness • Early Warning Systems in Power Plants*
1330 – 1420	***Calculating Risk Priority Number (RPN)*** *Formula: RPN = Severity × Occurrence × Detection • Thresholds and Interpretation • RPN Examples from Transformers, Relays • Group Exercise: RPN Calculation for Sample Systems*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Two*

Day 3: **Wednesday, 20th of August 2025**

0730 – 0830	***Criticality Analysis Basics*** *What is Criticality Analysis • Qualitative versus Quantitative Approaches • Linking to Asset Criticality in TRANSCO Systems • Industry Practices and Tools*
0830 – 0930	***Quantitative Criticality Assessment*** *Failure Rate (λ), Operating Time (t) and Exposure • Criticality Index (CI) and Formulas • Importance Factor and Consequence Modeling • Using MTTR, MTBF in Power Applications*
0930 – 0945	*Break*

0945 – 1100	***Risk Matrix & Risk Assessment Models*** *Creating and Using a Risk Matrix • Mapping RPNs to Risk Categories • Visualization and Stakeholder Communication • Case Studies: Risk Matrix for Power Substations*
1100 – 1215	***Ranking & Prioritizing Actions*** *Criticality Thresholds • Action Prioritization for High RPN Items • Developing Corrective Actions • Integration with Asset Management*
1215 – 1230	*Break*
1230 – 1330	***Linking FMECA with Maintenance Strategy*** *Preventive versus Predictive Maintenance • Updating Maintenance Tasks Based on FMECA • Maintenance Optimization in Substations • Aligning with ISO 55000 Principles*
1330 – 1420	***FMECA Reporting & Documentation*** *Reporting Templates and Formats • Tabular versus Graphical Presentations • Lessons Learned and Follow-up Plans • Communicating Findings to Upper Management*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Three*

Day 4: **Thursday, 21st of August 2025**

0730 – 0830	***Software Tools for FMECA*** *Overview of Tools: Xfmea, ReliaSoft, PTC Windchill • Setting up a Project • Simulation and Data Import Features • Exporting Reports and Charts*
0830 – 0930	***FMECA for Electrical Systems*** *Application to Protection Systems (Relays, CTs, VTs) • High Voltage Switchgear Case Study • FMECA for SCADA & Automation Controls • Risk Mitigation in Smart Grid Systems*
0930 – 0945	*Break*
0945 – 1100	***FMECA for Mechanical & Rotating Equipment*** *Case Study: Cooling Pumps, Motors, Compressors • Common Mechanical Failure Modes • Vibration and Thermographic Insights • Maintenance Alignment*
1100 – 1215	***Integration with Safety & Regulatory Standards*** *IEC 61508 / IEC 61511 and SIL Correlation • FANR and National Safety Requirements • Compliance Audits and FMECA Role • Safety-Critical Systems and Redundancy*
1215 – 1230	*Break*
1230 – 1330	***Human Factors in Failure Analysis*** *Human Errors as Failure Modes • Task Analysis and Error Likelihood • Control Room Interface Failures • Training and Procedural Improvement*
1330 – 1420	***Root Cause Analysis (RCA) versus FMECA*** *When to use FMECA versus RCA • Synergy Between Both Techniques • Using FMECA Results to Support RCA • Real Case Comparison from Transformer Station*
1420 – 1430	***Recap*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Topics that were Discussed Today and Advise Them of the Topics to be Discussed Tomorrow*
1430	*Lunch & End of Day Four*

Day 5: ***Friday, 22nd of August 2025***

0730 – 0930	***Group Exercise: FMECA for a Power Substation*** *Functional Breakdown of System • Identifying Failure Modes and Effects • Assigning Severity, Occurrence, Detection • Calculating RPN and Proposing Actions*
0930 – 0945	*Break*
0945 – 1100	***Case Study 1: Transmission Line Failure*** *Real Event Review (Conductor Breakage, Lightning) • Analysis of Causes and Effects • Criticality Scoring • Prevention and Mitigation Strategy*
1100 – 1215	***Case Study 2: Transformer Protection System*** *Protection Relay Malfunction • Impact on Transformer Operation • FMECA Matrix Development • Recommendations and Justification*
1215 – 1230	*Break*
1230 – 1345	***Interactive Software Demo (If Available)*** *Running an FMECA in Commercial Software • Live Data Input and RPN Visualization • Reporting Output and Decision Making • Customizing FMECA Templates for TRANSCO*
1345 – 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about Topics that were Covered During the Course*
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 the "iLearnVibration" simulator.

iLearnVibration Simulator

Course Coordinator

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