COURSE OVERVIEW PE0166
Hydrogen Industry Fundamentals

Course Title
Hydrogen Industry Fundamentals

Course Date/Venue
Session 1: April 06-10, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE
Session 2: August 04-08, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
PE0166

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

Course Description

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

This course is designed to provide participants with a detailed and up-to-date overview of Hydrogen Industry Fundamentals. It covers the properties of hydrogen and the efficiency and energy losses during production; the global hydrogen demand and market trends including hydrogen's role in decarbonization; the hydrogen safety and handling, hydrogen value chain, hydrogen in energy systems and hydrogen infrastructure; the steam methane reforming (SMR), electrolysis, other hydrogen production methods and carbon capture and storage (CCS); and the techno-economic analysis of hydrogen production and hydrogen production in practice.

During this interactive course, participants will learn the hydrogen storage options and hydrogen pipelines; the hydrogen transportation and hydrogen refueling infrastructure; the emerging storage and transport technologies, infrastructure development and challenges and hydrogen in transportation; the hydrogen for steel and cement production, ammonia production and fertilizers, hydrogen as a feedstock in petrochemicals and decarbonizing industrial heat with hydrogen; the hydrogen in power generation, hydrogen in resid ential and commercial use and hydrogen in emerging technologies; and the hydrogen policies and incentives, hydrogen economics, hydrogen sustainability and environmental impact and hydrogen innovation and research.

Course Objectives

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

- Apply and gain a comprehensive knowledge on hydrogen industry fundamentals
- Identify the properties of hydrogen and the efficiency and energy losses during production
- Discuss global hydrogen demand and market trends including hydrogen's role in decarbonization
- Apply hydrogen safety and handling and recognize hydrogen value chain, hydrogen in energy systems and hydrogen infrastructure
- Determine steam methane reforming (SMR), electrolysis, other hydrogen production methods and carbon capture and storage (CCS)
- Carryout techno-economic analysis of hydrogen production and hydrogen production in practice
- Identify hydrogen storage options and hydrogen pipelines as well as describe hydrogen transportation and hydrogen refueling infrastructure
- Discuss emerging storage and transport technologies, infrastructure development and challenges and hydrogen in transportation
- Recognize hydrogen for steel and cement production, ammonia production and fertilizers, hydrogen as a feedstock in petrochemicals and decarbonizing industrial heat with hydrogen
- Explain hydrogen in power generation, hydrogen in residential and commercial use and hydrogen in emerging technologies
- Discuss hydrogen policies and incentives, hydrogen economics, hydrogen sustainability and environmental impact and hydrogen innovation and research

Who Should Attend

This course provides an overview of all significant aspects and considerations of hydrogen industry fundamentals for engineers and technicians, project managers and consultants, government and policy makers, investors and business professionals and other technical staff.

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**.*

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: -

- 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. Attalla Ersan, PEng, MSc, BSc, is a **Senior Process & Instrumentation Engineer** with over **35 years** of extensive experience within the **Oil & Gas**, **Hydrocarbon** and **Petrochemical** industries. His expertise widely covers the areas of **Compressor** Control, **Control Valves**, **Emergency Response** Planning, **Boiler & Steam** System Management, **Process Control** Design & Plant Modelling, **Process** Instrumentation & Automation, **Process Control** Instrumentation, **Analyzer Measurement** Systems, **Pressure** Management, Selection & Sizing of all Instrumentation, **Power Transformers**, **Power System** Analysis, **Power Supply** Substations, **Electric Power System** Operation, Fundamentals of **Power System Equipment**, **Power System Stability**, **Power System Harmonics** Analysis, Mitigation & Solution Strategies, **Power System**, Generation & Distribution, **AC & DC Motors**, **Substations, Switchgears & Distribution**, **Electro-mechanical Protection Relays**, Engineering Drawings, Industrial **Power System Coordination**, Distributed Control System (**DCS**), **Honeywell TDS 3000 DCS**, **Liquid** and **Gas Flowmetering**, **Meter** Calibration and **Process Analyzer & Analytic Instrumentation**. Further, he is also well-versed in **Gas Sweetening & Sulphur Recovery**, Crackers Feed **Gas Sweetening** & Amine Washing Unit, **Process Plant** Operations, **Process Control**, Instrumentation, Troubleshooting & Problem Solving, **Process Plant** Startup & Operating Procedure, **Control Room** Emergency Response, **SIL Criteria**, Calibration & Configuration of Installed Instrumentation **PLC & DCS** and **Bearing** Replacement, **Permit to Work** System, Hazard and Operability (**HAZOP**) Study, Process Hazards Analysis (**PHA**), **HAZOP** Facilitation, **Loss Prevention**, Consequence Analysis Application, **Gas Detectors** Operation, **Accident/Incident Investigation** (**Why Tree Method**), **Occupational Exposure** Assessment, **Fire Fighting & First Aid**, **Environmental** Management and Basic **Safety** Awareness. Project Management, Human Resources Consultancy, Manpower Planning, Job Design & Evaluation, Recruitment, Training & Development and Leadership, Creative Problem-Solving Skills, Work Ethic, Job Analysis Evaluation, Training & Development Needs, Bidding & Tendering, Technical Report Writing, Supervisory Leadership, Effective Communication Skills and Total Quality Management (TQM). He is currently the **CEO** of **Ersan Petrokimya Teknoloji Company Limited** wherein he is responsible for the design and operation of Biogas Process Plants.

During his career life, Mr. Ersan has gained his practical and field experience through his various significant positions and dedication as the **Policy**, **Organization & Manpower Development Head**, **Training & Development**, **Head**, **Ethylene Plant – Pyrolysis Furnace Engineer**, **Production Engineer**, Process Training Coordinator, Ethylene Plant Shift Supervisor, Ethylene Plant Panel & Fit Operator, Process Training & Development Coordinator, **Technical Consultant**, and **Instructor/Trainer** for Qatar Vinyl Company Limited and Qatar Petroleum Company (QAPCO).

Mr. Ersan is a **Registered Professional Engineer** and has a **Master's degree** of **Education** in **Educational Training & Leadership** and a **Bachelor's degree** of **Petrochemical Engineering**. Further, he is a **Certified Instructor/Trainer** and has delivered numerous trainings, courses, workshops, conferences and seminars 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.

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 workshop 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	***Hydrogen Basics*** *Properties of Hydrogen (Physical and Chemical) • History of Hydrogen Usage • Hydrogen's Role as an Energy Carrier • Comparison with other Energy Carriers (Electricity, Natural Gas)*
0930 – 0945	*Break*
0945 – 1030	***Hydrogen Production Overview*** *Key Methods of Production (Electrolysis, SMR, etc.) • Grey, Blue and Green Hydrogen: Definitions and Differences • Efficiency and Energy Losses during Production • Environmental Impact of Various Production Methods*
1030 – 1130	***Global Hydrogen Demand & Market Trends*** *Current Global Hydrogen Demand by Sector • Projections for Hydrogen Demand Growth • Key Players and Countries Leading in Hydrogen Technology • Hydrogen in Global Energy Policies and Agreements*
1130 – 1215	***Hydrogen's Role in Decarbonization*** *Hydrogen as a Tool to Achieve Net-Zero Targets • Comparing Hydrogen and Electrification in Decarbonization Strategies • Case Studies of Hydrogen in Decarbonizing Industries • Challenges in Scaling up Hydrogen Technologies*
1215 – 1230	*Break*
1230 – 1330	***Hydrogen Safety & Handling*** *Unique Safety Considerations for Hydrogen • Storage and Transportation Risks • Case Studies of Safety Incidents and Lessons Learned • Current Safety Regulations and Certifications*

1330 – 1420	***Hydrogen Industry Overview*** *Overview of the Hydrogen Value Chain • Hydrogen in Energy Systems (Production, Distribution, Utilization) • Hydrogen Infrastructure: Current Status and Gaps • Future Opportunities and Challenges in the Hydrogen Economy*
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

0730 – 0830	***Steam Methane Reforming (SMR)*** *Basic Principles of SMR • Role of Natural Gas in Hydrogen Production • Carbon Emissions and Carbon Capture Technologies • Cost and Efficiency of SMR*
0830 – 0930	***Electrolysis*** *Fundamentals of Water Electrolysis • Types of Electrolyzers: PEM, Alkaline and Solid Oxide • Efficiency and Energy Requirements • Green Hydrogen Production Using Renewable Energy*
0930 – 0945	*Break*
0945 – 1100	***Other Hydrogen Production Methods*** *Biomass Gasification and Pyrolysis • Hydrogen from Waste and Municipal Solid Waste • Nuclear Hydrogen Production • Emerging Production Technologies (e.g., Photocatalysis)*
1100 – 1215	***Carbon Capture & Storage (CCS)*** *CCS Technology Overview • Integration of CCS with Grey and Blue Hydrogen Production • Cost Analysis of CCS Technologies • Challenges and Risks in CCS Adoption*
1215 – 1230	*Break*
1230 – 1330	***Techno-Economic Analysis of Hydrogen Production*** *Capital and Operational Costs of Various Production Methods • Energy Input versus Output Efficiency • Scalability of Production Technologies • Global Case Studies on Cost-Effective Hydrogen Production*
1330 – 1420	***Hydrogen Production in Practice*** *Current Operational Plants Around the World • Pilot Projects for Emerging Technologies • Policies Supporting Hydrogen Production • Challenges in Deploying Large-Scale Hydrogen Production*
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

0730 – 0830	***Hydrogen Storage Options*** *Compressed Hydrogen Storage • Liquefied Hydrogen Storage • Solid-State Hydrogen Storage (e.g., Metal Hydrides) • Comparison of Storage Methods: Cost, Efficiency, Safety*
0830 – 0930	***Hydrogen Pipelines*** *Design and Construction of Hydrogen Pipelines • Challenges in Retrofitting Natural Gas Pipelines • Hydrogen Embrittlement and Mitigation Strategies • Case Studies of Hydrogen Pipeline Projects*
0930 – 0945	*Break*
0945 – 1100	***Hydrogen Transportation*** *Trucking Hydrogen as Compressed Gas or Liquid • Shipping Hydrogen Globally • Emerging Technologies (e.g., Ammonia as a Hydrogen Carrier) • Cost Comparison of Different Transportation Methods*
1100 – 1215	***Hydrogen Refueling Infrastructure*** *Design and Operation of Hydrogen Refueling Stations • Refueling Processes for Vehicles and Equipment • Current State of Refueling Networks • Integration with Renewable Energy Sources*
1215 – 1230	*Break*
1230 – 1330	***Emerging Storage & Transport Technologies*** *Hydrogen Storage in Underground Salt Caverns • Liquid Organic Hydrogen Carriers (LOHCs) • Innovations in Long-Distance Hydrogen Shipping • Advances in Hydrogen Storage Materials*
1330 – 1420	***Infrastructure Development & Challenges*** *Costs of Hydrogen Infrastructure Deployment • Policies Supporting Hydrogen Infrastructure • Public-Private Partnerships for Hydrogen Projects • Lessons from Early Adopters (e.g., Japan, Germany)*
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

0730 – 0830	***Hydrogen in Transportation*** *Fuel Cell Electric Vehicles (FCEVs) • Hydrogen in Aviation and Maritime Transport • Hydrogen-Powered Trains and Heavy-Duty Vehicles • Comparison of Hydrogen and Battery-Electric Vehicles*
0830 – 0930	***Hydrogen in Industry*** *Hydrogen for Steel and Cement Production • Ammonia Production and Fertilizers • Hydrogen as a Feedstock in Petrochemicals • Decarbonizing Industrial Heat with Hydrogen*
0930 – 0945	*Break*
0945 – 1100	***Hydrogen in Power Generation*** *Hydrogen-Fueled Turbines for Electricity Generation • Energy Storage Using Hydrogen • Co-Firing Hydrogen with Natural Gas • Potential for Hydrogen in Grid Stability and Backup Power*
1100 – 1215	***Hydrogen in Residential & Commercial Use*** *Hydrogen for Heating and Cooking • Hydrogen-Powered Appliances • Challenges in Scaling Hydrogen for Residential Use • Pilot Projects for Hydrogen in Buildings*

1215 – 1230	*Break*
1230 – 1330	***Hydrogen in Emerging Technologies*** *Hydrogen Fuel Cells: Operation and Advancements • Hydrogen Drones and Robotics • Hydrogen-Based Synthetic Fuels • Emerging Research Areas in Hydrogen Technology*
1330 – 1420	***Case Studies of Hydrogen Applications*** *Hydrogen in Renewable Energy Integration • Hydrogen-Powered Cities and Hubs • Successful Projects Worldwide • Lessons Learned from Failed Implementations*
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

0730 – 0830	***Hydrogen Policies & Incentives*** *Overview of Hydrogen Strategies Worldwide (EU, US, Japan, etc.) • Government Subsidies and Tax Incentives • Carbon Pricing and its Impact on Hydrogen Adoption • Public-Private Partnerships and International Collaboration*
0830 – 0930	***Hydrogen Economics*** *Market Competitiveness of Hydrogen versus Fossil Fuels • Cost Reduction Pathways for Hydrogen Technologies • Supply Chain Challenges and Opportunities • Long-Term Investment Trends in Hydrogen*
0930 – 0945	*Break*
0945 – 1100	***Hydrogen Sustainability & Environmental Impact*** *Lifecycle Emissions of Hydrogen Production • Land and Water Use Considerations • Potential Environmental Risks and Mitigation Strategies • Social Acceptance and Public Perception of Hydrogen*
1100 – 1215	***Hydrogen Innovation & Research*** *Breakthroughs in Hydrogen Production and Storage • Advances in Fuel Cell Technologies • Role of AI and Digitalization in Hydrogen Systems • Future Applications of Hydrogen in Space and Advanced Industries*
1215 – 1230	*Break*
1230 – 1300	***Challenges & Barriers to Hydrogen Adoption*** *Technical Challenges: Efficiency, Durability, Scalability • Regulatory and Policy Hurdles • Public Perception and Market Readiness • Addressing Workforce and Skills Gaps*
1300 - 1345	***The Future of Hydrogen*** *Hydrogen in Achieving Global Energy Transition Goals • Roadmaps for Hydrogen Industry Growth (2030, 2040, 2050) • Global Collaboration Opportunities • Vision for a Hydrogen-Powered Economy*
1330 – 1345	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about t Topics that were Covered During the Course*
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:-

Course Coordinator

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