COURSE OVERVIEW DE0160-4D
ESP Application Engineering

Course Title
ESP Application Engineering

Course Reference
DE0160-4D

Course Duration/Credits
Four days/2.4 CEUs/24 PDHs

Course Date/Venue

Session(s)	Date	Venue
1	September 02-05, 2024	Club B Meeting Room, Ramada Plaza by Wyndham Istanbul City Center, Istanbul, Turkey
2	December 09-12, 2024	Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

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 comprehensive overview of ESP application engineering. It covers the artificial lift principles; the various artificial lift methods used in the petroleum industry; the electrical submersible pumps (ESP) advantages and other artificial lift methods; selecting the correct artificial lift system; the importance of well productivity to pump performance; the wellbore, reservoir and performance of artificial lift; the ESP systems, operations, head generation, impeller types and its characteristics; the ESP components; and the equipment and accessories that make up the ESP system.

During this interactive course, participants will learn the basic sizing principles for ESP artificial lift design and diagnosis; the ESP design procedure and sensitivity analysis; the steps to correctly size an electrical submersible pump; the concept of variable speed controllers; the process of pumping high GOR wells and viscous fluid; the economic analysis principles for project evaluation; the effects of artificial lift and ESP on project economics; the method of prediction, analysis and diagnosis of ESP performance application; the gas handling theory and practice; and the ESP technology, systems in combination with Smart wells, the effect of sand, blocking at intake and sand handling.

Course Objectives

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

- Apply and gain an in-depth knowledge on ESP application engineering
- Introduce artificial lift principles and have a good background on the various artificial lift methods used in the petroleum industry
- Identify electrical submersible pumps (ESP) advantages, its comparison with the other artificial lift methods and determine the criteria for selecting the correct artificial lift system
- Discuss the importance of well productivity to pump performance and review wellbore, reservoir and performance of artificial lift
- Recognize ESP systems and review ESP operations, head generation, impeller types and its characteristics
- Identify ESP components including their functions and determine the equipment and accessories that make up the ESP system
- Review the basic sizing principles for ESP artificial lift design and diagnosis and describe ESP design procedure and sensitivity analysis
- Carryout proper steps to correctly size an electrical submersible pump and discuss the concept of variable speed controllers including its techniques for designing
- Demonstrate the process of pumping high GOR wells and pumping viscous fluid and discuss their effects on the performance of ESP
- Review and improve economic analysis principles for project evaluation and discover the effects of artificial lift and ESP on project economics
- Practice the method of prediction, analysis and diagnosis of ESP performance application by giving practical examples and exercises
- Apply gas handling theory and practice by determining its properties, methods and effects
- Discover ESP technology including coiled tubing, ESP systems in combination with Smart wells, the effect of sand, blocking at intake and sand handling

Who Should Attend

This course provides an overview of all significant aspects and considerations of ESP application engineering for engineers, technologists and other technical staff with direct responsibility for electric submersible pumping (ESP) & artificial lift systems design and troubleshooting including maximizing production and minimizing operating costs.

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 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 **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.

- 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.

Accommodation

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

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. Konstantin Zorbalas, MSc, BSc, is a **Senior Petroleum Engineer & Well Completions Specialist** with over **25 years** of **offshore** and **onshore** experience in the **Oil** & **Gas**, **Refinery** & **Petrochemical** industries. His wide expertise includes **Workovers & Completions**, **Petroleum Risk & Decision** Analysis, **Acidizing Application** in **Sandstone** & **Carbonate**, **Well Testing Analysis**, **Stimulation Operations**, **Reserves Evaluation**, **Reservoir Fluid Properties**, **Reservoir Engineering & Simulation Studies**, **Reservoir Monitoring**, **Artificial Lift Design**, **Gas Operations**, **Workover/Remedial Operations** & **Heavy Oil Technology**, **Applied Water Technology**, **Oilfield Development & Production Optimization**, **Oil & Gas Production**, **X-mas Tree** & **Wellhead Operations** & **Testing**, **Artificial Lift Systems** (**Gas Lift**, **ESP**, and **Rod Pumping**), **Well Cementing**, **Production Optimization**, **Well Completion Design**, **Sand Control**, **PLT Correlation**, **Slickline Operations**, **Acid Stimulation**, **Well testing**, **Production Logging**, **Project Evaluation** & **Economic Analysis**. Further, he is actively involved in **Project Management** with special emphasis in production technology and field optimization, performing conceptual studies, economic analysis with risk assessment and field development planning. He is currently the **Senior Petroleum Engineer & Consultant** of **National Oil Company** wherein he is involved in the mega-mature fields in the Arabian Gulf, predominantly carbonate reservoirs; designing the acid stimulation treatments with post-drilling rigless operations; utilizing CT with tractors and DTS systems; and he is responsible for gas production and preparing for reservoir engineering and simulation studies, well testing activities, field and reservoir monitoring, production logging and optimization and well completion design.

During his career life, Mr. Zorbalas worked as a **Senior Production Engineer**, **Well Completion Specialist**, **Production Manager**, **Project Manager**, **Technical Manager**, **Technical Supervisor** & **Contracts Manager**, **Production Engineer**, **Production Supervisor**, **Production Technologist**, **Technical Specialist**, **Business Development Analyst**, **Field Production Engineer** and **Field Engineer**. He worked for many **world-class oil/gas companies** such as **ZADCO**, **ADMA-OPCO**, **Oilfield International Ltd**, **Burlington Resources** (later acquired by **Conoco Phillips**), **MOBIL E&P**, **Saudi Aramco**, **Pluspetrol E&P SA**, **Wintershall**, **Taylor Energy**, **Schlumberger**, **Rowan Drilling** and **Yukos EP** where he was in-charge of the **design and technical analysis** of a gas plant with capacity **1.8 billion m3/yr gas**. His achievements include **boosting oil production 17.2% per year** since 1999 using **ESP** and **Gas Lift systems**.

Mr. Zorbalas has **Master** and **Bachelor** degrees in **Petroleum Engineering** from the **Mississippi State University**, **USA**. Further, he is an **SPE Certified Petroleum Engineer**, **Certified Instructor/Trainer**, a **Certified Internal Verifier/Assessor/Trainer** by the **Institute of Leadership & Management** (**ILM**), an active member of the Society of Petroleum Engineers (**SPE**) and has numerous scientific and technical publications and delivered innumerable training courses, seminars and workshops worldwide.

Course Fee

Istanbul	**US$ 7,250** per Delegate + **VAT**. This rate includes Participants Pack (Folder, Manual, Hand-outs, etc.), buffet lunch, coffee/tea on arrival, morning & afternoon of each day.
Dubai	**US$ 6,750** 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 director(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 & Introductions*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Introduction to Artificial Lift Principles*** *Brief Introduction to the Various Artificial Lift Methods Used in the Petroleum Industry ● Advantages & Disadvantages of the Main Artificial Lift Methods & Analysis of which Method has Merit to which Applications*
0930 – 0945	*Break*
0945 – 1045	***ESP Advantages & Comparison with other AL Methods*** *Focus on ESP Artificial Lift Systems & How they Compare in Performance & Efficiency to other Artificial Lift Methods, Mainly to Gas Lift & Progressive Cavity Pumps (PCP) Systems*
1045 – 1200	***Criteria for Selecting the Correct Artificial Lift System*** *The Criteria Behind Decision Making & Proper Selection of the Artificial Lift System in the Oil & Gas Projects*
1200 – 1215	*Break*
1215 – 1315	***Well Productivity*** *A Brief Introduction of the Concepts of PI & IPR are Discussed along with the Importance of Correctly Matching Well Productivity to Pump Performance*
1315 – 1420	***Wellbore, Reservoir & Performance Review*** *Pressure Loss in the Wellbore ● Calculation of Density & other Fluid Properties ● Inflow & Outflow ● Impact of Changing Well Conditions & Need for Artificial Lift*
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 – 0930	***ESP Systems Overview & Operation*** *Review of Principles of ESP Operation, Head Generation, Impeller Types & Characteristics ● Impact on Well & Reservoir of ESP Operation ● Use of Nodal™ Analysis in ESP Applications*
0930 – 0945	*Break*

0945 – 1130	***ESP Components*** *Introduction to the Equipment & Accessories that Make Up the Electric Submersible Pumping System ● The Main Components of the ESP & Their Use & Function*
1130 – 1230	***Sizing Principles of ESP's*** *Introduction to Basic Sizing Principles for ESP Artificial Lift Design & Diagnosis ● ESP Design Procedure & Sensitivity Analysis ● Mechanical & Electrical Considerations*
1230 – 1245	*Break*
1245 – 1420	***Pump Sizing*** *The Steps to Correctly Size an Electric Submersible Pump Example Problem ● Participants Will Use a Similar Example to Size an ESP*
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 – 0930	***Variable Speed Controllers*** *The Effects of Speed Changes on the ESP ● The Techniques for Designing Variable Speed Pumping Systems ● The Student Will Work Through an Example Problem & then Solve a Problem Using a Variable Speed Controller*
0930 – 0945	*Break*
0945 – 1100	***Pumping High GOR Wells*** *The Effects of Gas on the Performance of ESP ● Determine the Amount of Free Gas Present at the Pump Intake ● The Probability of Gas Interference ● Appropriate Measures to Prevent Gas Locking ● Problems Sizing Equipment for Gassy Wells*
1100 – 1215	***Pumping Viscous Fluid*** *Effects of Viscosity on the Performance of Submersible Pumps ● Example Problem in an Application of a Field with Heavy Oil Properties to Predict Pump & Motor Performance*
1215 – 1230	*Break*
1230 – 1420	***Introduction to Economic Analysis*** *The Economic Principles for Project Evaluation are Presented SUCH as Net Present Value, Internal Rate of Return, etc. ● Evaluation of Projects & Decision Making Examples to Implement Artificial Lift Methods in Field Development*
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*

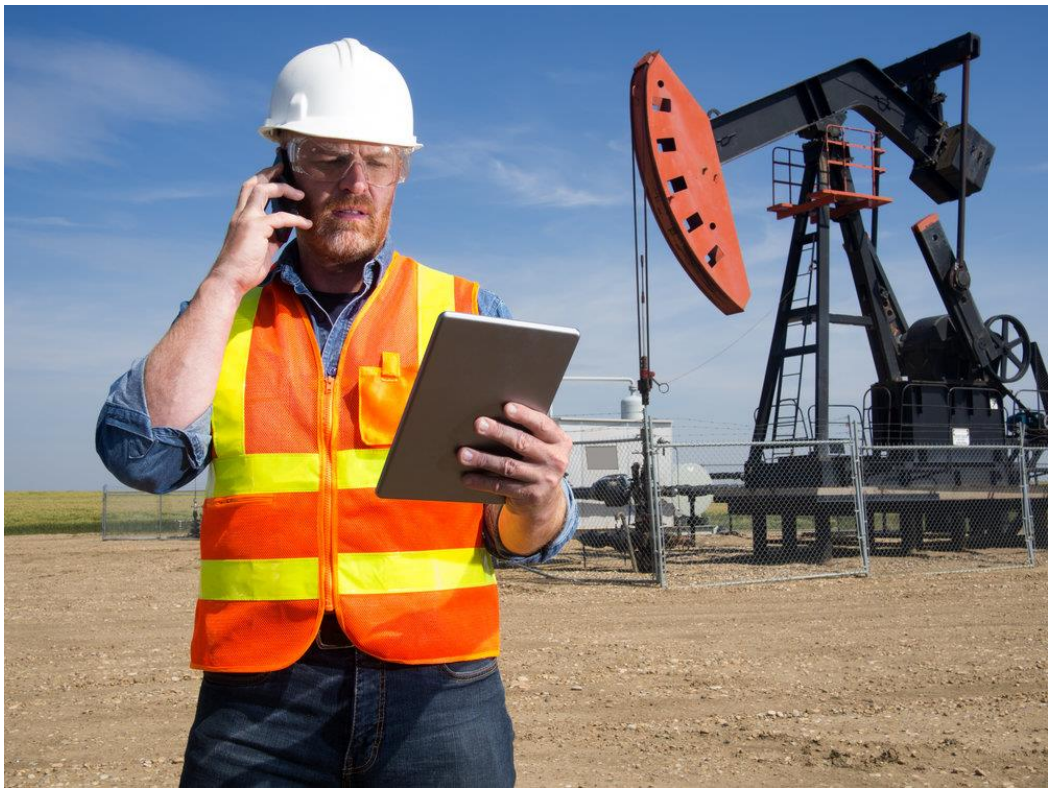
Day 4

0730 – 0930	***Effects of Artificial Lift & ESP on Project Economics*** *Data Analysis & Interpretation Examples ● Optimization of ESP Applications to Improve Project Economics*
0930 – 0945	*Break*

0945 – 1100	***Practical Workshop*** *Class Exercise on the Prediction of ESP Performance Under Varying Well & Reservoir Conditions ● Analysis & Diagnosis of Real Field Examples from Participants ● Presentations & Concluding Remarks from Teams*
1100 – 1215	***Gas Handling Theory & Practice*** *Gassy Oils Properties (Effect of Bubble Point, GOR, Pressure, Composition etc.) ● Gas Effects in Pump (Changing Volume, Effect on Pump Performance) & Wellbore ● Gas Handing Methods (Separation, Processing) &Review of New Technologies*
1215 – 1230	*Break*
1230 – 1330	***Latest Advances on ESP Technology*** *Coiled Tubing Deployed ESP ● Distinction Between CT External & Internal Cable Applications ● ESP Systems in Combination with Smart Wells ● Effect of Sand (Wear), Blocking at Intake ● Sand Handling*
1330 – 1345	*Open Forum*
1345 - 1400	***Course Conclusion*** *Using this Course Overview, the Instructor(s) will Brief Participants about the Course 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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