COURSE OVERVIEW DE0460-4D
Artificial Lift Systems & Optimization Technology

Course Title
Artificial Lift Systems & Optimization Technology

Course Date/Venue
October 14-17, 2024/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE

Course Reference
DE0460-4D

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 is designed to provide participants with a detailed and up-to-date overview of advanced artificial lift and optimization skills. It covers the well-performance evaluation leading to determination of well conditions necessitating application of artificial lift. The various types of artificial lift systems along with their selection criteria as well as the theoretical and practical aspects of the most important artificial lift methods will be covered, so that at the end of the course the participants will have a sound knowledge of the theory underlying each method including a abroad view of the relative advantages, disadvantages, niche of applications and limitations of each artificial lift system.

During this interactive course, participants will learn the basic PVT properties and inflow performance calculations related to artificial lift; the principles of multiphase tubing and pipe flow; the appropriate selection of artificial lift system; the comparison of systems to determine what system is most economically feasible; the specification of components and auxiliary equipment needed for each system; the classification of best practices to extend the life of equipment and installed lift systems; the basic design and analysis concepts; and the system features for gassy production, production with solids, viscous production, and for other harsh environments.

Course Objectives

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

- Apply and gain proper techniques on advanced artificial lift and optimization skills
- Identify basic PVT properties and inflow performance calculations related to artificial lift
- Recognize and apply multiphase tubing and pipe flow principles
- Select the appropriate artificial lift system
- Compare systems to determine what system is most economically feasible.
- Specify components and auxiliary equipment needed for each system
- Classify best practices available to extend the life of equipment and installed lift systems
- Apply basic design and analysis concepts
- Design system features that allow for gassy production, production with solids, viscous production, and for other harsh environments

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 artificial lift systems for production engineers, engineers with limited experience in the subject. Experienced engineers will also benefit from this course as it will serve as a refresher for their knowledge.

Course Fee

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.

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 **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.

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**, **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.

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 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, 14th of October 2024***

0730 - 0800	*Registration & Coffee*
0800 – 0815	*Welcome & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Artificial Lift Technology***
0930 – 0945	*Break*
0945 – 1100	***Introduction to Gas Lift***
1100 – 1230	***Application of Gas Lift Technology & its Limitations***
1230 - 1245	*Break*
1245 – 1330	***Reservoir Performance*** *Inflow & Outflow Relationships*
1330 – 1420	***Gas Lift Design*** *Mandrels ● Valves ● Injection Gas Requirements ● Temperature & Choke Effects ● Equilibrium Curve ● Continuous Flow Design ● Intermittent Flow Design ● Long Perforation Zone Gas Lift Systems*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2: ***Tuesday, 15th of October 2024***

0730 – 0930	***ESP: Components*** *This is an Introduction to the Equipment & Accessories that Make Up the Electric Submersible Pumping System. This Chapter Also Introduces Basic Sizing Principles. The Student Will Solve Basic Pump, Motor & Cable Problems*
0930 – 0945	*Break*
0945 – 1100	***ESP: 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*
1100 – 1230	***ESP: Pump Sizing*** *This Chapter Carries the Student through the Steps to Correctly Size an Electric Submersible Pump (ESP). An Example Problem is Solved & then the Student Uses the Example to Size an ESP*
1230 – 1245	*Break*

1245 – 1330	***ESP: Well Productivity*** *The Concepts of PI & IPR are Discussed Along with the Importance of Correctly Matching Well Productivity to Pump Performance. The Use of Data to Diagnose Well/Equipment Problems is also Discussed*
1330 – 1420	***ESP: Pumping High GOR Wells*** *The Effects of Gas on the Performance of ESP's are Studied. Calculations are Employed to Determine the Amount of Free Gas Present at the Pump Intake. The Probability of Gas Interference is Calculated & Appropriate Measures to Prevent Gas Locking are Studied*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3: ***Wednesday, 16th of October 2024***

0730 – 0930	***ESP: Pumping Viscous Fluid*** *This Section is a Study of the Effects of Viscosity on the Performance of Submersible Pumps. An Example Problem will be Worked & then the Student Will Work a Viscous Application to Predict Pump & Motor Performance*
0930 – 0945	*Break*
0945 – 1100	***ESP: Variable Speed Controllers*** *The Effects of Speed Changes on the ESP are Studied. The Techniques for Designing Variable Speed Pumping Systems will be Discussed*
1100 - 1230	***ESP: Well 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 ● Introduction to Pressure Gradient Plots & Use for Artificial Lift Design & Diagnosis*
1230 – 1245	*Break*
1245 – 1330	***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 ● ESP Design Procedure & Sensitivity Analysis; Mechanical & Electrical Considerations*
1330 – 1420	***ESP: Advanced Diagnostic Techniques & Methods*** *Effect of Sand (Wear), Blocking at Intake, Handling Emulsions & High Viscosity Fluids ● ESP Use in Reservoirs with Extreme Temperatures ● Detailed Review of Practical Case Histories of Complex Well & ESP Interactions*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4: ***Thursday, 17th of October 2024***

0730 – 0830	***ESP: Diagnosis & Interpretation*** *Monitoring Past & Present; Review of Electrical (Amp Chart) Interpretation Techniques ● Hydraulic (Pressure) Diagnostic Principles & Use for Validation & Pump Performance Analysis ● ESP Monitoring & Automation with Downhole Sensors ● Data Analysis & Interpretation Examples, Control & Optimization Applications*
0830 – 0930	***ESP: Gas Handling Theory & Practice*** *REVIEW of Gassy Oils Properties (Effect of Bubble Point, GOR, Pressure, Composition etc.) ● Discussion of Gas Effects in Pump (Changing Volume, Effect on Pump Performance) & Wellbore ● Overview of Gas Handing Methods (Separation, Processing) & Review of New Technologies*
0930 – 0945	*Break*

0945 – 1100	***Best Practices for Installation & Maintenance***
1100 – 1230	***Criteria for Selection of Artificial Lift Systems & Artificial Lift Screening Methods***
1230 – 1245	*Break*
1245 – 1345	***Economic Analysis of Artificial Lift Systems***
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:-

Course Coordinator

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