COURSE OVERVIEW DE0103
Flow Assurance & Production Chemistry

Course Title
Flow Assurance & Production Chemistry

Course Date/Venue
Session 1: April 21-25, 2025/Fujairah Meeting Room, Grand Millennium Al Wahda Hotel, Abu Dhabi, UAE
Session 2: October 19-23, 2025/Boardroom 1, Elite Byblos Hotel Al Barsha, Sheikh Zayed Road, Dubai, UAE

Course Reference
DE0103

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.

The fluid journey from reservoir pore to process facility involves many disciplines using advanced technologies. Even long-producing fields develop flow assurance problems as time goes by and ever-deeper fields bring new challenges that extend the envelope our industry can safely and economically produce.

Optimum flow assurance design and operation requires the evaluation of all disciplines interfacing flow assurance, as well as careful consideration of the interactions between the fluid, reservoir, wells, pipelines, surface facilities, and the surrounding environment. Through the detailed understanding of these disciplines, combined with the unique fluids capabilities and integrated approach, participants will learn the capability of bringing all of these together.

The goal of this course will be to increase, in participants, an understanding of the major problems associated with flow assurance, such as asphaltenes, paraffins, emulsion, scales, corrosions, and hydrates. The participants will review the conventional methods and new approaches to prevent, control, and remediate the major problem causes to assure the flow. A comparative analysis on the technology available and the advantages and disadvantages of each will be discussed. Participants will learn how to identify the causes and mechanisms of flow impediment, along with the methods and technologies that can be applied for prevention, control, and remediation of the depositions.

This course is aimed at leaders, managers and engineers working on oil and gas field projects and operations who wish to develop their understanding of flow and fluid issues between sand face and separator, and of how to manage those issues. Particular emphasis will be given to the interrelatedness of flow assurance with many other engineering disciplines and with key project and operational decisions.

The course assumes basic engineering education and experience. It will build on fundamental principles to develop an understanding of what flow assurance is, and how to successfully address flow assurance issues in oil and gas field development projects and operations.

Course Objectives

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

- Apply and gain a basic knowledge on flow assurance
- Discuss oil and gas field development and flow related issues
- Identify fluid related issues and the causes of blockage
- Obtain fluid samples and undertake laboratory analysis to assess risk of fluid related issues occurring in the expected pressure – temperature envelope
- Develop oil or gas reservoir from a flow assurance perspective
- Explain the methodologies and software for flow assurance engineering
- Get flow assurance work done through selecting flow assurance engineering resources, specifying the work required, ensuring correct input data, etc.
- Recognize the input to key project decisions and flow assurance in operations
- Analyze and recover from flow assurance operational issues

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 flow assurance for oil and gas field development project managers, operations managers, flow assurance engineers, production chemists, engineers, university chemical and petroleum engineering lecturers and researchers.

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. Hassan Ali is a **Senior Petroleum & Process Engineer** with over **30 years** of extensive experience in **Offshore** & **Onshore** fields within the **Oil & Gas** industries. He has great involvement and expert in all facets of **Production Operations** including Oil Plant & Process Operations for **Gas Compressors** Stations & **Condensate Recovery**, **Gas Dehydration/Regeneration** Units Troubleshooting, **Oil Production & Shipments**, Operations of Sea Water Intake **Pumping Station**, **Oil Storage Tanks** & Loading Facilities. His area of expertise includes **Electrical Submersible Pump** (**ESP**), **Crude Oil Artificial Lift** Systems, **Production Chemistry & Chemical Treatment** in the Oil & Gas Fields, **Processing & Well Testing** activities such as **Gas Lift Wells & ESP Well**, Natural Flow Wells, G/I Wells, G/L Wells, **GOSP & LGP** & Land Wells. He is further well-versed in **HYSYS & PIPESIM** Software Programs for Flow through **Pipeline** & **Process Equipment** such as Design of **Heat Exchangers** & Troubleshooting, Design of **Fired Heaters** & Operation Problems and **Air Coolers** & **Pumps** during his day-to-day work. Further, his wide experience also covers **Treatment** of **Crude Oil**, **Waste Water Treatment Technology**, **Production Shutdown**, **Gas Conditioning & Compressors**, **Plant Shutdown & Partial Shutdown**, **Surface Production Facilities**, Equipment Related & **Petroleum Risk Analysis**.

Mr. Ali is currently the **Field Production General Manager** of **SUCO** that is actively involved in the Production Operations, where he leads all On-shore Facilities, Plant & Off-shore Wells on Three Platforms and reviewed all Equipment Parameters such as Tanks, Vessels, Heat Exchangers, **Pumps Gas Flaring System** as well as **Quality Controller** of Crude Oil Analysis Salt Content & Shipment Crude Specifications to Tankers, Arrange Down Hole Surveys, Productions Logging Tools, Water Shut Off, Perforations, Chemical & Mechanical Tubing Cleaning, Operations of **Off-Shore Gas & Oil Separation** Plant, **Desalter** Plant, **Water Injection** Plant, Four **Gas Compressor** Stations & Four **Glycol** units, **Desalination** units & **R.O** units. Prior to this, he held challenging key positions as a **Production Engineer**, **Onshore Process Shift Engineer**, **Field Offshore Production Engineer**, **Offshore Supervisor**, **Process & Facilities Engineer**, **Production Supervisor**, **Processing Supervisor** and a **Senior Production Operations Engineer**. His experience was not only confined to the industry alone. He has been the **Senior Plant Engineer** in **KJO** and he was also able to contribute his expertise and impart his knowledge as a **Technical Instructor**.

Mr. Ali has a **Bachelor's** degree in **Petroleum Engineering**. Further, he is an **OSHA Certified**, a **Certified Instructor/Trainer** and holds **Certificates** in **School of Completion & Work Over** and **Well Testing** from the **USA** and has conducted numerous short courses, seminars, conferences and workshops 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 Fee

US$ 8,000 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 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 & Introduction*
0815 – 0830	***PRE-TEST***
0830 – 0930	***Overview of Oil & Gas Field Development*** *Introduction to Oil & Gas Fields • Nature of Reservoir Fluids • Pressure-Temperature Path from Reservoir to Processing to Export • Fluid Processing Near Wellhead or Remote?*
0930 – 0945	*Break*
0945 – 1200	***Flow Related Issues*** *Multiphase Flow Regimes and Their Characteristics • Change in Pressure - Effect of Fluid Properties and Flow Line Diameter, Length and Elevation Change*
1200 – 1300	***Flow Related Issues (cont'd)*** *Change in Temperature - Effect of Fluid Flow Velocity, Flow Line Diameter, Length & Insulation*
1300 – 1315	*Break*
1315 – 1420	***Flow Related Issues (cont'd)*** *Types of Slug Flow & How to Manage Them • Erosion, Sand Deposition*
1420 – 1430	***Recap***
1430	*Lunch & End of Day One*

Day 2

0730 – 0930	***Fluid Related Issues*** *Causes of Blockage - Hydrates, Wax, Scale, Asphaltenes, Napthenates • How to Manage Causes of Blockage - Engineering & Chemical Solutions*
0930 – 0945	*Break*
0945 – 1200	***Fluid Related Issues (cont'd)*** *Corrosion & How to Manage - Material Selection or Chemical Solution • Obtaining Fluid Samples & Undertaking Laboratory Analysis to Assess Risk of Fluid Related Issues Occurring in the Expected Pressure-Temperature Envelope*
1200 – 1300	***Developing an Oil or Gas Reservoir, from a Flow Assurance Perspective*** *Production Profiles • Reservoir Area Extent • Location, Capacity & Economics of Processing Facilities • Onshore Field Layout Options*
1300 – 1315	*Break*
1315 – 1420	***Developing an Oil or Gas Reservoir, from a Flow Assurance Perspective (cont'd)*** *Offshore Field Layout Options • Differences Between Greenfield & Brownfield Projects • Balance Between Managing Flow Assurance Risks, Ease of Intervention, and CAPEX*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Two*

Day 3

0730 – 0930	***Methodologies & Software for Flow Assurance Engineering*** *Prediction of Fluid Properties • Steady State Fluid Flow Modelling - Line Sizing, Characterisation of Slugging • Transient Fluid Flow Modelling - Start-Ups, Shutdown & Cooldown, Change of Flow Rate, Slugging*
0930 – 0945	*Break*
0945 – 1200	***Methodologies & Software for Flow Assurance Engineering (cont'd)*** *Detailed Localised Flow Modelling Using CFD • Understanding the Extent & Effect of Uncertainty in Input Data, & Level of Accuracy of Modelling, on Conclusions Drawn From Modelling • Designing Production System Networks • Production Optimisation Through an Operating System*
1200 – 1300	***Getting Flow Assurance Work Done*** *Selecting Flow Assurance Engineering Resources • Specifying the Work Required • Ensuring Correct Input Data*
1300 – 1315	*Break*
1315 – 1420	***Getting Flow Assurance Work Done (cont'd)*** *Checking for Correct Use of Software • Testing Output for Obvious Issues • Drawing Conclusions & Recommendations*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 4

0730 – 0930	***Input to Key Project Decisions*** *Flow Line Sizing, Configuration & Layout, & Setting Overall Field Production Capacity • Selection of Slugging Management Options • Selection of Hydrate Management Options • Specification of Chemical Injection System Configuration • Requesting Additional Instrumentation & Monitoring • Interface with Subsurface*
0930 – 0945	*Break*
0945 – 1200	***Input to Key Project Decisions (cont'd)*** *Interface with Process • Interface with Subsea, Pipeline & Riser • Interface with Static Mechanical • Interface with Material Selection • Interface with Instrument, Control, Electrical • Planning for Start-Up*
1200 – 1300	***Flow Assurance in Operations*** *Calibration & Checking of Instrumentation • Benchmarking & Updating of Software Models • Awareness of Current Fluid Flow Rates & Properties*
1300 – 1315	*Break*
1315 – 1420	***Flow Assurance in Operations (cont'd)*** *Risk Assessment of Effect of Operational Changes & Equipment Outages • Benefits of Online Simulation & Monitoring • Anticipating Challenges Resulting from Moving through Production Profile*
1420 – 1430	***Recap***
1430	*Lunch & End of Day Three*

Day 5

0730 – 0930	***Analysing & Recovering from Flow Assurance Operational Issues*** *Philosophy for Investigation of Flow & Fluid Related Incidents*
0930 – 0945	*Break*
0945 – 1200	***Analysing & Recovering from Flow Assurance Operational Issues (cont'd)*** *Hydraulic Behaviour, Particularly Slugging & Flow/Fluid Distribution*
1200 – 1245	***Analysing & Recovering from Flow Assurance Operational Issues (cont'd)*** *Hydrate Formation & Blockage*
1245 – 1300	*Break*
1300 – 1345	***Analysing & Recovering from Flow Assurance Operational Issues (cont'd)*** *Wax Deposition • Pigging*
1345 – 1400	***General Discussion & Course Conclusion***
1400 – 1415	***POST-TEST***
1415 – 1430	*Presentation of Course Certificates*
1430	*Lunch & End of Course*

Simulators (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 one of our state-of-the-art "PROSPER" software.

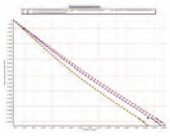
PROSPER

MULTIPHASE WELL AND PIPELINE NODAL ANALYSIS

WELL AND PIPELINE MODELS

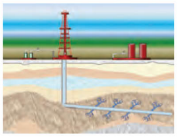
PROSPER was commercialised in the early 90's and has been the subject of ongoing research and development for over two decades. Each year, new models and functionalities are added to the already extensive list of options in the program. There are over three million combinations of options that can be used to describe the vast majority of physical phenomena happening in wells and pipelines. In spite of the large number of situations that can be modelled, the adaptive interface only presents the user with the relevant input fields and menus according to the selections made in the options menu, keeping the model building effort at a minimum. PROSPER has evolved into the industry standard for well and pipeline modelling due to it's unrivalled sound technical basis and unique modelling capabilities. The program today forms one of the foundation stones of the Digital Oil Field system, and the calculation engine is utilised by numerous workflows in real time on hundreds of fields world-wide.

OUTFLOW (VLPs) MODEL



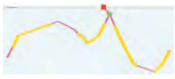
As part of the package of unique features available in PROSPER, research being conducted since Petex was founded has resulted in the creation of a number of proprietary multiphase flow pressure drop models (both empirical and mechanistic). The objective of this research has been to create fundamentally rigorous models that overcome the limitations of traditional models available in the industry. Petex is uniquely placed to have access to data from all over the world and over the years, a comprehensive database of pressure drop measurements has been created, which allows our researchers to compare novel physical models to real world information. Independent comparisons done by industry experts in multiphase flow have proven the reliability and consistency of the Petroleum Experts pressure drop models, to the point where these models are being widely used to quality check measurements obtained in the field. As part of a clearly defined well test quality check workflow, users have the ability to compare and contrast the behaviour of traditional pressure drop models with the ones uniquely available in PROSPER in order to assess suitability and consistency over the life of a well. Should users choose to use third party pressure drop models such as OLGAS or LEDAFLOW, these are also available as plug-ins, provided that the relevant licenses from the third party vendors are put in place.

INFLOW (IPRs) MODEL



A comprehensive set of inflow models complement the multiphase flow capabilities in PROSPER, enabling Nodal Analysis calculations to be done for virtually any type of well. There are over 20 inflow models that have been developed over the years, that can be applied to horizontal, vertical, deviated, multilayer and multilateral geometries. Furthermore, novel development has seen the realisation of unique inflow models that account for changing PVT conditions in the well drainage area as well as in multiple zones. This allows re-perforation studies, analysis of skin, the application of sand control measures and many other sensitivities to be conducted easily.

MULTILATERAL COMPLETIONS

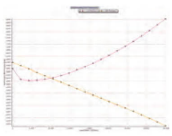


Alongside all of the analytically derived Inflow Performance Relationships available in PROSPER, the Multi-Lateral IPR model is the culmination of extensive research and has been designed specifically for complex well completions that have undulating trajectories across multiple producing zones. This is the most advanced analytical IPR that exists in the industry today and can only be found in PROSPER as another one of the many unique features in the program.

PROSPER

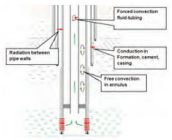
MULTIPHASE WELL AND PIPELINE NODAL ANALYSIS

INFLOW/OUTFLOW RESPONSE



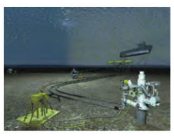
The rigorous multiphase pressure drop models and unique list of inflow performance relationships come together to form system calculations for well and pipeline models. This allows for assessing the productivity of oil, gas and condensate wells to be performed, both for production and injection scenarios, with or without artificial lift. Sensitivities can be conducted through a simple interface that allows the investigation of virtually all parameters that are inputs to the models and the matching workflows allow for comparisons to be done between the results predicted by the models and the measurements obtained for these wells if they are already operational.

THERMAL MODELLING



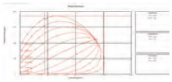
PROSPER is capable of modelling thermal profiles in wellbores using multiple methods, ranging from a constant rate of heat transfer (Rough Approximation) through to a detailed and rigorous full energy balance (Enthalpy Balance) that considers the forced and free convection, conduction and radiation heat transfer mechanisms. The latter considers a detailed materials specification, and to aid with this PROSPER has been furnished with a database of common casing, tubing, cement and mud descriptions with their associated heat transfer properties. Users can also take advantage of a hybrid thermal calculation technique that was developed by Petex (Improved Approximation). This allows for Joules-Thomson effects to be captured in the well, while at the same time enabling multiple heat transfer coefficients with depth to be used.

FLOW ASSURANCE



Flow assurance studies are an integral part of any pipeline and well analysis, done both for designing and troubleshooting purposes. In PROSPER many years of research have been dedicated to addressing these issues and users can study either hydraulic flow assurance challenges, or issues related to the thermodynamic behaviour of fluids. Hydraulic investigations can be conducted on flow regimes, erosional velocities, superficial velocities, wellbore stability analysis (liquid loading), slug catcher sizing and many others. Thermodynamic calculations can include studies on hydrate formation, waxing, salt precipitation and others. PROSPER will indicate where in the system these issues might occur and the user has options to consider intervention (e.g. hydrate inhibition, surfactants, etc.) or changing the operational conditions (wellhead pressure).

FULLY COMPOSITIONAL



As is the case with all the programs developed by Petex, PROSPER uses a powerful thermodynamics engine to complement the traditional black oil models that provide all the thermodynamic properties needed for the pressure drop, flow assurance and inflow calculations. In fully compositional mode, PROSPER allows users to take advantage of advanced hydrate prediction and mitigation calculations, salt deposition, special handling of CO_2 for dense and light phases and many other functionalities. In black oil mode, a large number of correlations are available that can be compared and matched to lab data. Special correlations for heavy oils have been implemented and these, coupled with an emulsion model as well as special heavy oil pressure drop models, make PROSPER unique in being able to deal with such fluids and the intricacies of producing them. Another feature that is widely used is the ability to predict the vaporised water that is produced from gas wells. This is based on industry standard calculations that have been modified based on data received from clients to create a uniquely accurate model for analysing this situation.

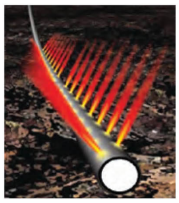
PROSPER

MULTIPHASE WELL AND PIPELINE NODAL ANALYSIS

ARTIFICAL LIFT SYSTEMS

Artificial lift design and troubleshooting has been an area where PROSPER has offered unparalleled modelling capabilities to the user community for many years. Gas Lift, ESPs, HSPs, Coil Tubing Gas Lift, PCPs, Jet Pumps, Sucker Rod Pumps are only a few of the many lift mechanisms that can be evaluated for new and existing installations. With every new release of the program, one or more methods are added and the capability of the existing methods are enhanced. A database of equipment (Pumps, valves, motors etc) is available and is being updated every year as new descriptions become available. Unique features include the Quicklook troubleshooting workflows, minimum energy methodologies for HSP wells, designs that consider the inflow performance and many others. The latest addition to the list is a Fully Transient Gas Lift Simulator, which simulates the unloading phase of gas lifting and allows users to assess the stability of such wells. All the artificial methods available can be made part of a bigger network model (GAP) for full field optimisation as well as the Digital Oilfield systems where they can form the basis of any workflow that users wish to automate (for surveillance, diagnostics and others).

PERFORATION DESIGN AND PERFORMANCE



As part of the philosophy of sharing knowledge among operators in the industry, Shell has contributed their proprietary perforation optimisation tool (SPOT) which can now be found as part of the standard toolkit of calculations in PROSPER. The objective of this module is to allow engineers to compare the perforation charge performance and assist in selecting the optimum perforation gun. This can be done through the charge properties, rock properties (averages of obtained from logs), fluid properties and by using appropriate drilling mud invasion models. It can handle open hole completions as well as cased hole completions. The implementation in PROSPER allows the output of SPOT to be directly combined with the vertical lift performance models to predict the complete well performance, therefore eliminating the artificial boundary conditions that would need to be put in place if only the inflow part of the well was considered.

STEAM WELLS

Steam injection wells (SAGD, Huff and Puff, Direct Steam Injection) are becoming more common in the industry and modelling of such systems can be done through a variety of tools in the IPM Suite, primarily REVEAL. PROSPER is also steam enabled and if the wells to be modelled relate to steam injection systems, then lift curves can be generated that can be used to model steam distribution systems (in GAP). In creating integrated steam injection systems models, the efficient designs of the network, analysing the operating envelope limits, evaluating energy management and the economics are now feasible for what have traditionally been a costly operation.

Course Coordinator
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