School of Petroleum Engineering, UNSW
List of Public & Tailored Short Courses

Course	Presenter
Reservoir Description and Analysis	
Formation evaluation	Henry Salisch
Reservoir rock and fluid properties	Henry Salisch
Geochemistry for Exploration & Production	B Hartung-Kagi / J Scott
Reservoir Characterisation & Geostatistics	Steve Tyson
Effective Upscaling	Steve Tyson
Reservoir Engineering	
Practical aspects of reservoir engineering	Val Pinczewski
Well test analysis	Val Pinczewski
Practical aspects of reservoir simulation	Val Pinczewski
Improved oil recovery	Val Pinczewski
Natural Gas Engineering	Barry Walsh
Reservoir Management & Reserves Optimisation	Ashok Khurana
Drilling Engineering	
Rotary drilling rig equipment and operation	Sheik Rahman
Well control and blow out prevention	Sheik Rahman
Drilling muds - design, optimisation and maintenance	Sheik Rahman
Practical aspects of directional and horizontal drilling	Sheik Rahman
Drilling mechanics - wellbore hydraulics & optimising rate	Sheik Rahman
Practical aspects of casing design and optimisation	Sheik Rahman
Cementing practices	Sheik Rahman
Production Engineering	
Practical aspects of well planning and costing	Sheik Rahman
Well completion and workover operations	Sheik Rahman
Production operations	Sheik Rahman
Management	
Petroleum economics and risk analysis	Guy Allinson
Fiscal analysis	Guy Allinson
Oil and gas accounting	Max Williamson
Petroleum contracts and PSC negotiations	Dennis Stickley
Natural gas contracts and management	Dennis Stickley
Petroleum Industry Service Contracts	Dennis Stickley
International petroleum contracts	Bun Hung
Fundamentals of Gas & LNG projects	M Williams / R Harrison

General

Introduction to the Oil & Gas Industry	Henry Salisch
The Search for Oil and Gas	John Conolly
Fundamentals of the Oil & Gas Industry	Various
Effective presentation skills	Jill Sweatman

Brief Resumes of Presenters

Formation Evaluation
Presenter: Henry Salisch

Overview

The programme is designed to familiarise geologists, geophysicists, engineers and all other personnel involved in using log, core and test data to evaluate the commercial potential of a reservoir. The participants will take an active part in going through the relative importance of geological, geophysical and engineering parameters and their inter-relationships. Emphasis will be placed on log interpretation in shaly sands, although other types of reservoirs will also be included. Interpretation techniques will be discussed that can be used for the evaluation of older suites of logs. Guided hands-on evaluation is part of the course. The participants will be guided to applying state-of-the-art technology for the interpretation of modern suites of logs.

On completion of the course, the participants will know how to:

- Evaluate old and recent sets of well logs.
- Select the most cost-effective suite of logs to be requested for a well.
- Integrate log, core and test data to make a valid evaluation of a reservoir.
- Arrive at a well-balanced judgment about a reservoir's prospectivity.
- Present a report based on which management decisions can be based.

Contents

Petrophysical measurements and their significance – Borehole environment. Review of the fundamentals of petrophysics. The acquisition of petrophysical data. The importance of scale factor. Data quality control and data integration. Presenting petrophysical data.

Basic well log interpretation – Well site log evaluation. Detailed log interpretation. The importance of water salinity chemical composition. The SP curve and its major applications. The measurement of natural gamma rays. The spectralog. Resistivity responses from well logs.

Detailed well log interpretation – Porosity responses from well logs. The interpretation and integration of core data. The integration of test data. The determination of lithology and depositional environment. Shaly sand analysis and evaluation in other types of reservoirs. The determination of fluid saturations.

Potential reservoirs – Irreducible water saturation. The estimation of permeabilities. Initial water cut determination. Moveable hydrocarbon studies. The effect of changes in grain size, sorting and hydrocarbon type.

Hands-on work with suites of logs – Case studies using log, core and test data presented by the participants or case studies prepared by the course presenter.

Reservoir Rock and Fluid Properties
Presenter: Henry Salisch

Overview

This course provides participants a basic understanding of the rock and fluid properties that are necessary for reservoir management and recovery calculations. It covers the basic understanding of the measurement of rock and fluid properties in order to allow participants to become more effective in correctly interpreting well logs and core test results. The course also covers the integration of these data. The course carries the participants through a comprehensive sequential study of the geological and engineering processes that have a bearing on hydrocarbon recovery. The sequential study covers how fluids flow through the reservoir rock and how this flow can be altered to produce greater recovery and profits.

On completion of the course, the participants will be able to:

- Design appropriate logging programs.
- Design appropriate coring programs.
- Integrate these programs.
- Evaluate the reliability of this information.
- Determine the physical nature of a reservoir.
- Determine reservoir wettability characteristics. Importance in reservoir studies.
- Classify petroleum fluids. Determine the chemical composition of formation waters and their effect on geological and engineering studies.

Contents

Generation, migration and accumulation of hydrocarbons: - Theories about the origin of hydrocarbons. Primary and secondary migration. Accumulation of hydrocarbons. Structural and stratigraphic traps.

Characteristics of reservoir rocks: Porosity. - Types and characteristics. Measurement of porosity from well logs and cores. **Permeability**: Relationships between Porosity and permeability. Permeability characteristics. Types of permeability. Intergranular and fracture permeability. Single phase permeability for oil and gas. Klinkenberg gas permeability. Laboratory measurement techniques. Basic flow concepts. Darcy's law. **Capillary pressure**: Surface forces and definition of capillary pressure. Wettability. Laboratory measurement of reservoir wettability. Initial saturation distribution from well logs and capillary pressure data. **Multiphase systems and relative permeability**: Steady-state permeability measurement. Determination of end-point saturations. Water-oil and oil-water systems. Determination of relative permeability curves. **Electrical properties**: Electrical conductivity of fluid saturated rocks. Resistivity relations. Measurement of electrical resistivity of rocks. Empirical correlations for electrical properties of rocks.

Logging and log analysis: - Environmental effects and corrections. Log quality control. Types of measurements. Importance in determining basic geological/petrophysical parameters. Well log analysis. Integration with core analysis results and well test data.

Coring and core analysis: - Conventional coring operations. Rubber sleeve coring. Pressure barrel coring. Sponge coring. Sidewall coring. Standard core analysis. Rig core handling, Laboratory handling procedures. Core preservation methods. Wettability characteristics.

Properties of petroleum fluids: - Phase diagrams. Single component systems. Two component systems. Multicomponent systems. Flash calculations. Gases and non-ideal gas law. Formation volume factors. Isothermal compressibility of gases. Viscosity of gas mixtures.

Properties of liquid hydrocarbons: - Bottom hole sampling. Recombination sampling. Conventional Pressure-Volume-Temperature (PVT) analysis. Density, specific gravity and API gravity. Differential and flash liberation experiments. Solution gas-oil ratio. Thermal expansion of liquid hydrocarbons. Compressibility. Oil viscosity. Converting laboratory measured solution gas-oil ratios and formation volume factors to field conditions.

Properties of formation waters: - Chemical composition of formation waters. Importance of this information for geological and engineering programs. Density and specific gravity. Solubility of natural gas in water. Compressibility. Thermal expansion. Formation volume factors. Viscosity.

Classification of petroleum reservoir fluids: - Bitumen. Tars and heavy oils. Low shrinkage oils. High shrinkage oils. Retrograde condensate gas. Wet gas. Dry gas.

Geochemistry in Exploration and Production
Presenters: John Scott and Birgitta Hartung-Kagi

Overview

The three-day course covers methods of analysis in source rock and oil geochemistry, interpretation of geochemical data in exploration and their production and integration with other geoscientific data in petroleum systems analysis. Theoretical aspects are presented and illustrated with practical examples from Australia, the Middle East, Europe and North America. No previous knowledge of geochemistry is assumed but a familiarity with basic petroleum geology is helpful.

At the end of the course the participants will have a good understanding of the application of geochemistry in the exploration and production of oil and gas.

Contents

Source rocks – analysis of the kerogen fraction
Depositional settings in marine, lacustrine and alluvial depositional systems are presented. Basic source rock analyses, in particular TOC-Rock Eval pyrolysis, Pyrolysis –Gas Chromatography and visual kerogen analysis, as well as the interpretation of results (in particular pitfalls), are covered. This section includes determination of source rock type, its likely distribution, richness and thermal maturity. Methods of sample selection, an issue of fundamental importance, and quality control are also discussed.

Biomarkers – analysis of the soluble fraction
The main saturate and aromatic biomarkers for source rock facies, depositional environment, maturity and oil-oil as well as oil-source correlations are presented and discussed, with illustrations from around the world in both clastic and carbonate-evaporite depositional environments. This section covers analyses using both gas chromatography-mass spectrometry and isotopic analysis for oils, condensates and gases. Particular problems in recognising and dealing with biodegraded crudes are discussed. The use of biomarkers for reservoir geochemistry is also covered.

Contamination
Contamination of oil and source rock samples with oil based muds, synthetic based muds, glycols etc. can, if unrecognised, be a serious problem for the users of geochemical data. An overview of the main types of contaminants is given and ways of dealing with this problem in order to obtain useful geochemical data from contaminated samples, are discussed.

Geochemical analysis, interpretation and integration with petroleum system analysis
This section primarily comprises a series of case studies in the Ordovician to Jurassic petroleum systems of Western Australia.

Reservoir Characterisation & Geostatistics
Presenter: Steve Tyson

Overview

Reservoir characterisation requires a multidisciplinary team effort. It involves a systematic integration of geological, geophysical and engineering data and improves description of reservoir properties in and between wells. This course presents a comprehensive overview of the application of modern concepts in reservoir modelling for field simulation. Use of multivariate statistics, geostatistics and artificial intelligence are presented together with a series of case studies. Hands-on exercises are also provided.

On completion of the course, the participants will know:

- How reservoir properties are derived from well logs.
- How to interpolate and simulate reservoir properties between wells.
- How to assess and reduce uncertainty in reservoir modelling.

Contents

Formation Evaluation: - Problems in formation evaluation. Electrofacies and lithofacies recognition. Review of probability and statistics. Clustering algorithms. Regression models. Artificial intelligence techniques. Use of advanced methods for the prediction of reservoir properties in un-cored wells and intervals. Case studies.

Well Interpolation: - Concepts in reservoir modelling. Introduction to geostatistics and stochastic simulation. Correlation and variogram measures of spatial variability. Simple and ordinary kriging. Gaussian simulation. Indicator kriging and simulation. Cokriging. Annealing algorithms. Object-based models. Neural networks. Hybrid methods. Case studies.

Data Integration: - Uncertainty issues. Integrating seismic attributes. Integrating well test data. Integrating production data. Integrating geological knowledge. Case studies.

Reservoir Characterisation - Workshop: Use of computers to generate reservoir models from various types of reservoir data and information. Group discussion. Study of examples provided by the participants.

Effective Upscaling
Presenter: Steve Tyson

Overview

This course focuses on the analysis of attributes from a finely gridded geological model and the determination of effective values at a coarser scale for use in a reservoir simulation. This process is often called 'Upscaling'. The upscaling process usually begins with the construction of a coarser grid from the fine grid but it often involves integration with legacy simulation grids. The upgridding, refining and correspondence functions will be examined.

On completion of the course, the participants will know:

- How to plan for upscaling during the reservoir modeling process.
- How to ensure that dependent attributes are upscaled consistently.
- How to identify those areas within the model where the upscaling is likely to be poor.

Contents

Measurement Scales - The upscaling problem begins here and a discussion of the effect of scale on measurement is given. The concept of stable and unstable scales of measurement will be presented and its relevance to the upscaling of geological information will be considered.

Effective Properties - What is an effective property? Is there a single value of each parameter at one scale that accurately represents the behaviour of a system at a fine scale?

Upgridding - The knowledge that the scale of measurement is important leads us to believe that the scale of the coarse grid itself is crucial to effective upscaling. The design and construction of coarse grids from fine grids will be investigated.

Grid Correspondence - Given a geological model and a simulation model, how are the two related? Which cells in the fine grid correspond to the coarse grid? How is this defined?

Upscaling Static Properties - A number of techniques are presented that upscale porosity, pore volume, depth, saturation and net-to-gross in a self- consistent way.

Upscaling Permeability and Transmissibilities - The upscaling algorithms available for upscaling permeability and transmissibility are discussed paying particular attention to ensuring that dependent variables are upscaled correctly.

Quality Control - Once the often time-consuming task of upscaling has been completed how do we know that it is correct? What tools exist to give us confidence in the upscaling? Can we calibrate our upscaling techniques?

Practical Aspects of Reservoir Engineering
Presenter: Val Pinczewski

Overview

This course prepares participants to undertake fundamental calculations to assess the performance of oil and gas fields under a variety of operating conditions and reservoir drive mechanisms. It covers the practical application of physical principles used in primary and secondary recovery of oil and gas. On completion of the course, participants will be able to apply fundamental reservoir engineering principles to reservoir evaluation and field development. The course provides "hands-on" experience in performing computer-assisted calculations, which emphasize the solution of common reservoir problems in a series of practical problem solving sessions.

On completion of the course participants will know:

- How basic reservoir rock and fluid properties are specified and measured in the laboratory.
- How these properties affect fluid flow and the distribution of fluids in the reservoir.
- How to perform basic material balance calculations for depletion, solution gas, gas-cap gas, water and combination reservoirs.
- How reservoir drive mechanisms affect overall reservoir performance.
- How to use fractional flow theory to calculate displacement efficiency and oil recovery factors.
- How to measure and calculate oil and gas properties at reservoir conditions.
- How to calculate static pressure and saturations distributions in a reservoir containing gas, oil and water zones.
- How to estimate production rates for vertical and horizontal wells.
- How to history match an aquifer model and how to use the predicted water influx to predict future reservoir performance.

Contents

Rock and Fluid Properties: Review of wettability, capillary pressure and relative permeability concepts. Residual oil saturations and design of special core analysis programs. Rock compressibility. Properties of oil gas and formation waters. Sampling of reservoir fluids. PVT properties of hydrocarbon systems. Reservoir hydrocarbon fluid classification.

Mechanics of Fluid Flow in Porous Media: Darcy's Law. Steady-state, semi-steady-state and transient flow. Linear and radial flow. Stabilised well deliverability. Productivity index, injectivity index, and inflow performance for horizontal and vertical wells.

Reservoir volumetrics: Techniques for estimating initial oil and initial gas in place. Capillary-gravity equilibrium and the vertical distribution of fluids. Initial pressure distribution and determination of oil-water, gas-oil and gas-water contacts.

Material Balance Equation and Reservoir Drive Mechanisms: General material balance equation. Solution gas drive, water drive, gas-cap drive, compaction drive and combination drive mechanisms. Drive index and production characteristics.

Reservoir Displacement Mechanisms and Recovery Factors: Fractional flow equations. Frontal advance theory. Effects of wettability and heterogeneity on displacement efficiency. Gravity Stabilised displacements. Practical use of immiscible displacement concepts in estimating field recovery factors.

Solution Gas Drive Reservoirs: Calculating original oil in place. Predicting future performance. Field derived relative permeability data. Converting material balance predictions to time.

Water Drive Reservoirs: Analysis of water drive reservoirs. Aquifer models and calculation of water influx. Oil-water contact stability. Water coning and fingering. Field case history example.

Gas-Cap Drive: Factors enhancing gas-cap drive. Segregation and gravity drainage. Calculating remaining oil saturations in gas-cap invaded zone. Factors affecting oil recovery in gas-cap expansion.

Combination Drive Reservoirs: Calculation of effective recovery factors. Estimation of drive indices and effect of drive indices on recovery. Field calculation example.

Well Test Analysis
Presenter: Val Pinczewski

Overview

This course provides a basic introduction to the theory which forms the basis for well testing and prepares participants to undertake sophisticated well pressure test analysis using state of the art computer assisted interpretation techniques. The course introduces the basic concepts of modern well test analysis and presents the student with a range of selected exercises, which illustrate actual well test interpretation problems likely to be met in practice. Students are given "hands-on" experience in the use of state-of-the-art well test interpretation computer software.

On completion of the course, participants should be able to:

- Set actual test objectives and design a test to achieve these objectives.
- Understand the basic types of well tests (drawdown, buildup, injection, falloff, interference, pulse and DST).
- Understand basic concepts (Horner plots, Log-Log plots, skin effect, wellbore storage, and effect of boundaries).
- Interpret tests in fractured reservoirs and fractured wells.
- Use computer based well test analysis software (derivative plots).
- Perform actual well test interpretations for homogeneous, fractured, double porosity systems).
- Estimate static well pressures.
- Determine the extent of well damage.
- Calculate distance to nearest boundary.
- Estimate fluid volume in place.
- Identify heterogeneities in the pay zone.

Contents

Transient flow theory: Solutions to the continuity equation. Skin effect and permeability changes near the wellbore. Wellbore storage effect. Principle of superposition and pressure buildup theory. Horner plots and pressure derivative plots. Infinitely acting systems, closed boundaries, fault boundaries, constant pressure boundaries.

Types of well tests: Drawdown test, Buildup test, Injection test, Falloff test, Interference test, pulse well test, DST.

Calculation of static pressure: Infinite and finite drainage area cases. MBH, Dietz and MDH methods.

Type curve matching: Agarwal, Bourdet and Gringarten and derivative type curves. Reservoir limit testing.

Fractured wells: Finite conductivity fractures, Infinite conductivity fractures, Uniform flux fractures, Double porosity behaviour.

Computer aided test analysis: Pressure derivative plots, Diagnostic evaluation, data handling, Multirate and variable rate tests, Superposition.

Gas Well Tests: Pseudopressure and Pseudotime, Rate dependent skin, multirate isochronal tests.

Well Test Interpretation Workshop: This workshop is conducted using state-of -the-art well test interpretation software and actual field examples. These examples include the responses in homogeneous reservoirs (identifying flow periods, estimating formation parameters, use of type curves, boundary effects, average reservoir pressure). Analysis of fractured wells. Double porosity example) Interference examples. Multiphase effects. Gas well test examples.

Practical Aspects of Reservoir Simulation
Presenter: Val Pinczewski

Overview

This course is designed to provide participants a basic understanding of reservoir simulators and reservoir simulation technology. The course is based around a state-of-the-art three phase, three dimensional, black oil PC based reservoir simulator and a carefully prepared reservoir simulation workshop during which participants solve a number of practical simulation problems which illustrate the uses and misuses of reservoir simulators. The workshop culminates with a practical exercise which requires each student to construct a 3-D reservoir model of an actual field and use the simulator to prepare a field development plan which includes a comparison between a conventional vertical well development and one utilizing horizontal wells.

On completion of the course participants will know:

- How a reservoir simulator works and how to select the most appropriate model geometry (areal, x-sectional, radial and 3-D) to solve practical field simulation problems.
- How to construct a simulator input file and how to prepare input data tables for PVT fluid properties and rock saturation dependent properties such as capillary pressure and relative permeability.
- How to prepare reservoir description data from geological maps and structural x-sections.
- How to use geostatistical data and fine-grid x-sectional models to prepare pseudo-functions, which account for the effects of reservoir heterogeneity on the sub-grid scale.
- How to correctly initialise a simulator to capillary-gravity equilibrium and how to match original hydrocarbons in-place.
- How to minimise computer run times and maximise efficiency.
- How the simulator models production and injection wells (vertical and horizontal) and how to use the well rate routines to simulate actual field production and monitoring strategies.
- How to model aquifers and specify aquifer influence functions for field-scale simulation studies.
- How to design an effective history match study and how to predict future reservoir performance.
- How to recognise the limitations of reservoir simulation and how to correctly apply the output from simulation studies to effective reservoir management.

Contents

Introduction: Reservoir models - what they are and what they are used for.

Simulator Equations: Darcy's Law and multi-phase flow. Models for three-phase relative permeability. Continuity equation and equation-of-state. Fully compositional models. Black Oil Model.

Solution of Simulator Equations: Finite difference method. Explicit and implicit procedures. Stability constraints for explicit schemes. IMPES method. Simultaneous solution. Newton iteration.

Model and Grid Selection: Areal, x-sectional, radial and 3-D models. Grid orientation effects. Guidelines for grid design, flexible griding techniques.

Model Initialisation: Gravity-capillary equilibrium procedure. Hysteresis. Oil-in-place calculations.

Treatment of Wells: Equivalent radius. Interpretation of well block pressures. Wellbore models. Well control routines.

Aquifer Models: Inclusion in simulation grid. Single-phase aquifer regional models. Analytical models and influence functions. History matching an analytical aquifer model.

Pseudo-functions: Psuedo-relative permeability and pseudo capillary pressure. Use of pseudo-functions to reduce the number of grid blocks in the vertical direction. Use of pseudo functions to model reservoir heterogeneity on the sub-grid block scale. Kyte and Berry pseudo.

Planning a Real Reservoir Simulation Study: Study objectives. Reservoir description. Assessment of quality of production data, fluids and rock data, special core analysis and wettability data. Model set-up. Need for pseudos? History matching strategies.

Reservoir Simulation Workshop: Areal models, cross-sectional models and pseudo-function calculation, three-phase oil, water and gas radial coning problem, 3-D three phase gas injection history match problem, Offshore field development study**.**

Improved Oil Recovery
Presenter: Val Pinczewski

Overview

This course provides participants with a strong background in the full range of modern improved and enhanced oil recovery technologies in use today. It prepares participants to select the most appropriate technology for a particular field application to undertake design studies leading to a technically and economically successful field application. Waterflooding, polymer flooding, immiscible and miscible gas flooding, thermal methods, and chemical methods are discussed. Special emphasis is placed on the most effective technologies in to-day's context of low prices; gas, including conversion of existing waterfloods to gas and water injection, and steam flooding.

The emphasis is divided equally between how individual EOR processes work in particular geological settings and field applications and case histories. Particular attention is given to the impact which horizontal and deviated well technology have had on the economic performance of IOR/EOR projects. The course is presented in the format of morning lectures and afternoon workshop sessions in which selected case studies are analysed and actual field performance calculations are performed.

On completion of the course participants should be able to:

- Understand the basis for all the improved oil recovery technologies in use to-day and be able to select the most appropriate technology for a particular field application.
- Calculate recovery factors for primary, secondary and tertiary displacements and determine realistic incremental oil recovery estimates for the secondary and tertiary processes.
- Specify coring procedures, special core analysis tests and PVT studies necessary to provide the basic data necessary to evaluate a potential field application.
- Perform sophisticated reservoir engineering studies, including reservoir simulation studies, to design and implement field pilot floods and full field developments.
- Design effective planning, reservoir management, reservoir surveillance data management strategies to implement and operate economic improved oil recovery projects.
- Understand mobility control methods including foam flooding, water-alternating-gas (WAG) injection and simultaneous water and gas injection.
- Utilise published case histories to economically convert existing waterfloods to water and gas floods and to take advantage of reservoir heterogeneity and horizontal well technology to improve oil recovery.

Contents

Overview of major IOR/EOR processes: Recovery factor calculations and remaining oil in place. Waterflooding, secondary and tertiary gas flooding, miscible and immiscible displacements, steam flooding, polymer and surfactant flooding, microbial methods.

Rock and fluid properties important to oil recovery processes. Wettability, spreading and interfacial tensions. Two-phase and three-phase relative permeability and capillary pressure curves. Phase behaviour and miscibility. Oil swelling and viscosity reduction. Thermal properties, temperature effects on rock and fluid properties. Residual oil saturations and film flow. Laboratory testing procedures.

Primary, secondary and tertiary fluid displacement mechanisms. Areal and vertical displacement efficiencies and the role of reservoir heterogeneity, gravity segregation. Well patterns and pattern re-alignments. Mobility ratios and dip angles. Application of infill drilling and horizontal wells.

Screening studies and selection of EOR processes. Screening procedures. Correlations for minimum miscibility pressure. Correlations for tertiary recovery in watered-out reservoirs.

Horizontal wells. Application of horizontal wells in improved oil recovery. Case histories for horizontal wells in gas flooding, steam flooding and in heavy oil recovery.

Design of reservoir simulation studies to evaluate and optimise the performance of IOR projects. Compositional models and modified black-oil models. Areal models, cross-sectional models, single well radial models and three-dimensional full field models. Geostatistical reservoir descriptions and the use of pseudo-functions. Guidelines for planning and executing a cost effective reservoir simulation study.

Operational considerations. Surface distribution systems for water and gas injection. Multi-phase flow effects. Injectivity losses and well stimulation, injection profile modification. Corrosion and well plugging problems.

IOR/EOR Workshop. Case studies. Impact of horizontal wells on gas flooding operations. Carbon dioxide, chemical and microbial techniques aimed at the small operator. Carbon dioxide floods recover commercial oil from watered out fields. Detailed overviews and performance up-dates for three of the world's largest IOR projects - Chevron's Rangely Weber Sand Unit carbon dioxide flood, Arco's Prudhoe Bay miscible hydrocarbon gas flood, and P.T. Caltex's Duri steam flood. Petroconsultants Australasia IOR Monitor.

Natural Gas Engineering
Presenter: Barry Walsh

Overview

This course introduces students to methods that are currently used for specifying and describing the properties of natural gas mixtures as well as for calculating the flow behaviour of natural gases in compressors, valves, wells, pipelines and reservoirs. The course deals with basic theoretical concepts as well as applied methods.

On completion of the course, participants should be able to :

- Understand the methods used to predict the volumetric and thermodynamic properties of natural gas.
- Predict conditions for hydrate formation in natural gases.
- Specify compressor power requirements and calculate appropriate efficiencies.
- Calculate flow rates through valves and chokes.
- Calculate pressure losses through pipelines, both vertical and horizontal.
- Understand the derivation of the pseudo-pressure function for flow of gas in reservoirs.
- Understand the basis for and application of the various well test methods for gas reservoirs.

Contents

Properties of natural gases: Typical compositions. Thermodynamic fundamentals. Equations of state - general cubic equations - specific high accuracy equations. Equations for predicting viscosity. Equilibrium water content in reservoir gas. Gas hydrates – prediction methods.

Gas compression: Positive displacement and centrifugal compressors, fans. Calculation of power requirements, isothermal, isentropic and polytropic efficiencies. Compressor flow-versus-head characteristics.

Compressible flow in pipes: Fundamental equations of flow – continuity, momentum, energy equations. Flow through valves, nozzles, sharp edged orifices. Choking in valves and nozzles. Isothermal and adiabatic flow in pipes – the Weymouth equation. Static and flowing bottom-hole pressures in wells.

Two-phase flow in pipes: Flow regimes. Calculation of pressure losses using (a) homogeneous fluid model (b) the Beggs and Brill method.

Fundamentals of gas flow in porous media: Steady-state flow equations. Definition of pseudo-pressure function. Special cases – P^2 as driving force at low pressures, P at high pressures. Non-Darcy effects – correlations for Beta, effective skin factor in radial flow.

Gas flow in cylindrical reservoirs: General equation for radial flow of gases in symmetrical homogeneous reservoirs. Assumptions required for solution of the equation for gas reservoirs. Non-dimensional forms of the equation – derivation of coefficients relating dimensionless to real variables. Infinite reservoir solution and pseudo-steady-state solution. Equivalence of average pseudo-pressure function and true average reservoir pressure.

Gas well deliverability tests: Flow-after-flow tests – prediction of IPR curve and AOF for the well based on either Rawlins-Schellhardt analysis (delta P^2 correlation), or Houpert analysis (pseudo-pressure function and non-Darcy term). Isochronal tests. Drawdown tests – need data for at least two flow rates.

Text and reference books

Katz DL and Lee RL, "Natural Gas Engineering", McGraw-Hill 1990
Wattenbarger RA and Lee John, "Gas Reservoir Engineering", SPE textbook Series 1996.

Reservoir Management & Reserves Optimisation
Presenter: Professor Ashok Khurana

Overview

This course is aimed at bringing together the discussion of a wide variety of reservoir description, surveillance, interpretation, studies, reserves determination, production forecasting and operational considerations which together constitute RM&RO. It is aimed at providing a basis for practical development and implementation of integrated RM&RO programs with emphasis on cost-effectiveness and economic justification. Extensive use of case studies will be made during the course.

On completion of the course, the participants will:

- Understand the integrated multidisciplinary Reservoir Management and Reserve Optimisation process
- Understand the various geophysical, geological and reservoir engineering RM&RO techniques, strengths and weaknesses, and how to integrate them
- Design "fit for purpose" RM & RO programs
- Ensure that the proposed RM&RO programs are justified and cost effective
- Knowledgeably represent the activities of their company to external organisations such as banks & brokers, media and government

Contents

Defining **Reservoir Management and Reserves Optimisation (RM&RO) -** with particular emphasis on understanding the differences between RM&RO and Reservoir Engineering, and recognising the strengths that emanate from the holistic nature of the former. The emphasis will be on the strengths and weaknesses of the techniques and how to integrate them.

Specifically it will cover the life cycle and nature of petroleum reservoirs; stepwise decision making processes in the face of uncertainties and how to avoid organisational procrastination when evaluating marginal reservoirs. Specific technical discussions include:

- Overview of Petroleum Geology
- Seismic Methods for Reservoir Management
- Open and cased hole logging techniques for Formation Evaluation
- Coring and Core Analysis Techniques
- Representative Core Samples
- Rock Compressibility, Capillary Pressure, Wettability and Relative Permeability
- Pressure Sponge Coring
- Representative Fluid Samples
- Phase Behaviour of Hydrocarbon fluids
- Properties of Reservoir Fluids

Explore reservoir analysis techniques, covering:

- **Material Balance** – discuss the significance of the terms representing Gas Cap Expansion, Released Gas Volume, Remaining Oil Volume, Rock and Connate Water Expansion and Water Influx.
- Material Balance in a **Closed Gas Reservoir** and the impact of Water Influx into a gas reservoir
- **Darcy's Law and Fluid displacement -** examine the Fractional Flow Theory, Buckley-Leverett Equation, the Welge technique, Critical Rate and Interfacial Tilt.
- **Reservoir Drive Mechanisms:** - Depletion Drive, Solution Gas Drive, Gas Cap Drive and Water Drive reservoirs.
- **Gas and Gas Condensate** reservoirs.
- Case Study of the **Kingfish Field**

Discuss **Gas and Water Coning** followed by an examination of the challenges associated with **Recovery of Oil from Thin Oil Column Reservoirs**, including a case study of the **Bream Reservoir**.

Following the overall reservoir behaviour, the course moves on to well performance:

- Well Productivity definitions
- Pressure Build-up theory and Well Testing
- Pulse Testing
- Pressure Testing case study of the Gippsland Basin
- Drill Stem Testing
- Types of Pressure Gauges
- **Reservoir Pressure Profiling** - a powerful reservoir continuity determination technique
- Well perforating practices and Formation Damage
    - Artificial Lift vs Wellbore Stimulation
    - Hydraulic Fracturing
    - Matrix Acidization
    - Acid Fracturing
    - Stimulation Optimisation
    - Horizontal Well – Applications, Types, Simple Screening Technique, Comparison with Vertical Wells

Participants will learn to apply a structured approach to Reservoir Appraisal requirements, covering:

- Decision Making
- Measures of Profitiability
- Accounting for Risk
- Bias and Preference Theory
- Expected Value Concept
- Value of Imperfect Information
- Decision Tree Analysis

Analyse the strengths and weaknesses of **Reservoir Simulation** including a case study of **Aquifer Modelling of the Gippsland Basin**.

Reserves Classification and Definitions – this important aspect of our business covers SPE definition of reserves categories, together with the different reserves calculation techniques that can be used during the life cycle of a petroleum reservoir.

Secondary Recovery operations looks at the management of **Gas Cap Reservoirs** covering Gas Injection and Gas Cap Blowdown followed by case studies of *Skua*, *Jabiru* and *Challis Fields* in the Timor Sea

Waterflood Reservoirs looks at the special management considerations including:

- Data Acquisition
- Waterflooding System
- Recovery Efficiency
- Pattern and Voidage Balancing
- Psgc Production Strategy
- Waterflood Reservoir Surveillance

As part of Integrated Reservoir Management, the course looks at **Data Acquisition and Analysis,** specifically**:**

- Acquisition Planning
- Data Types and Sources
- Information from each Data Type
- Importance of Interdisciplinary communication
- Data Analysis Techniques
- Anomaly Analysis
- Surveillance Maps and Plots

Examine the development of a Reservoir Management System which represents the essence of the key words identified from the definition of Reservoir Management:

- Alternative Approaches to the Management of Large and Small Reservoirs
- Reservoir Management Teams
- Reservoir Management Planning
- Guide to Key Performance Indicators for Reservoir Management
- Offtake Rate Management

Rotary Drilling Rig Equipment and Operation
Presenter: Sheik Rahman

Overview

This course is intended for foremen, tool pushers, drilling engineers and supervisors who are involved in contracting, operating and maintenance of land and offshore drilling rigs and associated equipment. It covers the general technology of rotating machines and their auxiliaries, selection and evaluation of drilling equipment, operation and maintenance of land and offshore drilling rigs and contracting and negotiation of rating capacity of drilling rigs. Numerous work examples and case studies give the participants a broad understanding of the mechanics, maintenance and operation of modern drilling rigs.

Upon completion of the course participants should understand:

- Operating principles of rotary drilling equipment and auxiliaries.
- Selection and evaluation of rotary equipment.
- Transportation, installation and operation of land and offshore drilling rigs.
- Contracting and negotiating of drilling rig hire
- Procedures for material procurement.
- Procedures for technical auditing

Contents

Offshore drilling rigs: General arrangement, operational capability and drilling equipment facilities of fixed platforms, jackups, barges, drillships and semi-submersibles; operating and standby or survival condition for mobile platforms; mooring procedure for jackups and semi submersible.

Rig powering and transmission system: Calculation of overall power requirement (life support system, rotary equipment, hoisting equipment, fluid circulation and solid separation and other non-drilling activities), rating of internal combustion engine, mechanical drive system and utilisation of power, DC-Engine-Generator System and AC-SCR system.

Hoisting and rotary system: Derrick and portable masts, block and tackle, drawworks, rotary table, rotary swivel, top drive system, calculation of hoisting and rotating power requirement and sizing and selection of rotary equipment.

BOP equipment hook up and testing procedure: Integral components and operating principles of different BOP equipment and choke line manifolds , hook up and testing of BOP equipment.

Drilling fluid circulating system: Triplex vs. duplex pumps, calculation of hydraulic horsepower of a pump, mud pits, mud mixing equipment, solid separation (shale shaker, desander, desilter, centrifuge etc.) and sizing and selection of pumps and auxiliary equipment.

Preparation of contract (drilling rig), negotiation and implementation: Classification, analysis and evaluation of drilling contracts; detailed development of the drilling job, selecting drilling rig equipment capability, development of the contract and the presentation and adjustment of each party's own position; management system of supervising and implementation of drilling contracts; and dispute case resolution by international law.

Material procurement and management: Market for drilling equipment, material and facilities; a bidding procedure; selection and evaluation of bidding documents

Technical Auditing: Technical auditing procedure of accidents and technical complications during drilling process

Work examples of rig sizing, selection and contracting; and local case studies.

Well Control and Blow out Prevention
Presenter: Sheik Rahman

Overview

A workshop approach with hands-on training using IMCO Boss simulator provides participants with the knowledge to predict and detect abnormal pressures and control the well on the event of a kick. This course takes the participants from the prediction and detection of over pressure, recognition of kick, kick-mud preparation and circulation to crew responsibilities, BOP equipment hook up, and maintenance and governmental regulation. Upon successful completion participants receive a well control certificate.

Upon completion of the course participants should know how to:

- Predict and detect abnormal pore pressure.
- Identify the causes of kicks.
- Shut in a well, calculate kick-mud weight and increase mud weight
- Safely circulate out the kick-fluid and control well pressure.
- Select appropriate BOP equipment.

Contents

Prediction and detection of abnormal pressure: concepts of pressure (hydrostatic pressure, pore pressure and overburden pressure), causes of sub-pressure and abnormal pressure, prediction of abnormal pressure from seismic data plot and estimation of pore pressure from drilling and mud logging data.

Identification of kicks: Identify the causes of kicks and the physics involved; causes of decrease in hydrostatic pressure; effect of differential fluid column, porosity, permeability and lost zones and abnormal pressure zone on well control; and different signs of well kick recognised from the drilling floor and mud check logging unit.

Shut-in and interpretation of shut-in pressures: Soft shut-in vs. hard shut-in and their effect on casing shoe and formation integrity; closed-in procedure while drilling, tripping out of the hole; read and interpret SICPP and SIDPP, use of diverter and characteristic of gas expansion in closed-in wells.

Well control techniques: Drillers vs. wait-and-weight method, calculation of maximum allowable surface pressure (MASP), factors affecting MASP, calculation of hole volume based on measured depth, various steps involved in drillers and wait-and-weight methods of well control and perform required calculations in both methods.

BOP equipment hook up and testing procedure: Integral components and operating principles of different BOP equipment and choke line manifolds , hook up and testing of BOP equipment.

Crew responsibilities and drills: station bill, crew responsibilities and well control drills.
Surface and underground blowouts: Major sources of surface and under ground blowouts; best practices for preventing blowouts; control of blowouts; and treatment of oil and gas blowouts by oil based drilling fluids.

Government and company regulations.

Well kick simulation and perform well control based on driller and wait-and-weight methods using portable IMCO-BOSS simulator.

Drilling Muds - Design, Optimisation and Maintenance
Presenter: Sheik Rahman

Overview

A self-paced course designed for individuals seeking in depth knowledge of water and oil based muds (low toxic to non-toxic) and completion fluids, testing procedure, product system formulation calculation of pressure losses in pipes and annuli and bit nozzle optimisation. The theory is combined with 'hands-on' problem solving using local case studies and API mud tests using a mobile mud lab.

Provide the participants with:

- Knowledge of designing appropriate programming of drilling and completion fluids for different hole sections and pay zones.
- Training and skill to formulate different mud systems and maintain and control desired mud properties.
- Knowledge of mud related hole problems and formulation of appropriate mud system to control these problems.
- Ability to conduct API mud tests.
- Ability to diagnose and prevent mud related hole problems during drilling.
- Knowledge of how to treat drilling muds to control drill pipe and casing corrosion.
- Knowledge of how to control mud solids.

Contents

Introduction to drilling, completion and workover fluids, composition and related properties of different mud chemicals: clays, polymers, weighting materials, lost circulation and fluid loss additives, shale inhibition chemicals, lubricating materials and corrosion additives. **Note**: an emphasis is also made on polymer chemistry and the application and limitation of polymers in drilling muds

Oil based muds: Composition and properties of oil based muds, application of oil based fluids in drilling through shales and completing wells with particular emphasis on horizontal wells.

Designing appropriate mud programs for different hole sections and pay zones: calculation of mud density based on pore pressure data and hole volumes; selection of mud chemicals and formulation of drilling muds with appropriate rheology (plastic viscosity, gel strength and yield point) and water loss properties for different hole sections.

Hands-on-training on measurements of API mud properties: Alkalinity, calcimetry, hardness, solid content, pH, rheology (apparent viscosity, plastic viscosity, gel strength and yield point), water loss and mud density.

Formulation of mud systems for special hole conditions: sloughing of holes, shale inhibitive muds, lost circulation, excessive torque and stuck pipe, weighted mud for high pressure wells, low solid polymer mud, high temperature and salt tolerant mud and non-damaging completion fluids (both solid containing and solid free muds), low toxic and non toxic muds, glycol muds etc.

Mud contamination and treatment: Sources of mud contamination and appropriate chemicals and methods for treating muds.

Solid control equipment and maintenance: effects of solids on fluid properties (rheology, density, water loss etc.), basic operating principles and selection considerations of different solid control equipment (shale shaker, centrifuge, hydrocyclone etc.), hook-up and maintenance of solid control equipment, and treatment of mud for effective solid separation.

Prevention of drill pipe corrosion: Basic theory of metal corrosion, sources of corrosive agents in fluids, treatment of fluids to remove corrosive agents, monitoring and control of corrosion of drill pipes and casings.

Cost estimation of muds

Case study of drilling in high pressure, lost circulation wells slough shale sections.

Practical Aspects of Directional and Horizontal Drilling
Presenter: Sheik Rahman

Overview

The purpose of this course is to provide drilling supervisors, engineers and foremen with necessary skills to plan and execute the drilling of directional and horizontal wells. This course emphasises the planning of well paths with single and multiple targets and selection of appropriate bottomhole assembly and drillstring for a given well path trajectory. The course also provides several opportunities for hands-on computer sessions for analysing directional planning and simulating directional drilling process.

Upon completion of the course participants should know how to:

- Control wellbore direction with placement of stabilisers, motors and bent subs, steerable systems, and other mechanisms.
- Understand the limits of tools and methods and calculate well-path trajectory from survey points.
- Plan well-path trajectory for a given target, geology, torque/drag and anti-collision constraints.
- Use software to make necessary directional drilling analysis easier.

Contents

Application of directional and horizontal drilling: Side tracking, inaccessible locations, offshore development drilling, dry hot rock development, low permeability and heterogeneous reservoirs, water and gas coning etc.

Directional well planning and navigation: planning and design of the optimum well-path trajectory (build-up, slant and drop-off sections), methods of calculating well-path trajectory from survey points and its presentation in 3-D coordinate system and operating principles and applications of surveying equipment (photo-mechanical devices, steering tools, solid state directional sensors, rate gyros and MWD).

Deflecting and drilling tools and methods: factors controlling bit deflection, equipment and methods to kick off the well and control deviation (whip stock, jets, bent subs with and without steerable system, downhole motors with bent-housing and double tilt bent-housing etc.), drillstring configuration with respect to long radius, short radius and ultra short radius and stabiliser configurations.

Drillstring design for directional control: calculation of side forces and lead angle (building or dropping tendency) of the bit and determination of the shape of the string for a given bottomhole configuration, performance analysis of single vs. multiple stabilizer bottomhole assembly and design of bottomhole assembly for build-up, slant and drop-off sections of the well trajectory.

Hands-on training on computer software for planning well-path trajectory, calculation and presentation of well-path trajectory from survey points, analysis and design of bottomhole assembly for different well configurations and case studies.

Drilling Mechanics - Well bore Hydraulics & Optimising Rate

Presenter: Sheik Rahman

Overview

This course concentrates on an exhaustive and critical study of all parameters, which influence the rate of penetration. This intensive course covers the basics of rock failure mechanism of different bits, bottomhole tools and equipment that affect penetration rate and wellbore hydraulics and its effect on hole cleaning. Hands on training using a PC is provided to develop optimum drilling parameters for maximum penetration rate in different drilling situations.

Upon completion of the course the participants should know:

- Different downhole tools (BHA) and equipment and their purposes.
- Rock failure mechanism of drag and tricone rolling cutter bits.
- Selection of nozzle size and cuttings transport efficiency for optimum hydraulic condition.
- Factors affecting penetration rate and bit life
- Factors affecting optimisation of drilling parameters.

Contents

Downhole equipment: Standard classification of drillpipe, heavyweight drillpipe, drill collars and stabilisers and their properties; general application and performance analysis of downhole motors and selection procedure of drill pipe, heavyweight drillpipe and bottomhole assembly configuration for different drilling conditions (deviation control).

Rotary drilling bits: Bit types and the applications, design characteristics of drag bits and their applications (surface set and polycrystalline diamond bits), design characteristics of rolling cutter bits and their application and standard classification of bits.

Bit selection and evaluation: Rock failure mechanism of drag and tricone rolling cutter bits, grading of tooth and bearing wear, causes of abnormal bit wear, factors affecting bearing and tooth wear and the procedure for terminating a bit run.

Prediction and optimisation of penetration rate: Factors affecting penetration rate (bit type, formation characteristics, fluid properties, operating conditions, rate of tooth wear, bit hydraulics etc.), development of penetration equation based on drill off test and selection of optimum bit weight, rotary speed and bottomhole assembly for maximum penetration rate.

Wellbore hydraulic optimisation: Energy balance in drilling fluid circulating system, rheological model for different fluids, flow through pipes and annuli and related pressure loses; selection of nozzle size for maximum nozzle velocity, hydraulic horsepower and jet impact force and selection of pumping rate for maximum hole cleaning efficiency.

Computer aided optimisation of drilling parameters and local case studies.

Practical Aspects of Casing Design and Optimisation
Presenter: Sheik Rahman

Overview

This program is designed to develop the basic skills of drilling and production engineers in preparing casing programs for different well situations: hydro and geopressured wells, wells penetrating massive salt domes, geothermal wells and directional and horizontal wells; and prepare them to discuss these issues with geological and reservoir management staff of the company. It also provides the participants with skill and knowledge of casing design and optimisation for reduced well cost and increased well life

Upon completion of the course participants should know how to:

- Physical dimensions and manufacture of casing and casing couplings.
- Determine API performance properties of casing and casing couplings.
- Develop casing program (hole geometry, casing seat, casing diameters and mud weight).
- Select casing weights, grades, and coupling types for different well situations (high pressure wells, hot wells, deviated and horizontal wells).
- Analyse casing design using a computer program and optimise casing program.

Contents

Manufacture and physical dimensions of casing and casing coupling: review of basic types and applications of casing and couplings, manufacture of casings and casing couplings and their standard physical properties and presentation of a video/film on the manufacture and quality control of casings and casing couplings.

API performance properties and different casing loads: calculation of performance properties of collapse, burst and tension; calculation of collapse and burst loads based on maximum loading condition; calculation of tension based on shock, bending and buckling loads; and analysis of biaxial vs. triaxial loads.

Casing design and optimisation: selection of casing size, casing seats based on pore pressure data, selection of weights and grades for surface, intermediate and production casing (combination string) for different well situations and computer aided optimisation of the casing for reduced well cost and increased well life (discussion of weight vs. price conflict in casing design).

Casing design for special well conditions: casing design and practice for hydro and geopressured wells, wells penetrating salt domes, geothermal wells and directional and horizontal wells.

Hands-on computer aided casing design and local case studies.

Cementing Practices
Presenter: Sheik Rahman

Overview

The purpose of this course is to provide the drilling foremen, supervisors and engineers with proven technology to conduct successful primary and secondary cementing jobs in all kinds of casing setting situations. The course proceeds logically from the basics of cements to special cementing practices. The course also provides hands-on training in determining optimum cement properties using mobile cementing lab equipment and planning a cement job.

Upon completion of the course participants should know how to:

- Measure and control cement properties (both slurry and set cement).
- Determine slurry properties required for successful primary, remedial, plug back and squeeze cementing jobs.
- Select appropriate additives to control cement properties.
- Plan, conduct and monitor primary and secondary cementing jobs.
- Design, plan and conduct special cementing jobs: thixotropic cement, foam cement, heavyweight cement, gas check cement etc.
- Select casing hardware and equipment.

Contents

Manufacture and chemistry of oil well cement: chemistry of portland cement, basic classification of API cements, essential properties of API cements, cement additives (accelerators, retarders, extenders, weighting agents, dispersants, fluid loss control agents etc.) and their related properties, selection of cement additives to control API cement properties.

Laboratory testing and evaluation of cement properties: chemical analysis, density, viscosity, API water loss, free water requirement, thickening and setting time, set cement strength (permeability, porosity, tensile and compressive strength) etc.

Cementing jobs - planning and quality control: calculation of hole and cement volumes, hydraulic optimisation of slurry displacement (determination of slurry properties and displacement velocities); blending, mixing and displacement of cement slurry; selection of appropriate casing hardware and equipment; quality control measures for each phase of cementing.

Execution, monitoring and evaluation of cement jobs: rig preparation for running casing and cementing, selection and assembly of casing hardware and running of casing, handling and running of cement slurry, and evaluation of cement quality by hydraulic testing and cement bond logs.

Special cement system design and operation: thixotropic cement, expansive cement, ultra light cement, heavy weight cement, gas check cement, thermal cement, cement for corrosive environment, freeze protective cements, salt cements etc., practical solutions to commonly encountered problems; and local case studies.

Cement job planning and evaluation for deviated and horizontal wells: horizontal well classification and application, determination of cementing parameters for effective mud displacement (cement and mud properties, fluid circulation, pipe movement, cable wipers, centralisers, preflush, spacer fluid properties etc.), cement job operation and evaluation.

Practical Aspects of Well Planning and Drilling Cost Estimates

Presenter: Sheik Rahman

Overview

Course well planning is designed for drilling and production engineers, geologists and well site technicians. It integrates drilling engineering principles, corporate philosophies and experience factors with the aim of providing the participants with the knowledge of how to drill a safe and useable well at minimum cost that satisfies the requirement of reservoir engineering for oil and gas production.

Upon completion of the course the participant should know how to:

- Collect pore pressure drilling data from offset well and use for well planning.
- Estimate pore pressure and fracture gradient and select hole geometry, casing shoes, mud weight and directional well-path (trajectory).
- Select bit and nozzle size, mud and cement composition and their properties and casing size, grades and drill bits.
- Select rig size and drilling equipment
- Select completion equipment
- Estimate well costs and prepare AFEs.

Contents

Collection and preparation of data for well planning: classification of well types, selection of offset well and data sources: Bit record, IADC record, scout tickets, mud logging, log headers, production history and seismic data and organise data for well planning.

Prediction of pore pressure and fracture gradient: estimating pore pressure from interval transient time data, d-exponent, resistivity log, density log and mud logging data, estimation of fracture resistance from modified leak-off data.

Selection of well location, well trajectory, hole geometry and casing seats: Geological settings of the reservoirs and hole sections, select well location, trajectory, hole size and casing shoes.

Bit, mud, casing and cement plan: Selection of bit type and size, nozzle size and number of bits for each hole section; calculation of mud and cement volumes for each hole section, estimation of basic materials and additives for mud and cement and the calculation of mud and cement properties; types of casings and casing couplings, selection of casing grades and weights, and planning the requirements for special situations.
Completion effects on well planning: Reservoir and production parameters, surface and subsurface completion equipment, types of completions and completion factors affecting well planning.

Rig sizing and selection: Rig types and their structures, estimation of derrick capacity, selection of rotary table, mud pumps, solids control equipment, BOP equipment and other drilling considerations for special situations.

Well cost estimation and AFE preparation: Development of projected drilling time, identification of different cost categories, e.g. tangible and intangible costs (site preparation, drilling rig and tools, drilling fluids and cement, support services, transportation, supervision and administration, tubulars and wellhead equipment, completion equipment etc.); development of drilling cost charts and equations and preparation of an AFE.

Local case studies

Well Completion and Workover Operations
Presenter: Sheik Rahman

Who Should Attend

This workshop is primarily designed for drilling, production and completion engineers and supervisors needing a practical understanding and an appreciation of well completion design and operation, well stimulation and workover planning. It explains how completion configurations are varied to meet well objectives and to maximise well productivity. Design concepts and methods are presented together with downhole tools and their selection criteria. Completion types and design for vertical, horizontal and multilateral wells, design and optimisation of tubing based on tubing performance analysis (Inflow performance analysis, liquid and gas hold up during fluid flow and forces on tubing), downhole equipment, tubing accessories, wellhead equipment including sub sea completion. Also fluid flow through perforations and perforation techniques; causes of sand production and sand control technique; and hydraulic fracture treatment design and optimisation are extensively reviewed**. Local case studies are also provided**.

What You Will Learn

Upon completion of the workshop the participants should know:

- Safety and economics of various completion design.
- Well completion design for any given tubing-casing wellbore configuration for vertical, horizontal and multilateral wells.
- How to select tubing (size and material) based on inflow performance analysis, fluid deliverability through tubing and forces on tubing.
- How to select and specifyl surface and sub-surface equipment including subsea completion.
- Fluid flow through perforation and estimation of production through perforated intervals, and selection of equipment, procedure and interval for perforating oil and gas wells.
- Causes of sand production (from geomechanical background) and material, methods and tools for sand control.
- Design and optimisation of hydraulic fracture treatments.

Course Content

Well completion design: planning essentials prior to drilling (safety, economics), wellbore tubing-casing configuration, completion procedures (well completion fluids, well control and damage prevention), workover considerations, artificial lift requirements on completion design, inflow performance, and completion variations (primary completion - oil and gas wells, multiple completion, secondary recovery production well completion and injection well completion**)**.

Interval selection consideration and optimisation of tubing dimensions for maximum Production: Production mechanism for different reservoir types, completion efficiency consideration, inflow performance relationship (IPR) and effect of partial penetration on IPR, typical IPR case studies for both oil and gas reservoirs, bottom hole flowing pressure requirements, estimation of pressure losses in tubing for different rock and fluid properties, development of tubing performance curve and optimisation of tubing dimensions for maximum prediction rate and selection of material properties based on analysis of forces on tubing of tubing. ***Specialised soft wares are used for case studies and analysis***.

Subsurface completion equipment and accessories: Forces on packers and tubing movements, selection consideration of packers and packer settings, tubing accessories and subsurface safety and flow control valves. Typical case studies.

Well Head Equipment: Geometries and dimensions casing and tubing hanger, well heads for topside and subsea completions, Christmas and subsea trees, flow line, cokes and other control valves and flow regulating valves.

Special consideration for horizontal and multilateral completions: Wellbore, tubing and casing configuration, special equipment for horizontal and multilateral completions and running and operational procedure of subsurface equipment.

Perforation of oil and gas wells: perforation methods and equipment, basics of shape charge and its penetration mechanism. Selection and evaluation of shape charge, API testing procedure of shape charge penetration, shape charge gun categories and their application, special tools and operations. Calculation of flow through perforation tunnels and estimation production from the perforation interval.

Sand Control: Causes of sand production from the perspective of geomechanics and fluid flow. Sand production and its impact on reservoir productivity. Sand analysis and selection procedure of gravel sizes and screen opening. Different sand control techniques, procedure of gravel placement and screen installation. Economics of sand control and local case studies.

Reservoir stimulation: Introduction to different stimulation techniques, understanding of stress and rock properties involved in the selection of stimulation techniques, design procedure of hydraulic fracture treatment, economic evaluation of stimulation treatment coupled with a production model based on NPV. **Specialised softwares used for local case studies and analysis.**

Production Operations
Presenter: Sheik Rahman

Overview

The scope of the course covers subsurface and surface production operations which include sand control, well stimulation, formation damage prevention and removal, separation, treatment and gathering of crude on site including offshore locations and oil field corrosion and corrosion treatments. the course will cover wide range of practical problems and their solutions and provide hands-on training on local case studies.

On completion of the course the participants will know:

- Causes of sand production and how to control sand production.
- How to select appropriate candidates for well stimulation and design and evaluation of hydraulic and acid fracture jobs.
- How to prevent and remove formation damage during production operations.
- Become familiar with equipment and facilities used at wellsite for treatment, separation and gathering of oil and gas.
- How to prevent and control oil field corrosion.

Contents

Sand control: Basic technology involved in sand control, screen analysis of formation sand, selection and evaluation of screens and liners, method of estimating gravel pack sand size and liner openings for a given formation sand size, methods and equipment used for the placement of gravel sands, design and evaluation of typical gravel packs and **local case studies**.

Hydraulic Fracturing: Candidate selection and system analysis for hydraulic fracturing, characteristics of acid and propant fracturing, basics of rock mechanics, state of stresses and its relation to fracture growth, design fracture geometry, pumping schedule propant placement, selection and evaluation of fracturing fluids and propants, the technology of acid fracturing and **local case studies**.

Matrix Acidizing: Candidate selection and system analysis for matrix acidizing, chemistry and physics of acidizing, sandstone and carbonate reservoir characteristics, kinetics of acidizing for sandstone and carbonate reservoirs, acid treatment design including preflush and afterflush, acid additives and job evaluation.

Control and prevention of formation damage: Mechanism of formation damage during completion and workover operation, selection and evaluation of completion and workover fluids, special chemicals to reduce and prevent formation damage, well-site equipment and facilities for handling and treating completion fluids, basic technology of acid treatment for removing formation damage, industry practice in the evaluation of formation damage and local case studies.

Oil and gas separation: Oil and gas processing facilities, low grade crude plants and selection plant location, initial separation and free water knockout, two and three phase separators, emulsion treatments, desalting and pumping and storage.

Flowline, gathering line and transmission pipeline: Gaseous, liquid and solid emission treatment, flowline, gathering line and transmission pipeline design, valves and fitting selection and sizing and fluid measurement

Oil field corrosion and corrosion treatment: Corrosion mechanism and influencing factors, corrosion preventive methods, chemical inhibitors, cathodic protection, protective coating s and plastics, removal of corrosion gases and selection of appropriate materials for preventing corrosion.

Petroleum Economics and Risk Analysis
Presenter: Guy Allinson

Overview

This course is a practical petroleum economics course, which introduces participants to the methods and practices the international oil industry uses to examine the economic viability of upstream oil and gas projects. Many of these methods and practices are also used extensively in other industries. The course is a practical foundation, which the course participants can use to carry out their own economic evaluations or to review critically evaluations prepared by others.

The course covers cash flow analysis, economic indicators, risk and uncertainty, fiscal analysis and techniques for valuing oil and gas properties and companies.

The course is a practical course that aims to give the participants the ability to understand the role of petroleum economics in investment decision making and how to use petroleum economics in their work. It aims to give participants the ability to:

- Understand and construct petroleum industry cash flow projections.
- Calculate, understand and know how to apply economic indicators.
- Understand and apply risk analysis to E&P investments.
- Evaluate and model fiscal/PSC terms of countries worldwide.
- Value oil and gas properties

Contents

Role and Purpose of Petroleum Economics: Investment decisions and petroleum industry risks.

Cash Flow Analysis: Cash flow for an oil and gas project, the difference between cash flow and profit. Cash flow and petroleum taxation. Cash flow and production sharing contracts. Depreciation in cash flow analysis. Cash flow analysis and inflation. Nominal and real cash flows - avoiding the pitfalls. Project financing and cash flows.

Economic Indicators: Net present value ("NPV") calculations. The meaning of NPV Internal rate of return - measurement and meaning. Problems with internal rate of return. Incremental economic analysis techniques (accelerated production example). Payback calculations. Profit - to - investment ratio calculations and their use. Comparison of economic indicators and their use in the oil and gas industry.

Risk Analysis: Treatment of risks given corporate circumstances and objectives Using probabilities, the meaning of Expected Value and its use in E&P investment decisions. Assessing exploration and project risks, decision trees and their use in exploration and development decisions. Sensitivity analyses. Simple probability analyses. Probability distributions and their use. How Monte Carlo analyses work and how they are used in practice. Reserves distributions. Portfolio analysis

Fiscal analysis: Defining Government Take. Aims of fiscal regimes. Components and workings of fiscal regimes. Comparison of severity of fiscal regimes worldwide. Efficiency of fiscal regimes worldwide. Worked example of royalty/tax regime, Worked example of PSC contracts. Incremental economic effects of fiscal regimes. how an example PSC works

Valuing Petroleum Properties: Purposes of valuations. The difference between value and price. Methods of valuing properties (market values, intrinsic values, fair market values). Valuations and risk analysis. Valuing exploration acreage. Valuing reserves. Tax and PSC effects. Matching risks

Petroleum Fiscal Analysis
Presenter: Guy Allinson

Overview

The economic impact of various forms of Government Take has a critical bearing on exploration and field development decisions in the upstream petroleum industry. In most countries, Government Take is over 50% of the net cash flow from a petroleum development and is typically larger than the capital and operating costs of the project.

This course leads the participants through basic economic concepts, the types and structures of fiscal regimes and how an example fiscal regime operates in detail. Emphasis is placed not only on fiscal severity, but also on fiscal efficiency and how fiscal regimes behave under different economic conditions.

The course includes numerous examples of different fiscal mechanisms worldwide and through worked examples, participants gain hands-on experience of how fiscal regimes operate in practice.

At the end of the course, the participants will:

- Understand the different components of fiscal regimes and how they work.
- Be able to assess the economic impact of different fiscal components.
- Understand the distinction between fiscal severity and fiscal efficiency
- See the effect of fiscal terms on exploration and field development decisions
- Be able to assess minimum prospect size and minimum field size under different regimes.
- Understand the incremental effects of fiscal terms on additional investments for an existing producing field.

Contents

Project economics revisited – Basic concepts of cash flow, profit, net present value and expected value.

Fiscal regimes – Aims of fiscal regimes. Types of fiscal regimes. Structure of fiscal regimes. State Take and Government Take. Severity of fiscal regimes worldwide. Efficiency of fiscal regimes. The effect of royalties. The effect of rate of return and profitability taxes and production sharing terms. The effect of cost recovery ceilings. The effect of production triggers. The effect of depreciation. The effect of other fiscal components. The stability of fiscal regimes. Progressive and regressive regimes. Ring fence arrangements. The effect of fiscal terms on exploration decisions.

Workings of example fiscal regime – For the country where the course is held :- Structure of example regime/s. Comparison of the regime with other regimes. Illustration of the workings of the regime. Detailed worked example. Incremental effects of the regime on exploration and development decisions. Lease-buy decisions.

Oil and Gas Industry Accounting
Presenter: Max Williamson

Overview

This course is aimed at those non-accountants who wish to gain an appreciation of how accounting is carried out in today's oil and gas industry. It covers the basics of accounting, company reporting, interpreting financial statements and company taxation. The course is suitable for a wide-ranging audience. People from inside and outside the oil and gas industry will find the course valuable.

At the end of the course, the participants will:

- Understand the reasons for the need to prepare accounts.
- Be able to prepare profit and loss accounts.
- Be able to prepare balance sheets.
- Be able to analyse and interpret company financial statements.
- Understand the different company reporting requirements.
- Understand the Australian system of taxation as it applies to oil and gas companies.

Contents

Introduction – Why prepare accounts? Regulatory and reporting obligations. Types of accounts prepared and their purposes. The users of accounting information. The format and style of accounts. Statutory requirements. Annual returns to the stock exchange. Annual reports.

Profit and loss accounts – Purpose and content. Review of oil industry examples. Review of costs and accumulations. How costs are coded and revenue characterised. Methods of depreciation. Calculation of profits and losses. Dividends.

Balance sheets – Purpose. Content. Review of oil and gas industry examples. Information available on a balance sheet.

Accounting standards – The role of accounting standards. International and local standards. The status of accounting standards and legal obligations. Examples of accounting standards. "Area of interest" concept. The role of accepted standards and interpretation of these principles. The statutory role of the director in preparing accounts and the annual report to shareholders.

Reports to management – Requirements of management. Cash flow reporting. Cost and profit reporting. Management indicators. Critical reports. Review of examples.

Reports to shareholders – Statutory obligations under corporate law. Annual report. Director's report. Auditor's report. Chairman's correspondence.

Reports to the stock exchange – Stock exchange listing rules. Continuous reporting of material events. Identifying report requirements. Review of example quarterly and six monthly reports.

Reports to lenders and financial institutions – Cash flow reports. Management reports. Special purpose reports. Tracking forward, hedging and option positions.

Annual report – Corporations law requirements on content and style. Market expectations on disclosures. Review of examples. Identifying relevant issues including – forward sales, area of interest, cash flow reports, borrowing and repayment schedules, contingent liabilities, environmental expenditures, auditor comments.

Audits – The statutory role of the auditor. Case Law precedents regarding auditors' responsibilities. The auditor's responsibility for negligence and insurance coverage. User's rights regarding the auditors and directors. The auditors' responsibility to report breaches of the corporations Law.

Interpretation of financial statements – Workshop using example accounts, presentations and interpretation of results.

Taxation – The basic rules for the calculation of the taxes payable. Review of typical company income tax, Fringe Benefits tax and payroll tax returns. The timing of payments to different taxing authorities.

Royalties, Excise and Petroleum Resource Rent ("PTRR") tax – Description of regimes. Reviews of typical royalty, excise and PTRR returns.

Goods and Services tax ("GST") – Review of basic rules. Examination of key concepts. Exports and local consumption of petroleum products. Registration requirements. Cash flow positions and recovery of input credits. Calculation of a typical company's GST. The problems of GST for the oil and gas industry.

Zone of Cooperation- Area A ("ZOCA") – Location and status. Statutory requirements. Review of a typical ZOCA agreement. Calculating obligations and corporate taxes payable in Australia and Indonesia. Unresolved tax issues.

Conclusions – Review of objectives. Summary of key elements of the course. Practical comments related to course participants. Quality of information and quality of management. Director's responsibility to shareholders and financial markets.

Petroleum Contracts and PSC Negotiations
Presenter: Dennis Stickley

Overview

Contracts are use extensively in the petroleum industry both to structure commercial arrangements and recite the rights and obligations of private enterprises and the state. The goal of all negotiations is to achieve a sustainable and enforceable contract. This course combines business, legal and cross-cultural training using various exercises that simulate how issues are resolved in negotiating contracts such as joint venture agreements, production sharing contracts, oil field service contracts and gas sales and purchase agreements.

The objective of the course is to improve the participant's personal skill in negotiating agreements common to the petroleum industry. In order to do this it is important to be aware of the interrelationship between economic outcomes and negotiating positions. Computer models are used to 'track' the economic consequences of the exercises. In addition, the understanding reached at the bargaining table is to be reflected in written agreements and memorandum. As a final training tool, simulations are video taped for review and feedback from the instructor after each round of negotiation.

Contents

The following topics are presented in the course:

(a)The negotiation process

Team structure - An effective negotiating team that is composed of legal, analytical, and communication skills.
Use of financial models - A successful outcome depends on being able to understand the financial impact of the offers and concessions exchanged in the negotiation process.
Preparation and planning - Using planning tools such as checklists, critical path schedules and transaction diagrams can enhance the outcome of negotiations.
Tactics and styles - Recognising and using negotiating tactics to improve bargaining position.

(b) The Drafting Process

Terms sheets - The main points of an agreement should be documented as early as possible to provide the framework for a definitive contract.
Memorandum of Understanding - Not all agreements are binding contracts and it is important to know the difference.
Drafting as negotiation- Much negotiation in the petroleum industry is conducted through the exchange of documents.

(c)Relations between companies and governments

Production Sharing Contracts - The affect of cost recovery limits and government take on project return and product prices.

Political Risk- Techniques for managing political and regulatory risk in the petroleum industry in order to maintain contract stability.

Cross-cultural communication - Understanding the role of organisational and national cultures on negotiations.

Natural Gas Contracts and Management
Presenter: Dennis Stickley

Overview

Natural gas development is the most complex type of project in the petroleum industry. Projects are only feasible when long-term contracts can be reached between the producer and end-user. Often the compromise nature of these contracts means that active management of the terms and conditions for performance is necessary in order to deal with events and interpretations that were not anticipated during negotiations.

Natural gas contracts are structured to contain provisions that are favorable to either the producer or the user. It is important to understand the rights and obligations created by provisions for take-or-pay, make-up, most favored nation, and alternate fuel pricing. In addition, the management of long-term contract requires further knowledge regarding trustee financing, production accounting, and pipeline access. All of these concepts are presented with examples. As a final exercise, participants will use a computer simulation that demonstrates the relationship between pipeline transportation costs and the net-back price paid at the wellhead.

Contents

The following topics are presented in the course:

Commercial Issues - The relationship of market load to reservoir characteristics, methods for conducting gas project feasibility analysis and selecting the contract format that is most suited to the market.

Gas Industry Contracts (gas sales and purchase agreements \ gas transportation agreements) - Alternative pricing systems for natural gas, take-or-pay thresholds and accounting, gas transportation agreements and tariff methodology, reserving pipeline capacity and expansion obligations.

Contract Administration - Force majeure impacts on take-or-pay, technical standards for measurement and gas quality, balancing deliveries between producers and pipelines, establishing gas delivery procedures for multiple pipeline users, preparing billing invoices and production statements.

Petroleum Industry Service Contracts
Presenter: Dennis Stickley

Course Overview

This course addresses fundamental issues related to the variety of service and support contracts (drilling, seismic, well logging, construction, consulting services) used in the upstream segment of petroleum industry. Generally, these contracts are arranged and administered by the Operator on behalf of the participants e.g. "joint venture working interests".

Commercial success in the petroleum industry often depends upon applying and developing technology that allows petroleum operations to be conducted in increasingly remote and hostile locations. Protecting the rights to these innovations and being able to license their use by third parties has become a standard consideration in relations between Contractors and their client companies.

The participants will apply the material discussed to the Case Study.

Contents

The following topics are presented in the course:

Contractor Selection - Tendering procedures, preparation of bid packages, bidding strategies, ensuring the integrity of bidding, bid evaluation, awards and variations.

General Obligations of Contractor & Company - Special and general contract conditions, formation of alliances with operators or suppliers, using industry precedents, performance standards, force majeure events.Error! Bookmark not defined.

Liability and Risk Control – Surface and downhole conditions, environmental, personnel and equipment, insurance, and warranties.

Technology Development & Transfer - Acquisition and control of proprietary information, patent rights, technology licensing, confidentiality.

International Petroleum Contracts
Presenter: Bun Hung

Overview

The course will examine the broad types of regime adopted by governments in the regulation of their petroleum resources.

The course will also examine in varying degrees of depth the following basic contracts found in the international upstream oil and gas industry:

- Production sharing contracts;
- Joint operating agreements and accounting procedures;
- Seller's Representative agreements;
- Farm-in agreements;
- Gas sales contracts;
- Lifting/Offtake agreements;
- Transportation (pipeline) agreements.

The negotiation of these basic contracts will also be discussed.

Objectives

The objectives of the course are to provide participants with:

- A fundamental understanding of the ways in which the exploration for and development of oil and gas reserves are controlled and regulated by governments;
- A sound knowledge of the key provisions of the basic contracts employed in the international upstream oil and gas industry; and
- An understanding of the way in which these basic contracts are negotiated.

Appropriate exercises will be carried out as a means of reinforcing and applying principles examined during the course.

Who Should Attend?

Corporate lawyers involved in the petroleum business, commercial managers of oil and gas companies, technical personnel who have an interest in understanding the legal framework within which business in the international petroleum industry is conducted and those involved generally in the negotiation of oil and gas contracts.

Course Content

A brief introduction to the main regulatory systems adopted by governments, namely:

- Licensing/concessionary regimes;
- Production sharing contracts;
- Service contracts: risk contracts/fee for service contracts;
- Joint venture/back-in contracts.

Brief analysis of the role of national oil companies.

Production Sharing Contacts

The use of production sharing contracts is prevalent in the international petroleum industry. The course will involve an in-depth review of the major terms of a "typical" production sharing contract, including:

- Cost oil/profit oil split;
- Classification of costs for cost recovery;
- Signature bonuses;
- Production bonuses;
- Economic stability;
- Minimum work programmes;
- Government rights to purchase production – pricing mechanisms;
- Local employment/local goods & services;
- Technology transfer;
- Additional taxes and royalties;
- Taxation – depreciation and "ringfencing";
- Environmental protection;
- Currency/exchange control;
- Relationship between government and contractor;
- Voting;
- Operator;
- Relationship between management committee and operating committee;
- Default;
- Assignment;
- Dispute resolution – sole expert/international arbitration.

Joint Operating Agreements and Accounting Procedures

The joint operating agreement is the agreement typically used by joint venture participants to govern the relations between them. A detailed analysis of the key provisions of a "typical" joint operating agreement will be carried out, including:

- Relationship between the PSC and the JOA;
- Relationship between the contractor parties;
- Appointment and removal of the operator;
- Duties of operator;
- Role of operating committee;
- Voting procedures;
- Programmes and budgets;
- Expenditure control procedures – AFE's and cash calls;
- Default;
- Abandonment;
- Sole risk operations;
- Dispute resolution;
- JOA accounting procedures.

Farm-in Agreements

Typically, a company will acquire an interest in an area either by direct application to the relevant government authority or by "farming-in" to the interest of an existing interest holder. Since farm-in agreements are very common in the industry, a sample farm-in agreement will be examined, with particular emphasis on the ways in which an incoming party may acquire or "earn" an interest from an existing party.

Gas Sales Contracts

Gas sales contracts are becoming increasingly important in the petroleum industry. They are amongst the most complex agreements to be found in the oil and gas sector. A "typical" long- term gas sales contract will be analysed and key terms and conditions discussed, including:

- Contract duration;
- Issues relating to contract quantity (ACQ, DCQ, make-up gas, build-up etc);
- Issues relating to gas quality
- Payment provisions, including "take-or-pay" arrangements;
- Pricing.

Transportation Agreements

The legal and commercial issues peculiar to pipeline transportation agreements will be reviewed.

The Fundamentals of Gas and LNG Projects and Markets
Presenters: Mike Williams & Richard Harrison

Overview

The 21st century has been coined the century of gas. The course will address the technical and economic factors that have driven and will drive the development of natural gas reserves through the delivery of gas to an end user by means of an integrated gas project. The range and role of relevant parties to a successful gas project are described. Actual case histories will be used frequently to demonstrate learning points. An introduction to terminology and "rules of thumb" should further enhance participant's ability to contribute to a successful gas project – or to ask the right questions to test and improve the viability of a proposed project. Gas and LNG project development executives are drawn from both technical (E&P geoscience and engineering) and non-technical (commercial, finance and legal) backgrounds, but this course assumes no particular expertise. Participants who have recently joined a gas market development team, and those from banking or legal firms, or the public service (regulatory, trade or diplomatic) should benefit from the course.

Objectives

On completion, participants in the course will be able to

- Understand the characteristics of natural gas which both broaden and yet constrain the commercial and technical links in the "gas chain"
- Identify key factors which determine an optimal gas field development plan and its related gas delivery system
- Generate options for market development proposals – "who dares, wins"?
- Negotiate more effectively the terms of gas supply agreements
- Understand the perspectives of the investor, the operator, the customer and government towards the gas project
- Recognise political and diplomatic implications of international trade in natural gas

Contents

Commercial characteristics of natural gas and its market
Consideration of gas as a 'commodity'; comparison with crude oil and NGLs; capital intensity of gas infrastructure; comparison of "green- field" and "incremental" investment decisions; parties involved in the "gas chain"; role of the State

Optimization of gas field development
Contrast between optimal field development factors from an "upstream" (E&P) perspective and from that of the gas supplier; impact of simultaneous production of crude and NGLs

Pipeline gas transmission
Investment decisions; sizes and distances; build up rates, rates of return; comparison with HT electricity transmission; when to liquefy?

Characteristics of LNG
Physical properties of LNG: density, purity, calorific value, relative "greenhouse" impact.

Gas liquefaction overview
Costs, benchmarks, typical process, safety, lead and construction times; storage requirements

Shipping/terminals/end uses
Costs, benchmarks, typical designs, safety, LNG "rollover", lead and construction times; storage requirements; upset conditions and responses; capacity/storage optimization, special issues involving power generation

Market Identification/Development
The three levels of market identification, costs, compatibility of gases, and conversion to piped natural gas

Environmental Considerations
The carbon load of natural gas; comparison with other fuels; opportunities for differentiation

LNG business development
Key factors which generate a successful LNG market; outline of LNG sales and purchase agreements; related contract terms and conditions

International competition for LNG markets
Current intense competition for markets is placed in historical context; effect on pricing formulae and contract terms

Future Trends
Australian gas development experience is contrasted with other regional markets; potential forces which impact on commoditisation; integration in US and Europe.

Introduction to the Oil and Gas Industry
Presenter: Henry Salisch

Overview

It is highly desirable that non-technical personnel that work in the petroleum industry or in related activities acquire a practical basic understanding of the petroleum industry in an interesting and effective manner. This will be conveyed in an integrated fashion by looking at the 'big picture' of the multidiscipline aspect of oil and gas exploration, reservoir fundamentals, drilling and completion of oil and gas wells and production of hydrocarbons. Participation in the course should result in greater job confidence, enthusiasm and productivity.

At the end of this course, the participants will:

- Understand the role of oil and natural gas as our main source of energy.
- Appreciate the complexity of the operations required to find and produce hydrocarbons.
- Understand the need for the integration of the activities that make up the petroleum industry.
- Understand the role of the geophysicist, geologist, engineer and people of many other professional backgrounds in the development of the petroleum industry.
- Appreciate the dedication required from every individual to make an operation efficient and profitable.

Contents

The role of oil and natural gas as our main source of energy
History of the oil and natural gas industry. Australia as an oil and gas producer. The oil companies and their role as energy suppliers. The role of the Federal and State governments in the industry. Worldwide distribution of oil and gas reserves. Conventional and non-conventional oil. Alternative sources of energy.

The study of Petroleum Reservoirs: Fundamentals
Measurements used in the oil industry. Importance of measurement scaling. Data acquisition and interpretation. Data quality control. Data integration and presentation. Concepts of rock/fluid systems. Coring and core analysis. Well logging and log analysis. Well testing and evaluation

Well drilling, completion and production
Planning and design of a well bore. The role of drilling fluids. Vertical, deviated, horizontal and multiple wells. On shore and off shore drilling. Well completion practices. Casing strings. Oil well cementing. Casing perforating. Well stimulation. The performance of productive formations. Flowing and pumping wells. Productive enhancement. Secondary and enhanced oil recovery.

The Search for Oil & Gas - Fundamentals of Petroleum Exploration

Presenter: John Conolly

Overview

This course will introduce the participants to oil and gas exploration by providing an understanding of the fundamental principles of today's petroleum exploration developed from the early important breakthroughs in technology to 3-D seismic.

The course is geared for the practical explorationist, the analyst, or the layman.

Contents

Using samples of maps, seismic sections, wells, geochemistry cores and cuttings, the participants will be able to develop an understanding of how exploration companies assess a particular region. The presenter will use examples from both the offshore and onshore basins of North America, North Sea, South East Asia and Australasia.

Comparisons will be made between Australasian basins and other basins in the world and will show how the Australasian basins are generally under-explored.

A state-of-the-art account of the major petroleum plays will utilise key site-specific reconstructions of basin evolution with an emphasis on

- Reservoir geometry and quality
- Seals
- Source rock and migration
- Traps and structural integrity.

The economics of each play will be reviewed and predictions made concerning its future development.

The following basins will be discussed:

1. Selected onshore basins of the USA and Canada.
2. Gulf of Mexico.
3. North Sea.
4. The Northwest Shelf Province, including its extension into Papua Guinea.
5. The offshore southern margins of Australia including the Great Australian Bight, Otway, Bass and Gippsland Basins and their extension into the Taranaki Basin in New Zealand.
6. The onshore and offshore Perth Basin, Surat, Eromanga, Cooper, Pedirka, Canning and Amadeus Basins.
7. Some selected Basins in the Southeast Asia-Pacific region.

By using sets of examples from different basins, and in different geological and economic settings, the course teaches the participants how to:-

1. Make a preliminary assessment of a basin using key wells, seismic lines and other general geological information (a basin analysis).

2. Prepare a basic exploration program to explore and develop the basin.

3. Make a risk profile based on the risk analysis of:

    A. Source
    B. Seal
    C. Reservoir
    D. Trap
    E. Economic setting.

4. After a series of fields have been discovered, plan future exploration of the region by assessing the risk analysis (above) in conjunction with a predicted oil and gas trend analysis within an economic framework.

Because sediments are laid within predictable natural systems, such as coastal plains, deltas, and reefs, the participants will learn how comparisons to these modern examples can help the explorer make trend predictions.

It is stressed that the course objective is to create confidence in the participants' ability to understand the nature of the search for oil and gas no matter what their background.

Fundamentals of the Oil & Gas Industry

Presenters: Henry Salisch, Henry Irrgang, Guy Allinson, Michael Williamson, Bun Hung

Overview

This course provides an appreciation of the technical and managerial elements of the upstream petroleum industry. It summarises the main features of oil and gas exploration, engineering, reserves estimation, field development, the economics of oil and gas investment decisions, the basics of oil industry accounting and petroleum law.

The course aims to give people who are new to the industry a practical appreciation of the full range of technical and managerial issues affecting the way in which the industry operates. It also aims to fill in gaps for those who already work in the industry, but want to round out their technical knowledge of what is involved in exploration and field development as well as the economic, financial and legal framework in which these activities take place.

Contents

Exploration for Oil and Gas (Day 1 - Henry Salisch)

How was oil and gas generated, how did it migrate and get trapped?
The earth's geological structure - A description of the overall geology of the earth. The formation of land and sea. The origin of oil and gas - How oil and gas was formed in the deeper part of the earth's crust. Source rocks for oil and gas - The nature and condition of the rocks where oil and gas is generated. How organic matter is decomposed under pressure and temperature. Oil and gas migration. - How oil and gas migrate into the reservoirs from their source rocks. Oil and gas traps. - The nature of the rocks and rock configurations needed to ensure that oil and gas is trapped. Reservoir description - How we characterise oil and gas reservoirs and the conditions required for oil and gas to flow to the surface. Techniques of locating oil and gas resources. - The use of geological analysis, coupled with seismic and other surveys. Exploration drilling. Measuring oil and gas reserves. - The techniques used to estimate how much oil or gas can be recovered commercially from the earth. Measuring oil and gas reserves - The techniques used to estimate how much oil or gas can be recovered commercially from a reservoir. Uncertainty and reserves estimates. - The difficulty in estimating oil and gas reserves accurately from limited information. Drilling and completion technology – vertical, deviated, horizontal and multilateral wells. - What different types of well can be drilled and under what circumstances. Drilling exploration wells. - Drilling to discover oil and gas - the methods, the costs and the uncertainties. Drilling appraisal and development wells. - Drilling to gain knowledge of the reservoir and to produce oil and gas after it has been discovered. Completion and production techniques. - How wells are prepared for production and how they are maintained during field life.

Engineering Oil and Gas Developments (Day 2 - Henry Irrgang)

Reservoir analysis. -The analysis of how much and over what period oil and gas reservoirs will produce.

Different types of petroleum reservoirs. - Crude oil, natural gas and condensate reservoirs.

Reservoir rock properties. - Defining the critical rock properties such as porosity, saturation, permeability, relative permeability and capillary pressure, understand their significance and look at open hole logging, cased hole logging and coring to estimate these properties. Again we will emphasise the uncertainties in making these estimates.

Reservoir fluid properties. - Measurement of fluid properties in the laboratory is generally quite reliable. However, uncertainties arise due to difficulties in obtaining representative reservoir fluid samples. We will define the important fluid properties and examine ways of obtaining reliable samples and analysis results.

Material balance. - Calculating the balances of fluid volumes produced from a reservoir.

Fluid displacement. - Fluid Flow and Fluid Displacement in a porous medium is the second fundamental calculation methodology which describes the relationship between flow rate and pressure drop of the various fluids flowing within a petroleum reservoir.

Reservoir simulation. - Reservoir simulation is, in principle, a very simple but powerful tool that solves the material balance, fluid flow and equation of state simultaneously and describes the processes occurring in different parts of the reservoir by dividing the reservoir into thousands of small cells. We shall discuss the strengths and weaknesses if the technique and understand the circumstances in which it should be applied.

Forecasting oil and gas production. - Methods used to estimate the rate of production each year in the life of an oil or gas field how much oil and gas will be produced.

Gas reservoirs. - Gas reservoir development and operation provides its own set of challenges which will be discussed.

Drive mechanisms. - A key determinant of how an oil or a gas field should be developed and operated is the drive mechanism enjoyed by its reservoirs. Natural drive mechanisms can range from depletion drive, solution gas drive, gas cap drive, compaction drive and water drive.

Secondary recovery. - If the natural drive mechanisms in an oil reservoir do not provide adequate energy for oil recovery, secondary recovery operations can augment natural energy by injecting water and/ or gas.

Enhanced oil recovery. - At the end of primary and secondary recovery operations, on a worldwide average, only about 30% of the oil-in-place is recovered. Enhanced oil recovery techniques work on the basis of injecting fluids or chemicals into the reservoir which alter the properties of the reservoir fluids or the fluid-rock interaction to facilitate the improvement of the recovery factor.

Economics of Oil and Gas Development (Day 3 - Guy Allinson)

Cash flow analysis - cash flow forecasts of oil and gas developments, components of cash flow, profit forecasts, cash flow and petroleum tax, cash flow and production sharing contracts, real and nominal cash.
Economic Indicators – definition, use and meaning of net present value, definition, use of internal rate of return, problems with using the internal rate of return in the petroleum industry.
Risk analysis – choosing discount rates, expected value, Monte Carlo simulation and probability distributions of reserves and economic indicators, investment portfolios.
Reserves – Concepts and terminology. Taking care when referring to reserves estimates.
Fiscal analysis – the effect of petroleum fiscal regimes on oil and gas investments, fiscal severity, fiscal efficiency.

The Gas & LNG Business (Day 4 – Michael Williams)

- Commercialization of gas reserves via pipeline developments or LNG
- Comparison with crude and NGLs
- Optimization of gas field development – market demands, impact of parallel production of crude & NGLs
- Pipeline gas developments – size & distances, build-up rates, comparison with HT electrical transmission
- LNG – properties, gas liquefaction, safety, storage, rollover, shipping, regasification, lead & construction times
- Market identification and development – compatibility of gases, LNG vs LPG
- LNG as an international business – contracts, competition & future trends

Basic Petroleum Contracts (Day 5 - Bun Hung)

Petroleum Regimes – Regulatory Framework, a brief introduction to the main regulatory systems adopted by governments, namely -

- Licensing/concessionary regimes;
- Production sharing contracts;
- Service contracts: risk contracts/fee for service contracts;
- Joint venture/back-in contracts.

Brief analysis of the role of national oil companies.
Production Sharing Contacts - the use of production sharing contracts is prevalent in the international petroleum industry. The course will involve a review of the major terms of a “typical” production sharing contract.
Joint Operating Agreements and Accounting Procedures - the joint operating agreement is used by joint venture participants to govern the relations between them. An analysis of the key provisions of a “typical” joint operating agreement will be carried out.
Gas Sales Contracts - Gas sales contracts are becoming increasingly important in the petroleum industry. They are amongst the most complex agreements to be found in the oil and gas sector. A “typical” long- term gas sales contract will be analysed and key terms and conditions discussed.

Effective Presentation Skills
Presenter: Jill Sweatman

Overview

This course is designed for engineers, scientists, managers and professionals who wish to increase their personal and business effectiveness by enhancing their presentation skills.

In a world where the use of information technology and computing is growing rapidly, the ability to impart knowledge in a meaningful and memorable manner is increasingly important. Each one of us communicates. However, good communicators can determine the future success of a business and presentation skills play a critical part in displaying their capabilities.

This course will focus on simplifying the complex in order to make a presentation more meaningful for the audience. It will deal with many of the fundamentals of presentations so often overlooked. It will also reveal some of the refinements rarely discussed yet are the mark of an impressive presentation.

On completion of this one day course you will learn how to:

- Present with greater confidence, credibility and professional presence.
- Recognise adult learning styles and motivators.
- Map the specific needs and concerns of the audience so that you can understand your audience.
- Plan the use of a variety of materials and equipment.
- Create presentations that focus on outcomes, results and process.
- Present figures and graphs in a meaningful and memorable way.
- Create an electronic overhead presentation that is appropriate for the occasion.
- Move mere data into knowledge and business implications so that your audience can better use your ideas.
- Design the right questions to ask to engage the audience so that they are thinking about your presentation and its applicability to them.
- Incorporate appropriate discussion and questioning activities to heighten the recall of your presentation.
- Customise a presentation to a range of audiences for compelling and memorable results.
- Stop your audience from falling asleep by being interesting and focused on their responses rather than just the presentation of data.

Contents

The Basics - Critical elements of every presentation.
The critical fundamentals of successful presentations.
Understanding the audience and engaging them to act on your message.
Establishing the needs and expectations of the audience.
Anticipating the possible questions and objections and planning to overcome them.

Preparation - Planning for a Good Presentation.
Key steps in a presentation.
How to create a visual map to build your presentation.
Compelling ways to support your ideas
How to look professional and still use notes.

Visual Aids - Adding credibility and professionalism.
What aids to use and how and when to use them.
Making the complex manageable for your audience.
Knowing the visual aid traps and how to avoid them.
Understanding the audience and pitching your presentation to ensure a high level of listener comprehension for varying degrees of knowledge.

Dealing with the Complex - Keeping it Simple.
Being simple without being simplistic.
Creating data and engaging the audience with the right questions.
How to handle challenging questions and situations.

Persuasion - How to establish credibility.
Keys to selling ideas in a presentation.
Ways to create credibility and build trust.
How to deal with challenging people.

Projection - Develop a style that delivers what you want to achieve.
Tailor your style to different audiences.
Using the room and physical environment to the best advantage
How to maximise your strengths.

Brief Resumes of Short Course Presenters

School of Petroleum Engineering, University of New South Wales

Val Pinczewski (Petroleum reservoir engineering)

Val Pinczewski is Professor of Petroleum Engineering and Director of the School of Petroleum Engineering at the University of New South Wales. Prior to joining the university, he worked as a Petroleum Engineer with Esso Australia. Val is an active consultant to industry in the areas of improved oil recovery and reservoir simulation. Professor Pinczewski conducts major research programs in improved oil recovery and reservoir simulation. He is the author of numerous technical papers and is Manager of the Improved Oil and Gas Recovery Program at the Australian Petroleum Cooperative Research Centre. He has presented numerous petroleum reservoir engineering short courses in the Asia - Pacific region.

Guy Allinson (Economics and fiscal analysis)

Guy Allinson is a Senior Fellow at the School of Petroleum Engineering, University of New South Wales ("UNSW"). He conducts undergraduate courses in petroleum economics and business practices and carries out research into the petroleum industry in the Asia Pacific region. He has also given frequent presentations to oil and finance industry seminars and conferences and has conducted many oil industry short courses in petroleum economics and PSC/fiscal analysis worldwide. Before joining the UNSW, Guy held various petroleum economics and commercial positions in the oil and gas industry. He has advised companies and Governments in the Asia / Pacific region on petroleum PSC and fiscal terms. He has valued many petroleum properties and companies for acquisition and sale, prepared economics research reports on the oil and gas industry and has provided commercial support for oil field operations and investments worldwide.

Richard Harrison (Fundamentals of Gas & LNG Projects)

Richard Harrison is a private consultant and is interested in the integration of commercial and environmental opportunities offered by the use of natural gas. He has five years professional experience in presenting the Gas & LNG Projects course, developed in conjunction with Michael Williams. Mr Harrison had been with the Shell Group of Companies for 30 years. His final post was General Manager, Natural Gas and Project Development Manager for Shell in China from 1997 to 2001. His main responsibility was to develop a liquefied natural gas (LNG) import project, as well as sales and marketing of natural gas, in China. He represented Shell on the Joint Venture Project Committee of the Australian North West Shelf LNG project between 1993 and 1997. Prior to that, Mr Harrison was involved in managing the application of onshore and offshore technologies for Shell's exploration and production programme, the successful development of gas projects for base and peak load duties in the UK Southern North Sea gas province, gas and oil venture assessments in Russia, Kazakhstan and Turkmenistan, and deep-water gas and oil discoveries in The Philippines. Before joining Shell, Mr Harrison worked for two years as a Field Geophysicist in Central Australia and Papua New Guinea for the Australian Government Bureau of Mineral Resources (now Geoscience Australia) and for a further two years as a field party leader in Central Australia for a private exploration contractor.

Birgitta Hartung-Kagi (Geochemistry for Exploration & Production)

Dr. Birgitta Hartung-Kagi obtained a PhD in Geology from the Technical University of Braunschweig (Germany) in 1982. Birgitta moved to Australia in 1984 and, after a couple of years' employment with oil companies and became the Manager of Analabs' Oil and Gas Division, a geochemical service company based in Perth. Since 1990, she established a Perth-based company which provides analytical and consulting services to the international oil and gas industry in petroleum geochemistry, environmental and industrial chemistry, fuel & lubricant analysis and petrophysics.

Bun Hung (International Petroleum Contracts)

Bun Hung holds degrees in Arts and Law from the University of Sydney. He is a Solicitor of the Supreme Court of New South Wales and is a Member of the Institute of Petroleum. For the past 20 years, Mr Hung has worked exclusively in the oil and gas industry, initially as a legal adviser and subsequently in general management and business development roles. Mr Hung was the General Manager of Command Petroleum Limited prior to that company being taken over by Cairn Energy PLC in 1996, after which he was appointed to the position of Managing Director, responsible for the company's Indian and South Asian activities. Mr Hung played a major role in the public listing of ROC Oil Company Limited on the Australian Stock Exchange in 1999 and was an Executive Director of that company until he left at the beginning of 2001. Through his consultancy firm, Petrolex Advisory Services, Mr Hung has been engaged by Reliance Industries Limited, India's largest private sector company, to advise on strategic development issues relating to Reliance's domestic and international oil and gas business and he plays a key role in negotiating Reliance's major oil and gas acquisitions and contracts. Mr Hung has delivered papers at various industry conferences and, at the request of the Oil and Natural Gas Corporation of India, India's national oil company, presented a course on international petroleum regulatory regimes and basic petroleum contracts.

Henry Irrgang (Fundamentals of the Oil and Gas Industry)

Henry Irrgang is a Reservoir Management Consultant working for a number of Australian and international companies. He has 27 years of Petroleum Engineering experience, primarily in Reservoir Engineering, and has worked in technical, supervisory and management roles. Prior to consulting, Henry worked with Esso from 1973 to 1990, and participated in most of their simulation studies, field developments and exploration well evaluations in the period 1980 – 1990 as Reservoir Developments/Studies Supervisor. Henry worked with Bridge Oil from 1990 - 1994 and Command Petroleum (Cairn Energy) 1994 – 1998 where he was Reservoir Engineering Manager for the Ravva field development in India. He has a broad knowledge and experience in related disciplines such as drilling, facilities design, economic analysis, and commercial areas. Henry has a M.Eng.Sc degree from the University of New South Wales.

Ashok Khurana (Reservoir Management)

Professor Ashok Khurana is Professor of Petroleum Engineering at the Australian School of Petroleum in the University of Adelaide, South Australia, as well as Adjunct Professor of Petroleum Engineering at Curtin University of Technology, Perth, Western Australia. He has previously held Professorial positions at Curtin University, Perth and The University of New South Wales, Sydney. Concurrently, he is an independent international technical and management consultant to the petroleum exploration and production industry. Professor Khurana has almost 25 years of industry experience with Santos Ltd and with Esso/ExxonMobil with extensive exposure to all technical and management aspects of the industry.

Sheik Rahman (Drilling Engineering)

Dr. S. Rahman is an Associate Professor and the Director for Postgraduate Studies and Continuing Learning Program at the School of Petroleum Engineering. He is a specialist in Drilling and Production Engineering and has served the petroleum industry in the Middle East, Europe and Asia for over 12 years. He has developed and taught over 25 industrial training courses in Asia, Europe and Australia. He has published over 40 scientific papers in drilling related areas and a text book on casing design. He is an active member of the program committee of the SPE-IADC Asia Pacific Conference and plays an important role in developing strategic planning and direction for the SPE-IADC programs. Dr. Rahman received a B.Sc. in Mechanical Engineering, an M.Sc. in Marine Technology from UK and Ph.D. in Petroleum Engineering from West Germany.

Henry Salisch (Reservoir Formation Evaluation)

Dr Henry Salisch has degrees in Geological Engineering and Petroleum Engineering (University of Oklahoma). He has worked as a Geologist for Anglo- Ecuadorian Oilfields and in log interpretation with Schlumberger for over 20 years. He headed the petrophysical group (well log) of Intevep (research affiliate of Petroleos de Venezuela), as Senior Research Associate, for close to 10 years. Is now in charge of teaching and supervising projects in formation evaluation at the School of Petroleum Engineering, University of New South Wales. He has published in excess of 20 papers related mainly to the integration of log, core and text data in formation evaluation. Member of SPE, SPWLA, EAGE, Pi Epsilon Tau.

John Scott (Geochemistry for Exploration & Production)

Dr. John Scott holds a PhD in Geology from the University of Reading (UK) and is Managing Director of Petroleum Geological Analysis Ltd and PGA Consultants Pty Ltd... Dr. Scott began his career with the Iraq Petroleum Company in Abu Dhabi in 1971. He moved to Buttes Gas & Oil Inc in 1977, becoming Exploration Manager of their Tunisian venture. In 1979 he founded Petroleum Geological Analysis Ltd. Petroleum Geological Analysis Ltd, a UK based consultancy which has undertaken extensive commercial research on the Northern Middle East in particular. From 1987 to 1991 he was Professor of Petroleum Geology at Curtin University, Perth, Western Australia. In 1991 he returned to full-time consulting and established PGA's second office in Australia, trading as PGA Consultants Pty Ltd. Dr Scott has undertaken a large number of exploration projects involving geochemistry, many in cooperation with Geotechnical Services Pty Ltd, in Australia, the Middle East, Europe and North America.

Dennis Stickley (Law and Contract Negotiations)

Dennis Stickley JD, LLM-Energy Law practices internationally specialising in petroleum development contracts. He has over 20 years of experience and has been the General Counsel for Sinclair Oil Corporation (USA) and Petrocorp (NZ). In addition, he has been an advisor and expert consultant to The World Bank, Asian Development Bank and various national governments on legal issues related to the petroleum sector. Mr. Stickley also lectures on the subject of petroleum negotiations at the Centre for Energy, Petroleum and Mining Law and Policy at the University of Dundee. His articles appear in the Journal of Comparative and International Law, Land and Water Law Review and Tulsa Law Journal.

Jill Sweatman (Effective Presentation Skills)

Jill Sweatman is a professional speaker, facilitator and consultant in business communication. She has conducted courses, keynoted and led conferences and groups for 15 years in over ten countries across Europe, USA and the Asia-Pacific region. Jill holds qualifications in Education and Communication Management from University of Technology Sydney. She is a guest lecturer in the School of Petroleum Engineering at the University of New South Wales in business communication. Her keen ability to impart knowledge coupled with her engaging manner and interactive style make her a sought after speaker internationally. Her articles are published regularly in business magazines.

Steve Tyson (Reservoir Characterisation)

Steve Tyson has a degree in physics from Imperial College, London. He has over 20 years experience in the oil and gas industry from desert seismic acquisition through seismic processing and geological modelling to the determination of effective properties for reservoir simulation. Since 1995 he has been a director of Geo Visual Systems Ltd and specialises in providing geological visualisation software. He has given courses on many aspects of geological modelling and the effective visualisation of technical data. He is a Chartered Mathematician and a member of SPE.

Barry Walsh (Natural Gas Engineering)

Barry Walsh is a visiting lecturer at the School of Petroleum Engineering at the University of New South Wales, where he has taught courses in Natural Gas Engineering and Advanced Recovery Processes. Barry has recently retired from the Department of Chemical Engineering at the University of Sydney, where he was a Senior Lecturer. During his 33 years at Sydney University, his principal areas of expertise were thermodynamics, reservoir engineering and engineering education. He has worked as a consultant to both the chemical and petroleum industries.

Michael Williams (Fundamentals of Gas and LNG Projects)

Michael Williams was born and educated in Australia, graduating in Chemical Engineering with Honours from the University of Queensland. He joined Shell in 1968 at the Geelong Refinery in Australia. He was first involved in gas & LNG when he spent a period in Brunei in 1973 during the start-up of the LNG plant. He has subsequently worked on Shell LNG projects in Brunei, Malaysia, Australia, Venezuela and Sakhalin and in the Shell Central Offices in The Hague and London. His experience in LNG projects and natural gas spans the range of activities from conceptual planning, detail planning, to project start-up and operation. Most recently, he was Managing Director, Gas & Power for the Shell Companies in North East Asia where his responsibilities included the development of strategy and the development of LNG import terminals in China and in Taiwan to allow the introduction of LNG for power generation and distribution as town gas. Since retiring from Shell in 2001, he has provided consulting advice to Governments and companies in Australia, United Kingdom, USA, Russia and China.

Max Williamson (Oil and Gas Accounting)

Max Williamson is a chartered accountant with 33 years experience in the accounting profession. Of those years, Max has worked for the profession and internally with major and medium sized mining and oil and gas groups in Australia. He also has worked for such groups in the major capital centres of the world. During his career, he has been a regular public speaker for the major industry conference organizers. He has extensive training experience having been training manager for Price Waterhouse in Sydney and national training manager and training partner for Ernst and Young in Australia.