This 3-Day course is developed to address three main issues. It is designed to show the different forecasting tools used to forecast oil and gas reserves. Accurate forecast is mandatory for production operations, facilities design, well design and configuration and economic evaluation of oil and gas investments. The course involves extensive problem sessions in which the participants gain hands-on experience with forecasting real life production data using various methods. The limitations of the methods are presented to make sure that the participants pick the correct method to use in their respective situation. Time is also dedicated to generating probabilistic production forecasts (P10, P50 & P90) and building Excel models to forecast production.

The course also shows tools that can be used to diagnose reservoir problems. Well test analysis results are typically used to identify any reservoir anomalies such as faults, distance to fault, dual porosity system, wellbore storage and so on. Performance forecasting methods such as PI, IPR are also used.

Mr. M. A. Mian, P.E.

B.Sc. Mechanical Engineering
M.Sc. Petroleum Engineering
M.Sc. Mineral Economics

3 Day

Decline Curve Analysis & Diagnostic Methods for Performance Forecasting

O&G Knowledge Sharing Platform

Enhancing Return on Investment in Oil & Gas Training

www.OGKnowledgeShare.com

What Will You Learn?

On completion of this course you will be able to fully understand the following:

- Why performance forecasting
- What Forecasting Techniques are Used
- Provide in-depth use of forecasting tools
- Limitation of these forecasting tools
- Forecasting methods of special interest in unconventional reservoirs
- Pressure/pressure derivative diagnostic plots Water control diagnostic plots
- Reserves definitions
- Requirements for reserves by U.S. SEC regulations
- Criteria for SEC reserves categories

Who Will Benefit?

The following oil & gas company personnel will benefit from the knowledge shared in this course:

- Reservoir Engineers
- Production engineers
- Petrophysists
- Geoscientists
- Economists and planners
- Facilities planning engineers
- Bankers & Stock Brokers
- Legal personnel
- Mid-level management

We offer more than just knowledge sharing.
We offer a partnership to share in your vision.

808 W. Boxborough Dr.,
Wilmington, DE 19810, USA
Tel: +1 (303) 872 0533
Mob.: +966 50 857 3255
e-mail: mianma@OGKnowledgeShare.com

Course Outline

HISTORY OF DECLINE CURVE ANALYSIS (DCA)

- Evolution of different methods over time
- Major assumptions for decline curve analysis
  - Recognizing transient production
  - Layered and compartmented reservoirs
  - Dual porosity systems
  - Changing facility conditions and facility constraints
  - Downtime and workovers
- Development of decline curve analysis
- Decline model identification

PRODUCTION DATA ANALYSIS

- Assess data viability
- Check for data correlation
- Preliminary diagnosis
- Selecting Appropriate Starting Rate for Decline Forecast
- Model-based analysis
- Common challenges/pitfalls

THE CLASSIC ARPS' DECLINE CURVES

- Exponential decline
- Hyperbolic decline
- Determining decline parameters
- Curve shift on log-log plot
- Harmonic decline
- Multi-well decline curves
- Smoothing production data
- Exercises

MODIFIED HYPERBOLIC DECLINE CURVES

- Reasons for the modification
- Specify Minimum Decline Rates in Hyperbolic decline curves
- Exercises

DECLINE CURVE ANALYSIS USING TYPE CURVES

- Fetkovich type curves
- Slider Type curves
- Stratified reservoir
- Fractured well
- Calculation of kh
- From Decline Curve Data

- Decline type curve analysis for a multiwall reservoir system
- Type curve analysis of a stimulated well before and after fracture treatment

RESERVOIR DIAGNOSTICS

- log(Δp/q) versus log (N_p/q)
- log(q/Δp) versus log(N_p/q)
- log(1/q) versus log(N_p/q)
- Exercises

DIAGNOSTIC PLOTS FOR ANALYSIS OF WATER PRODUCTION & RESERVOIR PERFORMANCE

- Problems of excess water production
- Diagnostic plots derivative method
- Application of the derivative diagnostic plots
- Log-Log plot of Water-Oil-Ratio (WOR) vs. Time
- Log-Log plot of Water-Oil-Ratio Derivative (WOR') vs. Time
- The advantage of derivative method
- The disadvantages of the derivative method
- Omoregie and Ershaghi (X-Plot)
- Hall & Hearn Plot for injectors
- Exercises

LATE-TIME EXTRAPOLATION FOR RECOVERABLE OIL

- log(f_w) versus N_p
- 1/f_w versus N_p
- f_o versus N_p
- log(WOR) versus N_p
- 1/q_o versus N_p/q_o
- Exercises

DIAGNOSTIC PLOTS FOR WATERFLOOD EVALUATION

- WOR functions versus production time
- WOR functions versus Np/qo
- WOR functions versus (N_p+W_p)/(q_o+q_w)

OIL & GAS MATERIAL BALANCE PLOTS

- Oil rate (q_o) vs. cumulative oil production (N_p)
- Pressure (p_{wf}) vs. cumulative oil production (N_p) plot
- Reciprocal of oil production rate ($1/q_o$) versus oil material balance time (t_o)
- p/z versus cumulative gas (G_p) production plot
- p/z versus cumulative gas (G_p) production plot - over pressured reservoirs
- p/z versus cumulative gas (G_p) production plot - water drive reservoirs
- Use of pseudo pressure
- Exercises

UNCONVENTIONAL GAS RESOURCES

- Production forecast rules of thumb
- Conventional gas vs. unconventional gas
- Tight gas vs. shale gas
- Monetizing unconventional gas
- The gas resource triangle
- Factors influencing monetization of UG
- Global shale gas resources
- Global UG production
- Breakeven gas price
- Schematic geology of natural gas resources

OTHER DECLINE CURVES AND PRODUCTION DATA ANALYSIS

- Gas & condensate production
- Cumulative gas vs. cumulative condensate production plot
- Challenges in evaluating unconventional gas (UG)
- Review of DCA methods for UG reservoir
- Flow regimes in UG reservoirs
- Modified hyperbolic decline
- q_g/G_p vs. time on log-log graph
- $1/q_g$ vs. square root of time plot on linear graph
- q_g vs. t on log-log graph with ½ slope
- Hybrid rate-decline model
- Comparative result from DCA methods

PRESSURE/PRESSURE DERIVATIVE DIAGNOSTIC PLOTS

- Pressure/Pressure Derivative Plot
- Well test diagnostic plot indicating several flow regimes
- Volumetric behavior - wellbore storage
- Wellbore storage effect
- Radial flow
- Linear flow
- Bilinear flow
- Spherical flow
- If time permits, we will also address the oil and gas IPR and gas deliverability tests.

- REFERENCES FOR DCA METHODS
- WORKSHEETS FOR DECLINE CURVE ANALYSIS
- GENERATING PROBABILISTIC PRODUCTION FORECAST USING MONTE CARLO SIMULATION

Mr. M. A. MIAN, P.E.

Mian has more than 35 years of experience in the oil and gas industry. He has worked with Saudi Aramco in Dhahran, Saudi Arabia, Qatar Petroleum (Doha, Qatar), ZADCO (Abu Dhabi, UAE), Euratex Corporation (Colorado, USA), Keplinger & Associates (International Energy Consultants in Colorado, USA), and as Independent Consultant in Colorado, USA. He is a registered professional Engineer in the state of Colorado, USA.

Mian has diversified experience in petroleum engineering, reservoir engineering, project economics and decision analysis. He had been involved in evaluating multi-billion-dollar oil and gas field development, LNG, GTL, Aluminum smelter, refinery, petrochemical, power and production sharing projects.

Mian is the author of six books:

- Tips & Tricks in Excel Based Financial Modeling, Vo. 1 & 2, Business Expert Press, USA
- Project Economics, Risk & Decision Analysis, Vol. 1 & 2, PennWell Books, Tulsa, Oklahoma, USA.
- Petroleum Engineering Handbook for the Practicing Engineer, Vol. 1 & 2, PennWell Books, Tulsa, Oklahoma, USA.

He has also authored several papers in the Oil & Gas Journal, The Log Analyst, World Oil, SPE Journals, and Oil & Gas Financial Journal. He is also the author of three software packages (PEPAC, PEPAC2 and PEPAC3) for petroleum engineers, available from Gulf Publishing Company in USA.

He has delivered lectures in more than 25 countries around the globe. He has always received excellent feedback, as an expert presenter, from the participants of his courses.

EDUCATION

- B.Sc. Mechanical Engineering
- M.Sc. Petroleum Engineering, Colorado School of Mines, CO, USA
- M.Sc. Mineral Economics, Colorado School of Mines, CO, USA

PORTFOLIO OF COURSES

- 5-Day – Project Economics, Risk & Decision Analysis
- 5-Day – Designing Efficient Oil & Gas Fiscal Systems
- 3 Day – Advanced Project Economics, Risk & Decision Analysis
- 3-Day – Economics of Production Sharing Agreements
- 3-Day – Development & Economics of Unconventional Resources
- 3-Day – Fundamentals of Oil & Gas
- 3-Day – Decline Curve Analysis, Diagnostic Methods and Performance Forecasting

PUBLICATIONS

Unnecessary and Avoidable Mistakes in Financial Calculations | Comparison of Methods used to Calculate Netback Value | Revisiting the Pitfalls and Misuse of WACC | Custom Graphs Help Analyze Oil, Gas Operations | Spreadsheet Programming Simplifies Drilling Calculations | Program Quickly Solves Trial-and-Error Problems | Creating Quality, Cost Effective Property Reports | Predicting the Performance of Tight Gas Reservoirs

COURSES DELIVERED IN

United Kingdom | Italy, Czech Republic | Norway | Sydney | Perth | Adelaide | Brisbane | New Zeeland | Singapore | Malaysia | Hong Kong | Pakistan | South Korea | Kazakhstan | UAE | Kuwait | Qatar | Saudi Arabia | Bahrain | Bolivia | Brazil | Canada | Angola | Nigeria | Ghana | Mozambique | Algeria | South Africa

Please complete the following Form and e-mail it to mianma@OGKnowledgeShare.com OR Submit the same details via the **Event Registration** on the website www.OGKnowledgeShare.com. We will then send you additional course details along with a detailed course registration Form.

Course Name			
Course Venue		Course Date	
Company			
First Name		Last Name	
Title			
Email		Phone	
Address			
City		State	
Postal Code		Country	

Full payment is due within 14 days from date of invoice and before the course commences. Delegates will not be allowed entry to the course if any payments are outstanding. A confirmation letter and invoice will be sent to you on receipt of your booking.

You may substitute delegates at any time as long as reasonable advance notice is given to O&G Knowledge Sharing Platform. For any cancellation received in writing not less than twenty (20) working days prior to the date of the training course, you will receive a full refund less US$ 150 administration fee and any related bank or credit card charges.

Delegates who cancel the registration less than twenty (20) working days of the date of training course, or who do not attend the course, are liable to pay the full course fee and no refunds will be granted.

In the event that KSP cancels or postpones the course for any reason, the delegates will be given choice to (a) request full refund less applicable credit card or bank charges, (b) attend the same course at the rescheduled date at the same or other venue or (c) receive credit note to be used by any employee of the same company for any other course offered by KSP, which must occur within one year from the date of postponement.

COMPANY GAURANTEE

If Company Payment is selected as the Billing Method, an official letter from the company, signed by HR or responsible Management, stating names of the delegates who will attend the course and the total course fee payment guaranteed by the company to be paid within 30 days upon receipt of invoice from KSP shall be submitted ten (10) working days before the start date of the course.

CHARGES AND FEES

1. For Payment by Direct Telegraphic Transfer, client has to bear both local and oversea bank charges.
2. For credit card payment, there is additional 4% credit card processing fee, which shall be added to the course fee.

COURSE FEES & VENUE

Middle East – US$ 2,500

All Other Locations – US$ 2,950

The fees is per participant. Hotel accommodation and travel costs are not included in the fees. The Fees includes refreshments, lunch and course material. Course is held preferably in a 5-star hotel. The final venue selection will depend upon the number of delegates attending the course and availability of the venue. All delegates will be informed about the venue two weeks before the course start date.