



Coalbed Methane & Shale Gas Technical Fundamentals

26 – 28 September 2011, Kuala Lumpur, Malaysia



Expert Course Director

Steve Hennings, M.S., P.E. Senior Petroleum Engineer, Colorado

With over 28 years of experience, Steve Hennings has been focusing on Coal Gas and Coal Mine Methane development in Canada, Australia, China, Indonesia, India, Turkey, Italy and the United States. Steve has taught technical Coal Gas workshops in several countries on topics ranging from completions and development to reservoir simulation.

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Coalbed Methane (CBM) Technical Fundamentals

26 – 27 September 2011

About the Training Course

As conventional sources of oil and natural gas are getting harder to find, leading energy companies are seeking out unconventional sources of gas. Coalbed Methane (CBM) is seen to be one of the most viable options. Interest is turning to CBM as a potential energy source for Asian countries as the economics improve with other energy costs soaring with the region's appetite for gas growing annually at about 2% per annum.

The purpose of this course is to provide delegates with practical insights and tools that can be used to efficiently identify, appraise, and develop these types of reservoirs. The course will review the origin and mechanisms of CBM production, discuss the various techniques used to analyze reservoir parameters and performance, and understand how these have been applied to numerous projects. Exercises in rock description, log correlation, and resource estimation will emphasize key points. Participants will analyze case histories to determine the effectiveness of different appraisal and development strategies and why projects succeeded or failed.

By attending this 2 day fundamentals training course, you will be able to:

- ❖ Recognize the factors controlling gas-in-place, reserves, and productivity
- ❖ Understand how to collect, quality-check, and interpret critical data
- ❖ Determine how to select the optimum well completion and stimulation methods
- ❖ Outline practical steps for calculating reserve volumes and forecasting production
- ❖ Recognize why various successful projects have required different development techniques
- ❖ Review the CBM development steps, costs, and timelines
- ❖ Apply techniques for performing due diligence
- ❖ Understand the global CBM activities, technologies, and future opportunities

This training course is designed for

Engineers, geologists, geophysicists, researchers, managers, government officials, planners, and technical support staff wanting a detailed review of the data, techniques and strategies needed for evaluating and developing Coalbed Methane projects. Participants are assumed to have an understanding of general engineering and geologic terms.

About Your Course Director: Steve Hennings, M.S., P.E.

Steve Hennings is Unconventional Gas Manager based in Colorado, USA. He is a registered professional engineer and holds degrees in Petroleum Engineering and in Finance. Steve has 30 years of industry experience that have included various field, office and research center assignments covering every phase of oil and gas exploration and development. His focus for the past nine years has been on Coal Gas, Coal Mine Methane and Shale Gas development in Canada, Australia, China, Indonesia, India, Turkey and the United States. During the past four years Steve has conducted private and public Coalbed Methane and Shale Gas workshops in nine countries. The courses have focused on various primary topics including drilling, completions, testing, computer simulation, operations, reservoir engineering and development fundamentals. In 2008 he was awarded the prestigious annual Stefanko Award from the Society of Mining Engineers for his technical contributions.

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CBM Course Outline, 26 – 27 September 2011

- **Coal Gas Basics**
 - Development History
 - Gas Properties
 - Gas Measurements
 - Development Lessons
 - Development Success
 - Global Coal Gas Resources
 - Coal Gas Storage
 - Determining Net Pay
- **Geologic Aspects**
 - Depositional Environment
 - Coal Formation
 - Coal Rank
 - Macerals
 - Origins of Gas
- **Key Coal Properties**
 - Adsorption Isotherms
 - Permeability
 - Gas Transport Mechanisms
 - Effective Net Thickness
 - Reservoir Pressure
- **Other Coal Properties**
 - Gas Saturation
 - Gas Content
 - Gas Composition
 - In situ Stress and Competency
 - Coal Continuity
- **Coal Log and Core Analysis**
 - Typical Electric Logs
 - Core Types
 - Core Reliability
 - Coal Analysis
 - Vitrinite Reflectance
 - The Effect of Ash
 - The Effect of Moisture
 - The Langmuir Isotherm
- **Coal Permeability Discussion**
 - Permeability and Porosity Descriptions
 - Ranges of Permeability
 - Impact on Well Performance
 - Coal Properties affecting Permeability
 - Relative Permeability Concept and Impact
 - Defining the Development Window
 - Directional Permeability Impact
 - Damage Mechanisms
- **Development Considerations**
 - Keys to Success
 - Variability in Commercial Coal Gas Projects
 - Methods for Improvement
 - Drilling and Completions -Technical Design Considerations
- **Global Development Activity**
 - Australian Coal Basins
 - LNG from Coal Gas
 - Canada
 - China
- **Exploration Activity**
 - India
 - Indonesia
 - Africa
- **Drilling**
 - Overview
 - Drilling Objectives
 - Drilling Practices
 - Deep Drilling
 - Shallow Drilling
 - Multi-Seam
 - Drilling Fluids
 - Horizontal Drilling
 - Drilling & Completion Strategy
 - Current Horizontal Coal Gas Activity
- **Completions**
 - Coal Gas Completion Objectives
 - Precautions and Objectives
 - Completion Summary by Commercial Play
 - Basis for Openhole Completions
 - Perforating Considerations
 - Cavitation
 - Hydraulic Frac Jobs

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Coalbed Methane & Shale Gas

Technical Fundamentals

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- **Gas Resource Analysis**
 - Gas Resource Analysis
 - Coal Gas Resource
 - Gas Content
 - Gas Content Canisters
 - The Three Components of Gas Content
 - Volumetric Gas-in-Place (Field Units)
 - Volumetric Gas-in-Place
 - Basis for Gas Content Reporting
 - Factors That Influence Gas Content
 - Gas Content Variability - Sydney Basin
- **Gas Recovery & Well Performance**
 - Coal Gas Well Performance
 - Reserve Classifications
 - Evaluating Coal Gas Reserves
 - Recovery Efficiency
 - Adsorption Isotherm Recovery Factor
- **Production Variations**
 - Production Distribution
 - Production Variables
 - Variability in Major Basins
- **Production Forecasting**
 - Reservoir Variation
 - Type Curve Development
 - Trends and Correlations
 - Early Well Performance Indicators
- **Production Analysis**
 - Types
 - Production Analysis Uses
 - Data Gathering
 - Water Proxy Permeability
 - Gas Flow Equation
 - Gas Proxy Permeability
 - Variability in Permeability
 - Correlations
 - Damage Mitigation
 - Operational Analysis
- **Due Diligence**
 - Gas Content Analysis
 - Gas Content Quality Control
 - Measuring and Changing Permeability
 - Net Coal
 - Gas Composition Changes
 - Isotherm Considerations
 - Reserve/Production Ratio
 - Development Constraint Maps
- **Simulation**
 - Model Design and Input
 - Applications
 - Data Requirements
 - Special Data
 - Model Design
 - Estimating Key Data
 - History Matching
 - Choosing Match Parameters
 - Forecasting Production
 - Model Types
 - Multiple Seams
 - Single-Well Models
 - Window Area Model
 - Full-Field Model
- **New Developments**
 - Technology
 - CMM
 - Deeper Exploration
 - Coal Gas Resources
 - Coal Gasification
 - Real-Time Methane Generation
- **Shale Gas Boom**
 - Production
 - Activity
 - Shale Gas Storage
 - Shale Properties
 - Unconventional Gas Resources

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Coalbed Methane & Shale Gas

Technical Fundamentals

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Shale Gas Technical Fundamentals

28 September 2011

About the Training Course

This one-day course reviews the distinct shale properties needed for commercial development and the required technology for defining and developing this major gas resource. The course is intended for those involved in evaluating or developing Shale Gas and also those wanting to understand more about these plays.

The target audience includes engineers, geologists, investors, managers, government representatives, service providers, planners, and technical support staff.

Participants will gain the following from this course:

- ❖ Identify the specific shales required for commercial development.
- ❖ Understand why and where these shales exist.
- ❖ Review the technology developed for evaluating and developing shale
- ❖ Recognize the factors controlling gas-in-place and productivity
- ❖ Understand what techniques are used to evaluate a prospective shale
- ❖ Review the steps for calculating reserve volumes and forecasting production
- ❖ Gain practical insight and techniques for quality-control and due diligence

It is recommended each participant bring a laptop to solve basic problems. A complete set of course materials is included.

Shale Gas Course Outline, 28 September 2011

Shale Gas Overview

- Development History
- Shale Characteristics
- U.S. Production
- Extending Development
- Well Design
- Environmental Overview
- Play Characteristics
- Development and Exploration

Expanding Shale Gas Development

- Disadvantages
- Advantages
- Development Areas
- Development Status
- U.S. Reaction to Shale Gas
- Shale Gas Outside the U.S.

Exporting Shale Gas Technology

- Challenges
- Shale Gas Resources
- Shale Gas Parameters

Natural Gas Development

- Fundamentals
- Wobbe Number
- Advantages and Disadvantages
- Gas Measurements and Nomenclature

Unconventional Gas

- Resources
- Growth
- Technical Analysis
- Rock Properties

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Relevant Lessons from 35 Years of Coal Gas

Development

- Rock Variability
- Kerogen
- Vitrinite Reflectance
- Rock Maturity

Gas Adsorption and Desorption

- Storage Capacity
- Desorption Process
- Gas Content Components
- Quality Control
- Flow Mechanisms
- Relative Permeability Concept

Relevant Lessons from 40 Years of Tight Gas

Development

- Tight Gas Introduction
- Gas Storage Capacity
- Permeability Relationships
- Water Saturation Analysis
- Latest Technology

Gas Sources

- Hydrocarbon Generation
- Organic Matter
- Kerogen Types
- Pyrolysis
- Van Krevelen Diagram
- Shale Development Windows

Log & Core Analysis

- Shale Gas Analysis Tools
- Coring Issues
- Shale Gas Log Analysis
- Other Measurements
- Isotopic Analysis
- Measuring Gas Storage in Shale

- Porosity plus Adsorption
- Adsorption Isotherm Recovery Factor
- Volumetric Gas in Place

Gas Productivity

- Minimum Permeability
- Core Permeability Issues
- Natural Fractures and Joint Sets
- Fracture Patterns
- Horizontals vs. Verticals

Hydraulic Fracturing

- Brittle vs. Ductile
- Composition Variability in Shale
- Breakdown and Containment
- Proppant Issues
- Fluid Types
- Treatment Design
- Treatment Effectiveness
- Real-time Monitoring
- Treatment Considerations

Production Analysis

- Production Forecasting
- Decline Factors by Play
- Type Curve Development
- Production Correlations
- Barnett Shale Well Evolution
- Well Design Evaluation
- Latest Improvements

Global Shale Gas Activities

Summary and Perspectives

- Environmental Concerns
- Technical Resources
- Public and Industry Perceptions
- Facts and Flaws
- Challenges

The training course has a limited attendance for up to 25 participants only. Sessions commence at 9am on all days, with short intervals at 10.30am and 3.30pm respectively. Lunch will be provided at 12:30pm for 1.5 hours. Sessions will end at 5pm on all days.

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Kuala Lumpur, Malaysia	Early Bird Price	✓	Normal Price	✓	TEAM DISCOUNTS PetroEdge recognises the value of leaning in teams. Group bookings at the same time from the same company receive the following: 3 or more at 5% off 5 or more at 7% off 8 or more at 10% off Team discounts are based on Normal Price only and are not applicable for other promotions.
Coalbed Methane & Shale Gas Technical Fundamentals	S\$ 3799		S\$ 3999		
Coalbed Methane Technical Fundamentals – 2 days	S\$ 2799		S\$ 2999		
Shale Gas Technical Fundamentals - 1 day	S\$ 1799		S\$ 1999		
PetroEdge In-house Training <input type="checkbox"/> Yes, I would like to organise this training on-site and save over 25% of total course fees! For further information about On-site Training Solutions, please call +65 67419927 or email info@asiaedge.net					

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4 Easy Ways to Register

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Please note:

- indicate if you have already registered by Phone · Fax · Email · Web ·
- if you have not received an acknowledgement before the training course, please call us to confirm your booking.
- photocopy this form to register multiple delegates.

Payment Methods

By Cheque/ Bank Draft: Make Payable to Asia Edge Pte. Ltd.

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Account Name: Asia Edge Pte. Ltd.

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