Sequence Stratigraphy in SE Asia Carbonate Reservoirs

Apply Effective Sequence Stratigraphy Analysis on SE Asia Carbonate Reservoirs

Date: 7th – 11th May 2012
Location: Kuala Lumpur, Malaysia

Distinguished Masterclass Instructor

Peter Gutteridge
Director
Cambridge Carbonates Ltd

- Over 25 years of international experience in carbonate systems exploration and delivery of trainings specializing in carbonate sedimentology and sequence stratigraphy
- Regional knowledge in Mediterranean, Middle East, Mexican and SE Asia carbonate reservoirs
- Professional affiliations in AAPG, SPE and IAS
- Selected client list include Shell, BHP Billiton, Talisman Energy, Hess Corp, JAPEX, KNOC, Murphy Oil, Kuwait Oil Company, Petrobras and TNK-BP

Masterclass Objectives

- GAIN an overview of the stratigraphic distribution and petroleum reservoir performance in SE Asia
- UNDERSTAND the principles and key concepts of carbonate sequence stratigraphy
- ANALYSE and interpret the seismic response of carbonate sequences accurately
- EXPLORE various techniques of studying carbonate diagenesis and pore systems
- APPLY high resolution sequence stratigraphy techniques to model carbonate successions
- LEARN from various specific case studies of carbonate reservoirs in SE Asia
- IDENTIFY the contribution of carbonate petroleum systems towards unlocking future hydrocarbon potential in SE Asia

Summary of Peter’s Recent Report Included:
South East Asian Tertiary Carbonate Systems and Reservoir Development: An Up-to-Date Synthesis

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TAMBANG
This course is designed for geoscientists working on exploration for carbonate plays and those concerned with production and modelling of carbonate reservoirs in need of an understanding of the principles and applications of carbonate sequence stratigraphy. They include:

- Geoscientists
- Geologist and Geophysicist
- Petrophysicists
- Sedimentologists
- Reservoir, Petroleum and Project Engineers
- Explorationist / Exploration Managers

Case histories of several reservoirs in SE Asia will be covered in this course including:

**North Sumatra carbonate reservoirs:**
- Example of attached carbonate ramp system
- Effects on diagenetic overprint of depositional facies

**Malampaya/Nido:**
- Reservoir layering
- Karstification and diagenesis of a large isolated carbonate platform.

**Pliocene carbonate contourites of onshore and offshore Java:**
- Discoveries in a new carbonate play in onshore and offshore Java.

**Kutei Basin**
- Context of carbonate build-ups
- How to recognise build-ups in a fluvio-deltaic system.

This would be useful for delegates who are currently or intending to work on carbonate reservoirs in SE Asia to gain an insight into reservoir developments of oil and gas field in the SE Asia region.

Masterclass Overview: Principles and Applications of Carbonate Sequence Stratigraphy

Sequence stratigraphy is rooted mainly in seismic stratigraphic sequence analysis, and its strength lies in its potential to predict facies within a chronostratigraphically constrained framework of unconformity-bound depositional sequences. Sequence stratigraphy offers a more extensive model to predict the distribution pattern of carbonate facies and paleoenvironments in response to various depositional and erosion processes associated with changes in sea-level.

This masterclass explains the principles of carbonate sequence stratigraphy and its role in understanding the distribution of reservoir potential in both onshore and offshore basins, porosity evolution in carbonate reservoirs and its application and approach to describing, predicting and modelling the distribution of pore types in carbonate reservoirs. It also discusses the definition of reservoir rock types, the types and controls of reservoir layering and the development of flow units. It addresses specific problems to SE Asia such as the origin of subsurface CO2 and the contribution of carbonate systems to the future petroleum potential of SE Asia.

Masterclass Agenda

**DAY 1**

a) Introduction to carbonate reservoirs and their importance to the oil industry
b) How carbonate reservoirs differ from siliciclastic reservoirs
c) Carbonate reservoirs in SE Asia
   i) Overview of stratigraphic distribution
   ii) Petroleum systems reservoir performance and poroperm
d) Carbonate depositional models
e) Classification of SE Asian carbonate depositional systems:
   i) Carbonate ramps and shelves
   ii) Attached carbonate systems
   iii) Deep water
   iv) Contourites
f) Case histories including
   i) North Sumatra carbonate reservoirs
   ii) Malampaya and Nido reservoirs
   iii) Pliocene contourites
DAY 3
a) Principles of carbonate sequence stratigraphy
b) Interplay of tectonics, eustasy and sediment supply
c) Low stand, transgressive, high stand and regressive systems tracts with exercise in correlation
d) Pitfalls and misconceptions in sequence stratigraphy:
   i) Differing responses of siliciclastic and carbonate systems
   ii) Carbonate low stand systems
e) Sequence stratigraphy of mixed carbonate:
   i) Siliciclastic systems
   ii) Context of fluvial and deep marine clastic systems
   iii) Case history from the Kutei Basin.
f) Interaction of high and low order sea level changes and sequence development
g) Implications for reservoir distribution and layering
h) High resolution sequence stratigraphy including
   i) Interplay of high and low order cycles
   j) High order cycles versus parasequences and autocyclicity

DAY 5
a) Introduction to the use and application of geological data in reservoir description
b) Integration of wireline log data with carbonate core, cuttings and log data
c) Interpreting wireline log data through carbonate systems
d) Gamma response, lithology and log expression of sequence stratigraphy
e) Practical and high resolution sequence stratigraphic analysis of a carbonate succession
f) Applications of FMI data in carbonates – electrofacies and analysis of dip patterns
g) Seismic response of carbonate sequences
h) Seismic geometry, attributes and palaeogeomorphology
   i) Integrating sequence stratigraphic information with biostratigraphy to produce chrono-stratigraphic sections and palaeogeographic maps
   j) Course summary and conclusions

DAY 6
a) Carbonate diagenesis
   i) Processes
   ii) Products and controls on the preservation
   iii) Creation and destruction carbonate porosity
b) Techniques of studying carbonate diagenesis
c) Applications of cathodoluminescence, fluid inclusion studies C & O isotopes and Sr isotopes in reservoir studies
d) Overview of diagenesis and Tertiary carbonate reservoirs in SE Asia
e) Origin and prediction of sub-surface carbon dioxide in SE Asia
f) The origin and types of micro, meso and macropore systems in carbonate reservoirs.
g) Porosity-permeability relationships
h) Practical exercise
   i) Identifying pore types
   ii) Estimating porosity and permeability from thin sections

DAY 7
a) Petrophysical and poroperm classifications of carbonate pore systems
b) Dual porosity systems in carbonates
c) Recognition of dual porosity reservoirs
d) Karsted reservoirs – recognition and description
e) Exercise in karst breccias correlation
f) Fractured carbonate reservoirs
g) Aims and principles of reservoir modelling
h) Reservoir rock types
   i) Controls on reservoir layering
   j) Use of analogues in the modelling of carbonate reservoirs
k) Case histories of diagenesis from SE Asia: North Sumatra carbonate reservoirs, Malampaya and Nido
l) Future hydrocarbon potential in SE Asia
m) Course summary and conclusions

Day 3
6) Global controls on tertiary carbonate systems:
   i) Changes in sea level
   ii) Oceanography
   iii) Carbonate producing communities
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Peter Gutteridge is a Consultant Sedimentologist and Director with Cambridge Carbonates Ltd where he worked on almost all productive carbonate hydrocarbon systems worldwide ranging in age since the Pre-Cambrian and consulted for and conducted carbonate exploration and reservoir studies for various majors and national oil companies including Shell, BHP Billiton, Talisman Energy, Hess Corp, JAPEX, KNOC, Murphy Oil, Kuwait Oil Company, Petrobras and TNK-BP.

His career started out with Britoil where he worked on the North Sea and acquired the basic skills and experience to be a petroleum geologist before he returned to academia to continue his research on Dinantian carbonates and teach all aspects of carbonate sedimentology, stratigraphy and petroleum geology. Peter has key experience in Palaeozoic carbonates and evaporite systems and is also a skilled interpreter of karst breccia and fracture systems in carbonates.

He graduated with a Bsc in Geological Sciences from University of Leeds and a Ph.D in Carbonate Sedimentology from the University of Manchester.

Selected Client List

Peter’s client list includes Anadarko Petroleum, BG Group, BP, BHP Billiton, Cairn Energy, Dana Petroleum, Gulf sands Petroleum, Hess Corporation, JAPEX, JOGMEC, KNOC, Kuwait Oil Company, Maersk Oil, Marathon Oil, Murphy Oil, OMV, PEMEX, Petrobras, Shell, Statoil Hydro, Talisman Energy, TNK-BP and Wintershall and many more

Summary of Peter’s Report

South East Asian Tertiary Carbonate Systems and Reservoir Development: An Up to Date Synthesis

This is a comprehensive overview of Tertiary carbonate systems in SE Asia based on publically available information, up to date reference lists and incorporates the authors’ knowledge of the area. It presents an up to date appraisal of the sedimentological and sequence stratigraphy of Tertiary carbonate reservoirs in light of recent research in SE Asia and on evolving concepts of carbonate sedimentology in general. The main aim is to review the future hydrocarbon potential of Tertiary carbonate systems in SE Asia.

The introductory section covers an overview of Tertiary carbonate systems, global changes and Tertiary sequence stratigraphy, diagensis of Tertiary carbonates, origin and prediction of sub-surface CO2, distinguishing volcanic structures from carbonate build-ups and trends in porosity and permeability of Tertiary carbonate reservoirs.

The main part of the report focuses on detailed basin-by-basin reviews including:

- North and South Sumatra and adjacent offshore areas.
- Java and adjacent offshore areas. Including a separate chapter on the new finds in Pliocene carbonate contourites.
- Offshore south and east Vietnam and the South China Sea.
- Offshore Sarawak, Philippines and Natuna Seas.
- East Kalimantan, Sulawesi and adjacent offshore areas.
- West Papua and Papua New Guinea.

The main focus, is on the carbonate reservoirs and the main controls on their reservoir quality, depositional facies, sequence stratigraphic context, diagensis, porosity permeability properties and seismic expression.

The future potential of the basins are also discussed, including any additional plays, the key uncertainties and any new concepts or methodologies that may lead to making further discoveries or adding reserves to existing fields. And finally a dataset of reservoir properties and other parameters from fields in each area is provided.
Course Details

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