PETROSYNC’S GEOSCIENCE SERIES

ADVANCED SEISMIC DATA ACQUISITION AND PROCESSING

Generate top quality seismic data through improved methodologies in seismic acquisition & processing

28 March 2016 — 1 April 2016
Bangkok, Thailand
**Course Overview**

O&G exploration is a series of capital-intensive activities, where data results are continuously affecting succeeding operations from the onset. It is only necessary that even from the initial stage of seismic surveying and processing, explorationists must acquire good data sets, as these consequently affect further subsurface evaluation and other E&P business decisions later on.

This course will cover both seismic acquisition procedures and data processing methodologies in application to various complex environments. You will learn the tools to ensure quality control on the conduct of the survey and the type of data acquired and processed.

**Includes Best Practices & New Technologies in Data Acquisition & Processing**

Advanced methods & technologies focused on specialized studies involving data integration of geological details, well logging data, and petrophysical data will presented.

**Provides a Holistic Look at the Workflow**

All steps in the workflow are discussed with an eye to the theoretical foundation, alternative implementations, assumptions, strengths and weaknesses, critical parameter choices and QC aspects.

You would also be able to learn these workflow with supporting case studies and examples from around the world. You’ll be worked through intensive practicals throughout the sessions to enhance your learning experience with applicable work skills.

**How Does This Course Benefit You?**

Implement an Optimal Survey & Processing Workflow

Learn how to choose an optimal survey and processing workflow with interrelated steps and parameters, all impacting the resulting data quality, cost, and time to delivery.

Ensure Quality Assurance and Quality Control

Understand the mechanisms of data acquisition in order to supervise or advise on the workflow execution, surveying methodology, and data processing. Develop the technical skills in ensuring quality assurance and quality control either as a supervising authority of the acquisition method or as an end user of the data sets.

Generate Business Decision for Venturing into Seismic Survey

Be able to evaluate the return of investment for new seismic information and the technical value add that a new seismic survey and new information can provide to your operations.

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**PetroSync Quality Assurance**

All PetroSync courses are developed with top quality to address all your training needs and purposes. Our courses are vetted strictly to ensure that we always deliver the best courses with the best industry expert.

**PetroSync Inhouse Solutions**

PetroSync can tailor our courses to meet your specific needs at your preferred location and schedule. Contact us for more information at +65 6415 4500 or email to general@petrosync.com

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**General Information**

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PetroSync Distinguished Instructor

Dr. Jaap Mondt  
Consultant,  
Exploration and Production Technical Services (EPTS)

Practical & Consulting
Jaap is a premier consultant with 38 years of experience in the O&G Industry. He has worked for SHELL from 1977-2007, specializing in acquisition, processing, and interpretation of seismic, gravity, magnetic and electromagnetic data in combination with Petrophysical and Geological information.

Training
During his time with Shell, Jaap was the Course Director for Geophysics for Shell Learning Centre Noordwijkerhout from 119-2001. In the recent years, Jaap has taught various industry professional through short courses offered in Southeast Asia and around the world.

Industry Affiliations
Member of European Association of Geoscientists and Engineers, Society of Exploration Geophysicist, Royal Geological and Mining Society of Netherlands (KGMG), Petroleum Geological Circle (PGK)

Who Needs This Program

- This program is for those who in need of comprehensive understanding of the important issues in seismic data acquisition and processing. This course also targeted at those who contribute to the processing workflow and parameter selection, be it hands on or in supervising processing done by others
- Knowledge on basic seismic data acquisition and processing is advised to fully appreciate the program

Job Titles Include:
- Exploration Geophysicists/Geoscientists
- Seismic interpreters
- Geomodelers
- E&P Managers

Course Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>08:00—09:00</td>
<td>Registration (Day 1)</td>
<td>13:00—14:00</td>
<td>Lunch</td>
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<tr>
<td>09:00—11:00</td>
<td>Session I</td>
<td>14:00—15:30</td>
<td>Session III</td>
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<td>11:00—11.15</td>
<td>Refreshment Session I</td>
<td>15:30—15:45</td>
<td>Refreshment Session II</td>
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<tr>
<td>11:15—13:00</td>
<td>Session II</td>
<td>15:45—17:00</td>
<td>Session IV (Last Session)</td>
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Course Agenda — 5 Days

DAY 1

KEY PRINCIPLES IN DATA ACQUISITION

Foundation Principles in Data Acquisition
- Overall Workflow of Data Acquisition
- Conducting Sampling in Time and Space
- Avoiding Data Aliasing
- Reciprocity, Shannon, Fourier Transformation
- Principles of Data Acquisition: Sound and Unsound Practices
- Interrelating Workflows of Acquisition & Processing

Quality Assurance & Quality Control
- Resolution (Ensuring Needed Resolution)
- Signal to Noise
- Mode Conversion
- Amplitude Faithfulness

DAY 2

SURVEY DESIGN & EXECUTION

Survey Design & Execution
- Standard Geometries, Spatial Sampling
- Illumination, Multiplicity, Needed Offset Range
- 2D, 3D, Land & Marine Aspects, Key Parameters, Ghost, Source Depth and Size, Noise Spread, Patterns for Single Sensor Acquisition
- Lead-In, Lead-Out Multiplicity, Migration Aperture
- VP-Wave, S-Wave, Special Geometries, Crooked Line, Survey Edge, Survey Overlap
- Field Tests, Instruments QC, Monitors, Detector (Planting), Sources (FTB, Similarity, Spread Continuity)
- 2D and 3D Symmetric Sampling

Repeatability and Efficiency
- OBS Methods, Coupling, Steerable Streamers (WG Video), Sampling Density
- Time Lapse (4D) Aspects
- Cost Aspects (Production, Line Change, Standby Time), Station Count, Reliability

DAY 3

DATA PREPARATION & PRE-PROCESSING

Overall Workflow of Data Processing
- Shot and Receiver Amplitude Scaling

Problems and Remedies to Data Pre-Processing
- Noise Suppression: KF Filtering
- Signal and Wavelet Processing
- Zero-phasing of Marine Data
- Zero-phasing of Vibroseis Data
- Resolution Difference between Minimum and Zero-Phase Data
- Relationship between Amplitude and Phase Spectrum of Minimum-Phase Data
- Static Corrections
- Multiple Elimination
- Complexities of Near-Surface Seismic Images
- Surface-Consistent Filtering

Surveying Best Practices
- Ideal Surveying Practices
- Pre-Plotting
- Practical Limitations in Data Surveying
- Costs, Irregularities, and Remedies (Interpolation, etc)

Sources, Detectors, and Instruments
- Land Sources, Marine Sources, Shear Sources (Broadband)
- Scaling Laws, Summation of Sources
- Detectors, Streamers, Multi-Component, Instruments
- Array Designs, Source and Receiver
- Patterns, Marine (Airgun Array)

Exercises:
- Wave Propagation: Snellius, Huygens, Fermat
- Data Aliasing in Time Video:
- PGS Marine Acquisition
- Vibroseis Land Acquisition
- Propagation of Seismic Waves
- Seismic Wave Hitting a Dipping Layer
- Bandwidth

Repeatability and Efficiency
- Multi-Streamer, Simultaneous Methods, Slip Sweep, etc
- Surveying Optimization Methods, SurvOpt, etc, Shooting and Recording Patterns

Exercises:
- End-on 25 and 12.5m Shot Interval Survey
- Split-Spread 50m and 25m Shot Interval Survey
- 2D Survey Design
- 3D Marine Survey Design

Videos:
- Phase
- Bandwidth
- Bin-Size
- Tuning

Developments in Data Acquisition Geometries & Hardware
- New Developments of Receivers/Streamers
- New Developments in Sources
- New Developments in Acquisition Geometries

Exercises:
- Autocorrelation, Cross Correlation, Convolution, De-convolution
- FFT
- Convolution in the FFT Domain
- Sampling in the Space Domain
- Operator Aliasing
- Static Corrections
- Multiple elimination by stacking

Case Study 1: Marine 2D Data Set
DAY 4
ADVANCED DATA PROCESSING

Methodological techniques will be discussed thoroughly with supported examples and case studies. Pre-cautions and remedies to pitfalls of these methodologies will also be discussed. Limitations of data processing techniques will also be incorporated.

- Velocity Analysis
- Anisotropy
- Velocity Model Building and Updating using
- Time and Depth Migration (Pre- and Post-stack)
- Novel Migration Solutions
- Well Seismic (VSP) Processing
- AVO (Amplitude vs Offset) and AVA (Amplitude vs Angle)
- Inversion Methods

Exercises:
- Migration distance
- Survey Extend in Relation to Full Fold Data and Migration Distance
- From Normal Incidence to Migrated Data
- Migration Operator Aliasing in Relation to Spatial Sampling
- VSP Modeling

Videos:
3D Seismic; 3D Seismic Acquisition; 3D Seismic Imaging

Case Study 2: Land 3D Data Set

DAY 5
DATA PROCESSING & INTERPRETATION

- How important is anisotropy?
- How to detect fracture orientation and density from Seismic?
- What is the overall sequence of (seismic activities) in Exploration and Production?
- Additional Processing Aspects for 3D Seismic Data
- Calculation VOI (Value of Information) - VOI of a new survey
- Project Management, Processing Quality Control, Archiving and Reporting

Case Study 3: Class Case Study Contribution (Land / Marine)
**COURSE DETAILS**

**Title**: ADVANCED SEISMIC DATA ACQUISITION & PROCESSING  
**Date**: 28 March—April 1 2016  
**Location**: Bangkok, Thailand

**INVESTMENT PACKAGES (Please Circle)**

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<th>INVESTMENT PACKAGE</th>
<th>DEADLINE</th>
<th>FULL MASTERCLASS</th>
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<tr>
<td>Standard Price</td>
<td>25 March 2016</td>
<td>USD 4,295</td>
</tr>
<tr>
<td>Early Bird Offer</td>
<td>26 February 2016</td>
<td>USD 4,095</td>
</tr>
<tr>
<td>Group Discount</td>
<td>25 March 2016</td>
<td>USD 3,995</td>
</tr>
</tbody>
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Group Discount is based on Standard Price
*To enjoy the promotion & discount offer, payment must be made before date.*
*For 7 or more delegates, please inquire for more attractive package.*
*Prices include lunches, refreshments and materials. Promotion & discount cannot be combined with other promotional offers.*

**DELEGATES DETAILS**

1st Delegate Name: ___________________________  
Mr □ Mrs □ Ms □ Dr □ Others □
Direct Line Number: ___________________________  
Email: ___________________________
Job Title: ___________________________  
Department: ___________________________
Head of Department: ___________________________

2nd Delegate Name: ___________________________  
Mr □ Mrs □ Ms □ Dr □ Others □
Direct Line Number: ___________________________  
Email: ___________________________
Job Title: ___________________________  
Department: ___________________________
Head of Department: ___________________________

3rd Delegate Name: ___________________________  
Mr □ Mrs □ Ms □ Dr □ Others □
Direct Line Number: ___________________________  
Email: ___________________________
Job Title: ___________________________  
Department: ___________________________
Head of Department: ___________________________

**INVOICE DETAILS**

Attention Invoice to: ___________________________  
Direct Line Number: ___________________________  
Fax: ___________________________
Company: ___________________________  
Industry: ___________________________
Address: ___________________________  
Country: ___________________________  
Email: ___________________________

Please note:
- If you have already registered by Phone □ Fax □ Email □ Web □
- If you have not received an acknowledgement before the training, please call us to confirm your booking.

**PAYMENT METHOD**

- By Credit Card: Please debit my card □ Visa □ MasterCard □ AMEX  
  Security Code: ___________________________  
  Card Number: ___________________________  
  Expiry Date: ___________________________
  Name Printed on Card: ___________________________

  - By Direct Transfer: Please quote invoice number(s) on remittance advice
    PetroSync Global Pte Ltd Bank Details:  
    Account Name: PetroSync Global Pte Ltd  
    Bank Name: DBS Bank Ltd  
    Account No: SGD: 288-901898-0 USD: 0288-002682-01-6  
    All bank charges to be borne by payer. Please ensure that PetroSync Global Pte Ltd receives the full invoiced amount.

**CONFIRMATION**

I agree to PetroSync’s terms & conditions, payment terms and cancellation policy.

Authorized Signature: ___________________________

**PAYMENT TERMS**: Payment is due in full at the time of registration. Full payment is mandatory for event attendance.