Surface Geochemical Exploration for Oil & Gas

Reliably predict commercially viable reservoirs through non-seismic direct hydrocarbon indicators

26th - 28th of November 2013 at Kuala Lumpur, Malaysia

Petrosync Distinguished Instructor:
DR. DIETMAR “DEET” SCHUMACHER
Vice-President for Geoscience & Technology
E&P Services

- Over 20 years of experience with international oil and gas exploration companies (Phillips Petroleum-US, Pennzoil-US, Terralliance) and more than 15 years in acquiring and interpreting surface geochemical data worldwide
- Specialized in the exploration and development applications of petroleum geochemistry
- In the last 30 years, he has acquired and interpreted surface geochemical data for hundreds of surveys conducted in North and South America, Europe, Africa, Middle East, Asia & Australia
- Certified Petroleum Geologist (CPG-4301), American Association of Petroleum Geologists (AAPG), Canadian Society of Petroleum Geologists (CSPG), Member
- Previous President of the Association of Petroleum Geochemical Explorationists (1993)
- Previous President of the Houston Geological Society (1988-1989)

COURSE OBJECTIVES
- Gain understanding of hydrocarbon seepage and microseepage, as well as seepage characteristics, mechanisms and rates
- Apply direct and indirect geochemical, remote sensing, and non-seismic geophysical methods available for hydrocarbon detection
- Analyze varied surface and near-surface expressions of hydrocarbon seepage and microseepage - geochemical, mineralogic, and geophysical
- Execute proper survey design and survey method selection
- Avoid pitfalls in acquisition and interpretation of geochemical and non-seismic data
- Value-add to conventional geologic and seismic data by inclusion of data from hydrocarbon detection surveys

TARGET AUDIENCE
- Surface Geochemists / Geologists / Geoscientists
- Exploration Geologists / Geophysicists / Geoscientists
- Development Geologists / Geophysicists / Geoscientists
- E&P Managers

*Basic knowledge on exploration geology is advised, but no prior knowledge on geochemistry is required in order to appreciate the program*
The great majority of oil and gas pools and mature source rocks have recognizable surface geochemical expression. The O&G industry devotes significant time and resources in finding and defining traps, but little or none in establishing the likely presence of hydrocarbon in those traps, especially for older onshore basins. The methods that will be discussed in this course can reliably predict 70%-80% of subsequent commercial discoveries, and about 90% of the eventual dry holes.

This program will cover surface geochemical and non-seismic detection of oil and gas, the variety of surface and near-surface methods for high-grade basins and plays, and the pre-drilling prediction of hydrocarbon charge. Explorationists will learn the techniques and methodologies that will help refine the economic evaluation of reservoirs before investing in to new plays. The course is illustrated from a wide range of international basins and plays, structural and stratigraphic case studies, onshore and offshore examples, and also the application to shale-chalk plays.

CASE STUDIES include SEAsian Basins
Among the examples presented and discussed will be from:
- Malaysia (Sarawak)
- Indonesia (Kalimantan, Natuna Sea, several Deep Water basins)
- Khorat Plateau (Laos & Thailand)
- Taiwan

Case Histories include both Stratigraphic and Structural Traps, Onshore and Offshore Examples, and Carbonate and Clastic Reservoirs. There will also be a discussion of potential applications of hydrocarbon microseepage surveys to Unconventional Reservoirs, chiefly on Shale and Chalk source rocks.

COURSE OUTLINE

DAY 1
The first day will introduce the basic concept of hydrocarbon seepage, seepage mechanisms and rates, the varied surface expressions of seepage, the implications for geochemical exploration, and the Direct Detection Methods for Hydrocarbons.

Hydrocarbon Seepage and Geochemical Exploration
- History
- Near Surface Expression of Hydrocarbon Migration
- Models for Migration and Microseepage
- Migration Rates

Direct Detection Methods of Hydrocarbon Migration
- Soil Gas
- Acid Extracted Soil Gas
- Fluorescence (Aromatics)
- Heavy Hydrocarbons
- Sniffers
- Airborne and Satellite Sensors

Program Schedule

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<thead>
<tr>
<th>Time</th>
<th>Session/Activity</th>
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<tr>
<td>08:00 – 09:00</td>
<td>Registration (Day1)</td>
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<td>09:00 – 11:00</td>
<td>Session I</td>
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<td>11:00 – 11:15</td>
<td>Refreshment &amp; Networking Session I</td>
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<td>11:15 – 13:00</td>
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<td>13:00 – 14:00</td>
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<td>14:00 – 15:30</td>
<td>Session III</td>
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<td>15:30 – 15:45</td>
<td>Refreshment &amp; Networking Session II</td>
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<td>15:45 – 17:00</td>
<td>Session IV</td>
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COURSE OUTLINE

DAY 2

Day 2 will go into the various indirect Geochemical and non-seismic Geophysical Detection Methods. Delegates will be able to learn how to properly design a hydrocarbon detection survey and how to select the method(s) best suited for their exploration objectives. They will have a Class Mapping Exercise which will practice their knowledge of the tools learned in the first two days.

**Indirect Geochemical Detection Methods**
- Microbial
- Radiometric
- Helium
- Iodine
- Soil Alteration
- Biogeochemical
- Vegetation Effects
- Remote Sensing

**Indirect Non-Seismic Geophysical Detection Methods**
- Electrical
- Aeromagnetic and Ground Magnetic (Micromagnetics)
- Passive and Active Electromagnetics
- Telluric Methods

**Geochemical Survey**
- Geochemical Survey Objectives
- Survey Design
- Method Selection

**Introduction of Class Mapping Exercise**
Participants will be given a data set from a surface geochemical survey and asked to map these data and interpret the results.

**Exploration Case History 1**
- Reconnaissance Surveys in Frontier Basins and Other Underexplored Areas

DAY 3

Day 3 emphasizes Case Histories from all stages of exploration ranging from reconnaissance surveys to high-grading leads and prospects, to field development and production. Case histories will come from the full range of geologic and environmental settings -- onshore and offshore -- from different parts of the world, including SE Asia. Delegates will also learn interpretation guidelines and the importance of integrating geochemical data with other exploration data.

**Exploration Case Histories 2**
- Evaluation of Exploration Leads and Prospects
- Prospect Generation from Geochemical Leads
- Pre-Drill Prediction of Hydrocarbon Charge

**Exploration Case Histories 3**
- Applications for Field Development and Production
- Production Monitoring
- Applications for Shale Gas
- Shale Oil Development

**Interpretation Guidelines**
- Inferring Hydrocarbon Composition
- Recognizing and Defining Significant Microseepage Anomalies

**Integrating Geologic, Seismic, and Geochemical Data**
- Uncertainties and Limitations

**Discussion of Class Mapping Project**
Dr. Schumacher is Vice President for Geosciences and Technology for E&P Field Services, a Paris and Malaysia-based company providing surface geochemical exploration surveys and other geological E&P services worldwide. Before joining E&P Services, Deet was the Director of Geochemistry (1997-2012) for Geo-Microbial Technologies, an international provider of surface geochemical and microbiological surveys.

He received his B.S. and M.S. degrees in Geology from the Univ. of Wisconsin (Madison) and his Ph.D. from the Univ. of Missouri (Columbia). Dr. Schumacher taught geology at the University of Arizona for 7 years before joining Phillips Petroleum in 1977. He held a variety of positions at Phillips, including Research Supervisor for petroleum geology and Senior Geological Specialist. Deet joined Pennzoil in 1982 and served as manager of geology/geochemistry before transferring to assignments with Pennzoil International, Pennzoil Offshore, and Pennzoil Technology Group. From 1994 thru 1996, Deet was a Research Professor with the Energy and Geosciences Institute at the University of Utah. He also served as Sr Director of Geophysics for Terralliance, a small California-based exploration and technology company (2006-2009).

Dr. Schumacher has a long-standing interest in the exploration and development applications of petroleum geochemistry, particularly geochemical and geomicrobiological exploration methods. In the past 30 years, he has been responsible for acquiring and interpreting surface geochemical data for hundreds of surveys conducted in North and South America, Europe, Africa, the Middle East, Australia, and in Southeast Asia including Malaysia (Sarawak), Indonesia (Sumatra, Kalimantan, Sulawesi, Natuna Sea), Thailand, Laos, Papua New Guinea, Pakistan, India, Taiwan, and China.

He has organized and taught an industry short course, Geochemical Exploration for Oil and Gas, for AAPG and other geological organizations and individual companies worldwide for more than 20 years. Schumacher has edited several significant volumes on petroleum exploration, including AAPG Memoir 66 (1996), “Hydrocarbon Migration and Its Near-Surface Expression”, and “Surface Exploration Case Histories”, published jointly by AAPG and SEG in 2002. He is currently working on a new book for the Society of Exploration Geophysicists titled “Non-Seismic Detection of Hydrocarbons: Methods, Applications, and Exploration Case histories.” Dr. Schumacher is a Certified Petroleum Geologist (CPG-4301), a member of the American Association of Petroleum Geologists and the Canadian Society of Petroleum Geologists.
**Course Details**

**Title:** SURFACE GEOCHEMICAL APPLICATION FOR OIL & GAS  
**Date:** 26th - 28th November 2013  
**Location:** Kuala Lumpur, Malaysia

### INVESTMENT PACKAGES

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<th>Deadline</th>
<th>FULL MASTERCLASS</th>
<th>Standard Price</th>
<th>Early Bird Offer</th>
<th>Group Discount (3 or more Delegates)</th>
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* To enjoy the promotion & discount offer, payment must be made before deadline  
* 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.  
* Important: Please note that registration without payment will incur a SGD 200 administration fee.

### DELEGATES DETAILS

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### PAYMENT METHODS

- By Credit Card:  
  - Please debit my credit card: Visa ☐ MasterCard ☐ AMEX ☐  
  - Security Code:  
  - Expiry Date:  

- By Direct Transfer: Please quote invoice number(s) on remittance advice

PetroSync LLP Bank details:  
- Account Name: PetroSync LLP  
- Bank Number: 7144 • Branch Code: 013 • Account No: 13-1-005531-6  
- Name of Correspondent Bank: Standard Chartered Bank, 6 Battery Road, Singapore 049909  
- SWIFT Code of Correspondent Bank: SCBLSGSGXXX  
- All bank charges to be borne by payer. Please ensure that PetroSync LLP receives the full invoiced amount.

### TERMS AND CONDITIONS

**DATA PROTECTION**  
The information you provide will be safeguarded by PetroSync that may be used to keep you informed of relevant products and services. As an international group we may transfer your data on a global basis for the purpose indicated above. If you do not want us to share your information with other reputable companies, please tick this box.

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

**CHARGES & FEE(s)**  
- For Payment by Direct Telegraphic Transfer, client has to bear both local and overseas bank charges.  
- For credit card payment, there is additional 4% credit card processing fee.

**GENERAL TERMS & CONDITIONS**  
- If you have not received an acknowledgement before the training, please call us to confirm your booking.  
- Prices include lunches, refreshments and materials. Promotion & discount cannot be combined with other promotional offers.  
- Important: Please note that registration without payment will incur a SGD 200 administration fee.

**GROUP DISCOUNT**  
10% discount for groups of 3 registering from the same organization at the same time.

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

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**Authorized Signature:**

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