



Society of Petroleum Engineers

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Centre, University Malaya

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**Hartley Downs**  
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Massachusetts Inst. of Technology

# NANOTECHNOLOGY IN THE OIL AND GAS INDUSTRY – AN EVOLUTION OR REVOLUTION?

6-9 December 2009 • The Westin Langkawi Resort & Spa  
Langkawi, Malaysia

## WORKSHOP DESCRIPTION

Global energy demand is projected to rise as high as almost 60% over the next 30 years. It is a challenging trend that may be met only by revolutionary breakthroughs in energy science and technology. Innovative collaborative efforts between the E & P sector and the nanotechnology industry could hold the key to moving beyond the current alternatives for energy supply by introducing technologies that are more efficient and environmentally sound. Nanotechnology is characterized by collaboration among diverse disciplines, making it inherently innovative and more precise than other technologies.

While application of nanotechnology has significantly contributed and advanced across a variety of industries, such as electronics, pharmaceuticals, biomedical, aerospace and photography, the oil and gas industry has yet to fully investigate its potential. Nanotechnology offers tremendous potential to modernize infrastructure, increase net recovery from new and existing reservoirs, extend the area of applications to deep waters, and find solutions for producing unconventional hydrocarbons. Such a technology may be the cornerstone of any future energy technology that offers hope of extending the lifeline of our current energy resources by providing innovative solutions.

This Workshop will provide a platform for scientists, global experts and leading industry executives to discuss, challenge and explore the practical applications and potential importance of nanotechnology for the oil and gas industry.

## WORKSHOP OBJECTIVES

This meeting of minds will provide excellent networking opportunities for sharing of knowledge, ideas, latest development and potential applications of nanotechnology in the oil and gas industry. Topics that are expected to facilitate discussion would include:

- Structural Nanomaterials and Applications in colloids, fillers, sensors, lasers, etc.
- Production Assurance in diagnostics, monitoring surveillance and management strategies.
- Corrosion Management for surface, subsurface and facilities applications.
- Integrated Mercury Management.
- Selective Filtration and Waste Management for water and carbon nanotube applications.
- Enhanced Oil and Gas Recovery through reservoir property modification, facility retrofitting, gas property modification, water injection, etc.
- Improving the success of exploration by improving data gathering, recognition of shallow hazards and avoidance of dry holes.
- Refining and Petrochemicals Technologies.
- Needs and Opportunities of Nanotechnology in the E & P industry.

## WHO SHOULD ATTEND

The Workshop will be of interest to professionals, researchers, and service and technology providers from the upstream and downstream segments of the E&P industry, academicians, government officials, etc. Registrants are also encouraged to present case studies and other experiences as discussion leaders.

**REGISTRATION DEADLINE: 6 NOVEMBER 2009**

**EARLY BIRD REGISTRATION DEADLINE: 6 OCTOBER 2009**

**REGISTER EARLY TO SAVE RM355! (US\$100)!**

## NANOTECHNOLOGY IN THE OIL AND GAS INDUSTRY – AN EVOLUTION OR REVOLUTION?

### Preliminary Daily Activities Agenda

Note: While every attempt will be made to adhere to the schedule, the status/availabilities of session topics, discussion leaders and moderators are subject to change. For updated technical agenda information, please visit the SPE website at [www.spe.org/atws](http://www.spe.org/atws).

#### Sunday, 6 December 2009

3:00 p.m.	–	4:00 p.m.	Programme Committee Meeting
3:00 p.m.			Hotel Check-in
4:30 p.m.	–	6:30 p.m.	SPE Registration
5:30 p.m.	–	6:30 p.m.	Discussion Leaders and Session Managers/Moderators Briefing
7:00 p.m.	–	9:00 p.m.	Welcome Reception/Dinner

#### Monday, 7 December 2009

8:00 a.m.	–	9:00 a.m.	Breakfast
9:00 a.m.	–	10:00 a.m.	<b>Session 1: Introduction/Opening/Keynote Address</b>
10:00 a.m.	–	10:30 a.m.	Group Photo/Coffee Break
10:30 a.m.	–	12:30 p.m.	<b>Session 2: Nanomaterials and Applications</b> Nanomaterial applications have a wide variety of potentially game changing effects. From strengthening tensile and surface strength to improve the life of materials in harsh environments, Nanomaterials can create a paradigm shift in the way material selection for surface and subsurface applications are done. This session will address the following: <ul style="list-style-type: none"> <li>• Coatings and Hardened Surfaces</li> <li>• Colloids</li> <li>• High Pressure/High Temperature</li> </ul>
12:30 p.m.	–	1:30 p.m.	Lunch
1:30 p.m.	–	3:00 p.m.	<b>Session 3: Nanomaterials and Applications (Cont.)</b> Improvements introduced by nanomaterials can be applied to the key downhole function to help control formation damage, improve, recover and aid in the mitigation of undesired effects such as water and CO <sub>2</sub> production. Additionally, because of their nature, implementing new technological answers to data gathering and reserve access can be refined to new levels. The session subtopics include: <ul style="list-style-type: none"> <li>• Filler</li> <li>• Sensors</li> <li>• Laser</li> </ul>
3:00 p.m.	–	3:30 p.m.	Coffee Break
3:30 p.m.	–	5:30 p.m.	<b>Session 4: Corrosion Management</b> Chemical treatments as well as naturally occurring catalysts increase the frequency of degeneration in both above ground and subsurface materials. Nanomaterials can provide additional longevity to the affected materials and increase the standard run-life of moving pieces throughout the operational spectrum. This session will address the following: <ul style="list-style-type: none"> <li>• Subsurface</li> <li>• Facilities</li> <li>• Surface</li> </ul>
8:00 p.m.	–	10:00 p.m.	Group Dinner

#### Tuesday, 8 December 2009

8:00 a.m.	–	9:00 a.m.	Breakfast
9:00 a.m.	–	11:00 a.m.	<b>Session 5: Mercury Management - Challenges</b> Asia Pacific reservoirs face a particular challenge in the production of mercury. Besides the corrosive effects it also provides various environmental hazards. Nanotechnological applications can help to provide solutions for the production of mercury, diminishing its production at the source and its disposal. The session subtopics include: <ul style="list-style-type: none"> <li>• Diagnostics</li> <li>• Monitoring Surveillance</li> <li>• Management Strategies (Mitigate or Control)</li> </ul>
11:00 a.m.	–	11:30 a.m.	Coffee Break
11:30 a.m.	–	1:30 p.m.	<b>Session 6: Mercury Management - Solutions</b>
1:30 p.m.	–	2:30 p.m.	Lunch
Afternoon			Rest & Recreation/Networking Opportunities/Dinner on Own

**NANOTECHNOLOGY IN THE OIL AND GAS INDUSTRY – AN EVOLUTION OR REVOLUTION?****Preliminary Daily Activities Agenda**

*Note: While every attempt will be made to adhere to the schedule, the status/availabilities of session topics, discussion leaders and moderators are subject to change. For updated technical agenda information, please visit the SPE website at [www.spe.org/atws](http://www.spe.org/atws).*

**Wednesday, 9 December 2009**

8:00 a.m. – 9:00 a.m.

Breakfast

9:00 a.m. – 11:00 a.m.

**Session 7: Enhanced Oil and Gas Recovery**

Improving the geomechanics of a reservoir as through improvements of surface tension as well as actual modification to the reserves themselves can drastically increase the recovery rates of a well. These materials also offer the reduce production reducing events such as scales and corrosion. However, application of such technology does have to take into account that facilities which are in place must be retrofitted to take advantage of the new technology. This session will address the following:

- Reservoir Property Modification
- Facility Retrofitting
- Gas Property Modification
- Water Injection

11:00 a.m. – 11:30 a.m.

Coffee Break

11:30 a.m. – 1:30 p.m.

**Session 8: Production Assurance**

By changing the scale of detention and management, better-refined and effective means to assess and survey reservoirs become available. Further to this, nano-scale control schemes can be implemented to filter and control undesired effects as well as maximise recovery. The following subtopics will be discussed in this session:

- Diagnostics – Evaluation
- Monitoring Surveillance
- Management Strategies (Mitigate or Control)

1:30 p.m. – 2:30 p.m.

Lunch

2:30 p.m. – 4:00 p.m.

**Session 9: Improving the Success of Exploration**

This session will look at various ways in which nanotechnology can help to reduce the risks associated to drilling and exploring new reservoirs, be it through avoidance of potential hazards or through the gathering of more accurate data. The session subtopics include:

- Shallow Hazards
- Dry Hole Avoidance

Data Gathering

4:00 p.m. – 4:30 p.m.

Coffee Break

4:30 p.m. – 6:00 p.m.

**Session 10 : Needs and Opportunities in the E&P Industry (Future Mindset)**

The future is just on the horizon with nanomaterials. Improvements can be had in every aspect of production from upgrading of reserves to reducing damage endured in production. Moreover, the application in the development of emerging and still unconventional reserves such as ultra-heavy oils and hydrates open up a new potential for broad reaching production options of hydrocarbon sources. This session will address the following:

- Insitu Upgrading
- Facility Life Extension
- Nanotechnology in Unconventional Resources

6:00 p.m. – 6:30 p.m.

**Session 12: Summary & Wrap-Up**

8:00 p.m. – 10:00 p.m.

Group Dinner

**Thursday, 10 December 2009**

7:00 a.m.

Breakfast at Leisure

12:00 noon

Hotel check out

**Documentation:**

1. Proceedings will not be published; therefore, formal papers and handouts are not expected from speakers.
2. Work in progress, new ideas, and interesting projects are sought.
3. Professionally-prepared visual aids are not required; handwritten viewgraphs are entirely acceptable.
4. Note-taking by participants is encouraged. However, to ensure free and open discussions, no formal records will be kept.

**Workshop Deliverables:**

- The committee will prepare a full report containing the highlights of the Workshop discussions. This report will be circulated to all attendees. A one-page summary will be prepared by the Workshop Co-Chairperson, which will be posted on the SPE Web Site, and published in the Journal of Petroleum Technology (JPT), if space permits. The copyright of the Summary Report will belong to SPE.
- PowerPoint presentation materials will be posted on a specific SPE URL address after the Workshop. Provision of the materials by the discussion leaders will signify their permission for SPE to do so.

**Commercialism:**

In keeping with ATW objectives and the SPE mission, excessive commercialism in presentations will not be permitted. Company logos must be limited to the title slide and used only to indicate the affiliation of the presenter and others involved in the work.

**Attendance Certificate:**

All attendees will receive an attendance certificate attesting to their participation in the Workshop. This certificate will be provided in exchange for a completed Workshop Questionnaire.

**Continuing Education Units:**

This workshop qualifies for SPE Continuing Education Units (CEU) at the rate of 0.1 CEU per hour of the ATW.

**Attendees' Information:**

General and detailed accommodation information will be forwarded to registrants with the attendee package prior to the scheduled Workshop, in November 2009.

**Transportation/Visa:**

All delegates are advised to book their international airline tickets early from their country to Langkawi, Malaysia. Further detailed transportation information will be available and included in the attendee package upon registration. All travellers to Malaysia must be in possession of passport valid for at least six (6) months with proof of onward passage, either return or through tickets. Please check with your travel agent for information on visa requirements to Malaysia.

**Dress Code:**

Casual clothing is recommended. The Workshop atmosphere is informal.

**Workshop Venue:****The Westin Langkawi Resort & Spa**

Jalan Pantai Dato Syed Omar

Langkawi 07000, Kedah

Malaysia

Tel: 60.4. 960.8888 • Fax: 60.4.966.6414

Website : [www.starwoodhotels.com/westin](http://www.starwoodhotels.com/westin)

**Registration Fees:****Early Bird Registration Deadline: 6 October 2009**

- **SPE MEMBER** : RM 8,520.00 (US\$2,400.00)/person on/before 6 October 2009
- **NONMEMBER** : RM 8,875.00 (US\$2,500.00)/person on/before 6 October 2009

**Registration Deadline: 6 November 2009**

- **SPE MEMBER** : RM 8,875.00 (US\$2,500.00)/person on/before 6 November 2009
- **NONMEMBER** : RM 9,230.00 (US\$2,600.00)/person on/before 6 November 2009

**Fee includes the following:**

- Four-day registration fee for all Workshop sessions;
- Four nights accommodation based on single occupancy with arrival Sunday, 6 December 2009 and departure Thursday, 10 December 2009;
- Welcome reception followed by dinner (Sunday evening);
- Three meals per day except on Tuesday & Thursday;
- Daily coffee/tea breaks;
- Workshop Workbook and Certificate of Continuing Education Units (CEU).

**Note:** Registration fee does not include hotel accommodation and meal costs for additional family member(s).

**Registration Policy:**

- Registration fee **MUST** be paid in advance for attending the Applied Technology Workshop.
- Full Fixed fee is charged regardless of the length of time that the registrant attends the Workshop.
- Fixed fee cannot be prorated or reduced for anyone (Workshop chairpersons, committee members, speakers, discussion leaders, students and registrants).
- Attendees are expected to attend all Workshop sessions and are not permitted to attend on a partial basis.

**Cancellation & Refund Policy:**

- A full refund less **RM532.50 (US\$150.00)** processing fee will be charged for cancellation received before the registration deadline **6 November 2009**.
- For cancellation received after the registration deadline **6 November 2009**, 25% refund will be made to the registrant.
- No refund on cancellation received seven (7) days prior to the starting of the Workshop date, on or after **29 November 2009**.
- Substitutions will not be accepted without prior Programme Committee approval.
- **No refund** will be issued if a registrant fails to show up at the Workshop on-site.

**ATTENTION NON-MEMBERS:  
JOIN SPE DURING THIS WORKSHOP AND RECEIVE  
YOUR FIRST YEAR'S MEMBERSHIP FREE!  
SUBMIT YOUR MEMBERSHIP APPLICATION ONSITE!**

## Registration Form

Please Print or Type in Black Ink

SPE Member:  Yes Membership No. \_\_\_\_\_  No

Name: \_\_\_\_\_  
(First/Forename) (Middle) (Last/Family Name)

Position: \_\_\_\_\_

Company: \_\_\_\_\_

Address: \_\_\_\_\_

Town/City: \_\_\_\_\_ Zip/Postal Code: \_\_\_\_\_ Country: \_\_\_\_\_

Tel: \_\_\_\_\_ Fax: \_\_\_\_\_

Email: \_\_\_\_\_

**Would you be willing to give a brief (10 minute) presentation \_\_\_\_ (Yes/No) or a poster presentation \_\_\_\_ (Yes/No)**

If yes, please provide a title and a detailed description of the presentation in the space below. (Use additional paper if required). One of the Programme Committee members will contact you to discuss your presentation.

**Important:** Registrants for SPE Applied Technology Workshops are accepted on the basis of information submitted by each registrant.

### Technical Disciplines (Check One)

- |  |  |
|--|--|
| <input type="checkbox"/> Drilling and Completions              | <input type="checkbox"/> Health, Safety, Security, Environment and Social Responsibility |
| <input type="checkbox"/> Management and Information            | <input type="checkbox"/> Production and Operation  |
| <input type="checkbox"/> Projects, Facilities and Construction | <input type="checkbox"/> Reservoir Description and Dynamics                              |

### Primary Responsibility (Check One)

- |   |                                    |                                    |                                     |                                       |
|---|------------------------------------|------------------------------------|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> Asset Management | <input type="checkbox"/> Economics | <input type="checkbox"/> Drilling  | <input type="checkbox"/> Geology    | <input type="checkbox"/> Geophysics   |
| <input type="checkbox"/> Production       | <input type="checkbox"/> Operation | <input type="checkbox"/> Reservoir | <input type="checkbox"/> Management | <input type="checkbox"/> Others _____ |

List background and experience. (Use additional paper if required).

List your expectation for the Workshop, so that the committee can tailor a portion of the Workshop to answering attendees' concerns. (Use additional paper if required).

### REGISTRATION FEES: (Please select appropriate box)

**Early Bird Registration Deadline: 6 October 2009**

- SPE MEMBER : RM 8,520.00 (US\$2,400.00)/person on/before 6 October 2009
- NONMEMBER : RM 8,875.00 (US\$2,500.00)/person on/before 6 October 2009

**Registration Deadline: 6 November 2009**

- SPE MEMBER : RM 8,875.00 (US\$2,500.00)/person on/before 6 November 2009
- NONMEMBER : RM 9,230.00 (US\$2,600.00)/person on/before 6 November 2009

Fee includes workshop registration, workbooks, certificate, 4 nights **SINGLE** accommodation with daily breakfast, 1-welcome reception/dinner, 3 luncheons, 2 dinners and daily coffee breaks.

### PAYMENT BY CHEQUE

- Malaysian Ringgit Cheque to **SPE-Asia Pacific (M) Sdn. Bhd.**
- U.S. Dollars Cheque to **Society of Petroleum Engineers.**
- Payment Enclosed (Check No. \_\_\_\_\_)

### PAYMENT BY CREDIT CARD

Credit Card Payment will be in U.S. Dollars only

- |   |                                      |
|---|--------------------------------------|
| <input type="checkbox"/> American Express | <input type="checkbox"/> Master Card |
| <input type="checkbox"/> Visa             | <input type="checkbox"/> Diners Club |

Card Number

Exp. Date  
(mm/yy)

CVV Code

(CVV code is the 3 digit code on back of VISA/MasterCards and the 4 digit code on the front of American Express.)

Signature (as it appears on your credit card)

Name as it appears on Card \_\_\_\_\_

Billing address of Card \_\_\_\_\_

Zipcode/Postal Code of Card \_\_\_\_\_

**Note: Forms will not be processed and space cannot be guaranteed unless accompanied by payment for total amount due.**

### CANCELLATION POLICY:

- A full refund less **RM540.00 (US\$150.00)** processing fee will be charged for cancellation received before the registration deadline, **6 November 2009**.
- For cancellation received after the registration deadline, **6 November 2009**, 25% refund will be made to the registrant.
- No refund** on cancellation received seven (7) days, **29 November 2009**, prior to the starting of the Workshop date.
- Substitutions will not be accepted without prior Programme Committee approval.
- No refund** will be issued if a registrant fails to show up at the Workshop on-site.

### THIS FORM MAY BE USED AS A COMPANY INVOICE

Mail completed registration form with remittance and any supporting material to:

#### Society of Petroleum Engineers

Suite 23-02, Level 23, Centrepoint South, Mid Valley City  
Lingkaran Syed Putra, 59200 Kuala Lumpur, Malaysia

Tel: 60.3.2288.1233 • Fax: 60.3.2284.9220 • E-mail: spekl@spe.org

To submit your registration on-line, please visit the SPE Web Site at [www.spe.org](http://www.spe.org)  
The online payments are secured by VeriSign.  
(For Credit Card Registration Only)

## Sponsorship Information

Sponsorship support helps offset the cost of producing workshops and allows the Society of Petroleum Engineers (SPE) to keep the attendance price within reach of operations-level individuals, those who benefit most from these technical workshops.

The sponsorship will provide an excellent opportunity for publicity efforts as well as networking with International workshop participants. Sponsors benefit both directly and indirectly by having their company names associated with a specific workshop.

While any type of commercialism is prohibited within the meeting room, SPE recognizes that sponsoring companies offer valuable information to attendees outside the technical sessions. There will be a range of sponsorship opportunities available for this event.

### For further information, kindly contact:

Jean Paul Valdes, SPE Event Manager  
Society of Petroleum Engineers  
Suite 23-02, Level 23, Centrepoint South, Mid Valley City  
Lingkar Syed Putra, 59200 Kuala Lumpur, Malaysia  
Tel: +60.3.2288.1233 • Fax: +60.3.2284.9220  
E-mail: [jvaldes@spe.org](mailto:jvaldes@spe.org) • Web Site: [www.spe.org/atws](http://www.spe.org/atws)

## General Information about Langkawi, Malaysia

Langkawi is an archipelago of 99 islands lying in the north western coast of Peninsular Malaysia. The islands are a part of Malaysia's Kedah state, and are located adjacent to the Thai border. By far, the largest of the islands is Pulau Langkawi (Langkawi Island) with a population of some 45,000.

Langkawi is an administrative district with the town of Kuah as the capital and largest town. The government of Malaysia has declared the entire Langkawi Island as a duty free zone. Hence this island is also termed Duty Free Island. All goods sold in Langkawi island are exempted from government tax.

### TRANSPORTATION

- Malaysia Airlines and Air Asia operate daily flights between Kuala Lumpur and Langkawi, direct or via Penang and Singapore. Flight duration is 55 minutes from Kuala Lumpur International Airport (KLIA) and 1 hour 15 minutes from Singapore.

### PASSPORT AND VISAS INFORMATION

- Visitors to Malaysia must be in possession of passports valid for at least six (6) months with proof of onward passage, either return or through tickets. Visa requirements depend on country of origin and last destinations before entering Malaysia. Please check with your travel agent or airline before your departure.
- Information on visa applications are available at <http://www.kln.gov.my/>.

### CURRENCY

- The national monetary unit is RINGGIT MALAYSIA (RM). US\$1.00 is approximately RM3.55. Foreign currency can be exchanged at the airport, local banks and hotels. 1 Ringgit equals 100 Cents.
- Money and travelers cheques can be exchanged at banks and money changers. Major credit cards are accepted in hotels and department stores. Cash however, is required in the local markets.

### LANGUAGE

- The official language of Malaysia is Bahasa Malaysia. English is however widely used in business, so communication is relatively easy.

### CLIMATE

- Hot and humid all year. Temperature ranges from 25°C to 33°C.

### TIME

- Langkawi is 8 hours ahead of GMT and 16 hours ahead of US Pacific Standard Time. The time zone is the same as Perth, Singapore, Kuala Lumpur, Beijing, Hong Kong and Taipei.

### ELECTRICITY

- 220--240 volts with 50 cycles AC are available.

### DRESS CODE

- Casual/smart clothing is recommended. The Workshop atmosphere is informal. With due respect for the Muslim religion, it is not recommended to wear revealing clothes in the town area. Swimwear attire is acceptable at the beach and swimming pool area.