NMR Petrophysics Application

Understanding practical aspects of NMR as a valuable reservoir characterization tool
22nd September 2014 - 25th September 2014, Kuala Lumpur, Malaysia

Petrosync Distinguished Instructor

Dr. Ayham Ash
Consultant Petrophysicist, PETROPHYSICS LTD.

- Over 17 years of experience in Oil & Gas industry
- Specializes in NMR, core analysis, formation evaluation and integration between core & log
- Handled projects and senior positions in CNR, RWE, SASOL, Fugro-Robertson, Weatherford

Course Objectives

- Enhance the understanding for NMR physics and the concept principle of NMR measurement
- An overview on logging tools available in the market
- Identify the CBW, BVI, BVM
- Learn how to gather Core NMR measurements
- Acquire knowledge in the different NMR petrophysical properties (porosity, permeability, T2 cutoff), pore body size distribution and fluid properties
- Develop permeability and capillary pressure models
- Understand wettability and fluid characterization
- Knowledge on NMR corrections and quality control

Specially Designed for

The course is designed for petrophysicists, geologist, geophysicists and reservoir, petroleum and drilling engineers whose job requires a more extensive knowledge of Nuclear Magnetic Resonance.
Nuclear magnetic resonance (NMR) is a very useful tool to determine rock properties. The NMR response of the hydrogen contained within rocks can be related in a direct or indirect way to porosity, pore size distribution, rock permeability, capillary pressure, wettability and water saturation. Depending on the tool and the mode of operation, the type of fluid in the formation can be indicated whether it is gas, oil or water. All these can be achieved with an understanding of fundamentals and proper calibration of log data to laboratory NMR measurements on core samples.

This 4-day course covers the practical aspects of NMR as a valuable reservoir characterization tool such as determinations of T1 and T2 distribution; porosity and permeability; T2 cutoff for bound and free fluids; pore size distribution; fluid types and properties.

Designed to focus on the NMR principle and its use in formation evaluation domain, it additionally gives highlight on the different tools and parameters for the different application. The trainer will focus more on data interpretation and how NMR is best used.

Instructor Profile

Ayham have over 17 years of experience in the oil E & P. He has extensive petrophysical experience on both logs and core quality control and interpretation including NMR, log and core design and integration between log and core analysis.

Currently, he is a consultant petrophysicist with Petrophysics Ltd. wherein he carry out projects and have worked with recent clients such as Maersk, CNR, OPC on rock typing, reservoir modeling, petrophysics interpretation and runs courses provided to the industries. Prior to that, Ayham worked and held several projects and senior positions with Parenco Holding, RWE DEA UK, Fugro-Robert Ltd., Weatherford International Ltd, Reslab UK,Techsia and Syrian National Oil Company.

Ayham was VP of Arrangements and Publication for London Petrophysical Society and was the Training and Education Director of Petroleum Exploration Society of Great Britain. His publication includes Workflow for the calculation of drainage capillary pressure and Swi estimation using NMR T2 relaxation; Determination of surface relaxivity from NMR T2 measurements; LPS NMR Petrophysics course and more.

His recent clients include CNR, RWE, SASOL Petroleum, LPS, Perenco, Gulfsands, ADCO, KNOC, KEC and SPC. He has experience in areas of Middle East, Arabic gulf, Europe (mainland and offshore) and Africa.

Petrophysics Training Courses (JANUARY - DECEMBER 2014)

<table>
<thead>
<tr>
<th>DATE</th>
<th>COURSE TITLE</th>
<th>INSTRUCTOR</th>
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<tbody>
<tr>
<td>17th – 21st Mar</td>
<td>Special Core Analysis</td>
<td>Jos Maas</td>
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<tr>
<td>24th – 27th Mar</td>
<td>Integration of Petrophysics &amp; Core Analysis</td>
<td>Ahmed Taha</td>
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<tr>
<td>5th – 9th May</td>
<td>Advanced Cased Hole Logging Interpretation &amp; Application</td>
<td>Mourad Wassef</td>
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<tr>
<td>23rd – 27th June</td>
<td>Advanced Well Log Interpretation &amp; Formation Evaluation</td>
<td>Ahmed Taha</td>
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<tr>
<td>22nd – 25th Sep</td>
<td>NMR Petrophysics Application</td>
<td>Ayham Ash</td>
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<tr>
<td>13th – 17th Oct</td>
<td>Petrophysics Operations Quality Control</td>
<td>Ahmed Taha</td>
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<tr>
<td>27th – 31st Oct</td>
<td>Petrophysics in Unconventional Reservoirs</td>
<td>Mourad Wassef</td>
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<tr>
<td>24th – 28th Nov</td>
<td>Advanced Production Logging</td>
<td>Mourad Wassef</td>
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22nd - 25th SEPTEMBER 2014, Kuala Lumpur, Malaysia

Course Agenda

Day One - 22nd September 2014

Introduction
- How NMR works?
- Tool development history

NMR application and physics
- Signal generation
- Nuclear spin and relaxation
- T1 & T2 Relaxation times
- Inversion and CPMG echo train
- Acquisition parameters

Introduction to NMR petrophysics and interpretation
- What information NMR can achieve?
- What affects the relaxation time?
- Surface relaxivity
- Pore size vs relaxation time

Exercises

Day Two - 23rd September 2014

Wireline Tools, Operations and Signal Processing
LWD NMR Tools and Operations
Core analysis tools and operation
NMR QC and corrections
Parameters vs objectives
Exercises

Day Three - 24th September 2014

NMR petrophysical application
- Porosity and shale volume
  - T2 cutoffs
  - Porosity in gas reservoirs

- Permeability and capillary pressure assessment
  - Permeability models pros and cons
  - Capillary and pore size distribution
- Rock and fluid typing
  - Bound and free fluid
- Viscosity and wettability

Exercises

Day Four - 25th September 2014

Core NMR Analysis
- NMR value in core analysis compare to logging
- Measurement planning and value
- Example of a typical NMR core analysis program

Core NMR and Log Calibration
- Porosity
- Permeability
- Capillary pressure

NMR responses examples
Case studies: Example of the log response within these reservoirs and how to benefit from NMR to allow better understanding and assessment to reservoir properties, as well as how NMR can benefit from other logging tools to get the required answer.
- Rock typing
  - Highlight on NMR possible draw backs
  - NMR in gas Reservoir Applications
  - NMR in low resistivity pay reservoirs
  - Shale gas

What is next for NMR?

Course wrap-up & evaluation

Course Exam

IN-HOUSE SOLUTIONS

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INVESTMENT PACKAGES

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<tr>
<th>Investment Package</th>
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<tr>
<td>Standard Price</td>
<td>19th Sep 2014</td>
<td>SGD $ 4,995</td>
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<tr>
<td>Early Bird Offer</td>
<td>22nd Aug 2014</td>
<td>SGD $ 4,795</td>
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<tr>
<td>Group Discount (3 or more Delegates)</td>
<td>19th Sep 2014</td>
<td>10% discount for groups of 3 registering from the same organization at the same time</td>
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Group Discount is based on Standard Price

* 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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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

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Please note:
- Indicate if you have already registered by Phone  □ Fax  □ Email  □ Web  □
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PAYMENT METHODS

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Please debit my credit card:  □ Visa  □ MasterCard  □ AMEX  □ Security Code: ____________________________
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