Production Optimization
by Using Nodal Analysis

Learn the ways to identify bottlenecks and optimize the production system
23rd June 2014 - 25th June 2014, Kuala Lumpur, Malaysia

Petrosync Distinguished Instructor

Mr. Haq Minhas
Sr. Technical & Reservoir Advisor for ME Region, Baker Hughes
International Consultant

- Over 30 years of International Oil & Gas industry experience
- Specializes in production enhancement, hydraulic fracturing, EOR, and unconventional gas
- Handled projects and senior positions in Schlumberger, ENI, Petronas and Baker Hughes
- Subject Matter Expert in many areas, a visiting lecturer for Heriot Watt University
- Co-Chair for SPE ATW in three events, Well and Reservoir Management and Well Testing (2012)
- Published more than 15 technical publications (1997 - 2012)

Course Objectives

- IDENTIFY bottle necks and optimize the entire system rather than maximizing individual components that add little value to overall production.
- LEARN to design new wells by using nodal analysis that would deliver at optimum rates and to diagnose production problems in existing wells where well productivity is sub-optimal due to various reasons
- UNDERSTAND both production engineering and reservoir engineering aspects of production optimization
- LEARN the various forms and aspects that can be used to estimate inflow performance by using nodal analysis
- GAIN knowledge in integrated system analysis including reservoir, wellbore, and surface facility.

Specially Designed for

The course is designed for, but not limited to, production technologists, petroleum engineers, and production engineers, who are directly involved field performance under performing wells.

- Production Technologists
- Production Engineer
- Reservoir Engineers
- Field Operators
- Petroleum Engineer
- Maintenance Engineers

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PRODUCTION OPTIMIZATION BY USING NODAL ANALYSIS

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Course Overview

NODAL analysis is a standard technique in production engineering to integrate the entire producing system from reservoir to facilities. The total production system consists of reservoir, near well bore, the well, tubular, artificial lift, gathering lines and manifolds. The objective of Nodal Analysis is to identify bottlenecks and optimize the entire system. On the contrary maximizing individual components, with suboptimal overall system may result in unnecessary costs with little or no increase in the production. In this context NODAL analysis becomes a powerful tool for production enhancement. NODAL analysis can be used in designing new wells that would deliver at optimum rates or diagnosing production problems in existing wells where well productivity is sub-optimal due to various reasons. The objective of this three days course is to have an in-depth understanding of NODAL analysis from back of the envelope calculations to excel based analysis to standard computer software.

This course will take the learning of entire three days to design and execute any production enhancement project from reservoir to wellbore. Identification of underperforming wells from broad studies, identifying reservoir problems, diagnosing well problems and designing appropriate technique for production enhancement. Production forecasting before and after any production enhancement project is key to feasibility studies.

Course Agenda

Day-1: Inflow Performance in Nodal Analysis
- Session 1: Overview of Nodal Analysis
  - The role of Nodal Analysis in production and reservoir engineering
- Session 2: Inflow or Reservoir Performance
  (Discussion will be using NODAL analysis)
  - Aspects of inflow performance inflow performance methods or relations for gas and oil reservoirs
  - Comparison the important input between well test transient IPR and pseudo steady state IPR in NODAL analysis
  - Multi-layer IPR curves of oil and gas well including well bore and reservoir cross flow effects
  - Basics of inflow performance for tight gas reservoirs
- Session 3: Inflow performance for different reservoir from under-saturated oil to two-phase systems
  - Conventional gas reservoirs
  - Tight gas reservoirs
  - Inflow performance of horizontal wells
  - Impact of water flooding on inflow performance
- Session 4: Drilling and Workover Formation Damage
  - Mechanisms of formation damage
  - Permeability damage (water block, condensate banking and perforation which related damage.)

Practical Exercise and Case Studies will be given.
Group Discussion session : participants are encouraged to bring their own data for group discussion

IN-HOUSE SOLUTIONS
SAVE COST • IMPROVE PERFORMANCE • REDUCE RISK

PetroSync understands that in current economic climate, getting an excellent return on your training investment is critical for all our clients. This excellent training can be conducted exclusively for your organization. The training can be tailored to meet your specific needs at your preferred location and time. We will meet you anywhere around the globe.

If you like to know more about this excellent program, please contact us on +65 6415 4502 or email general@petrosync.com
Course Agenda

**Day-2: Wellbore Dynamics and Artificial Lift: Outflow part of Nodal Analysis**
- Session 1: Tubing or outflow Performance (within the scope of NODAL analysis)
  - Estimation of wellbore pressure drops
  - Production logging in vertical and horizontal wells
  - Restrictions of Wellbore slugging
  - Important and consequences of sonic flow
- Session 2: Wellheads and gathering systems in the context of NODAL analysis
  - Single and multi-phase flow in horizontal pipes
  - Flow through chokes (pressure drop happens across chokes)
  - Surface gathering systems and horizontal well bores.

**Day-3 Production Enhancement - Application of Nodal Analysis**
- Session 1: Production forecasting
  - Identify different methods of production forecasting to understand the feasibility of any production enhancement project
  - Role of integrated reservoir performance in development planning
  - Technique of managing uncertainty in production forecasting, optimization and selection of best development option considering subsurface uncertainty
- Session 2: Well performance evaluation
  - Techniques to diagnosing well problems and identifying opportunities for production enhancement
  - Techniques to identify and solve production problems by using current production data
  - Cement evaluation, production logging, transient well testing, and saturation monitoring
- Session 3: Acidizing and fracturing
  - Essentials of different stimulation techniques
  - Estimation of expected gains from stimulation
- Session 4: Production enhancement strategies (Integration Application)
  - This session will take the learning of entire three days to design and execute any production enhancement project from reservoir to wellbore. Identification of underperforming wells from broad studies, identifying reservoir problems, diagnosing well problems and designing appropriate technique for production enhancement. Production forecasting before and after any production enhancement project is key to feasibility studies.

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Haq is a recognized industry professional with 30 years of worldwide experience; 20 years with Schlumberger, 10 years with ENI and PETRONAS, and at present with Baker Hughes as Chief Reservoir Engineer. He is a subject matter expert in many areas. His core expertise include gas reservoir engineering, field development planning, reservoir management, fluid sampling and analysis, production enhancement, rock mechanics, hydraulic fracturing, EOR, and unconventional gas.

He is a visiting lecturer for post graduate courses in Well Testing and Reservoir Simulation. He has published more than 15 SPE and other papers. Haq had worked as a petrophysicist for three years before working full time on Reservoir Engineering. Along with dual skills of reservoir engineering and petrophysics; in service and oil companies; in 10 different countries and numerous sandstone and carbonate fields, having industry and academic experience, he has managed large teams, projects, and business across countries. His role varied from team lead, to subsurface manager and mentor; in both conventional and unconventional reservoirs; from land to deep-water projects. In rock mechanics, he has worked on developing techniques for sanding risk, and numerous hydraulic fracturing jobs from design to execution and post fracture analysis.

PROGRAM SCHEDULE

08:00 – 09:00  Registration (Day1)
09:00 – 11:00  Session I
11:00 – 11:15  Refreshment & Networking Session I
11:15 – 13:00  Session II
13:00 – 14:00  Lunch
14:00 – 15:30  Session III
15:30 – 15:45  Refreshment & Networking Session II
15:45 – 17:00  Session IV
17:00  End of Day

WHY YOU SHOULD ATTEND PETROSYNC’S EVENTS

- To ensure that all objectives of the course matches yours, all PetroSync programs are developed after intensive and extensive research within the industry
- PetroSync programs focus on your immediate working issues to ensure that you are able to apply and deliver immediate results in real work situations
- Application and implementation of industry knowledge and experience are the drivers for our course design, not theoretical academic lectures
- PetroSync training focuses on practical interactive learning tools and techniques including case studies, group discussions, scenarios, simulations, practical exercises and knowledge assessments during the course. Invest a small amount of your time to prepare before attending the course to ensure maximum learning
- PetroSync follows a rigorous selection process to ensure that all expert trainers have first-hand, up-to-date and practical knowledge and are leaders of their respective industrial discipline
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INVESTMENT PACKAGES

<table>
<thead>
<tr>
<th>Investment Package</th>
<th>Deadline</th>
<th>Course Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Price</td>
<td>20th JUNE 2014</td>
<td>SGD $ 3,995</td>
</tr>
<tr>
<td>Early Bird Offer</td>
<td>9th MAY 2014</td>
<td>SGD $ 3,795</td>
</tr>
<tr>
<td>Group Discount (3 or more Delegates)</td>
<td>20th JUNE 2014</td>
<td>10% discount for groups of 3 registering from the same organization at the same time</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 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

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: __________________________  Postcode: __________________________
Country: __________________________  Email: __________________________

Please note:
- Indicate 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 METHODS

□ By Credit 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 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.

Course 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.

TERMS AND CONDITIONS

DISCLAIMER

Please note that trainers and topics were confirmed at the time of publishing; however, PetroSync may necessitate substitutions, alterations or cancellations of the trainers or topics. As such, PetroSync reserves the right to change or cancel any part of its published programme due to unforeseen circumstances. Any substitutions or alterations will be updated on our web page as soon as possible.

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

CANCELLATION POLICY

You may substitute delegates at any time as long as reasonable advance notice is given to PetroSync. For any cancellation received in writing not less than fourteen (14) working days prior to the training course, you will receive credit voucher less a SGD $200 administration fee and any related bank or credit card charges.

Delegates who cancel less than fourteen (14) working days of the training course, or who do not attend the course, are liable to pay the full course fee and no refunds will be granted.

In the event that PetroSync cancels or postpones an event for any reason and that the delegate is unable or unwilling to attend on the rescheduled date, you will receive a credit voucher for 100% of the contract fee paid. You may use this credit voucher for another PetroSync to be mutually agreed with PetroSync, which must occur within a year from the date of postponement.

PetroSync is not responsible for any loss or damage as a result of the cancellation policy. PetroSync will assume no liability whatsoever in the event this event is cancelled, rescheduled or postponed due to any Act of God, fire, act of government or state, war, civil commotion, insurrection, embargo, industrial action, or any other reason beyond management control.

CERTIFICATE OF ATTENDANCE

70% attendance is required for PetroSync’s Certificate

CHARGES & FEES

- For Payment by Direct Telegraphic Transfer, client has to bear both local and oversea bank charges.
- For credit card payment, there is additional 4% credit card processing fee.

Please accept our apologies for mail or email that is incorrectly addressed. 
 Please email us at registration@petrosync.com and inform us of any incorrect details. We will amend them accordingly.

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