PETROSYNC’S PRODUCTION ENGINEERING SERIES

FLOW ASSURANCE FOR O&G PRODUCTION SYSTEM

Effective and Reliable Flow Management in order to Maximize the Overall Production

28 MARCH 2016—1 APRIL 2016
BANDUNG, INDONESIA
Course Overview

As conventional oil reserves decline, companies are developing unconventional fields with complex fluid properties. All these factors mean that flow assurance plays an increasingly important role in the oil and gas industry and employers are frequently seeking skilled engineers in this field.

This course will cover the fundamentals of flow assurance and the phase behaviour of multiphase flow. Delegates will have an in-depth understanding of the systematic concept of flow assurance. Delegates will also learn the flow phenomena that can help to avoid problems such as hydrate formation, pressure waves, or high viscosity liquid flow failure.

Furthermore, this course will cover potential challenges to pipeline operation including: surge, hydrate formation, wax deposition, multiphase fluids, and slugging. The causes of these issues, design solutions and subsea operational will be an integral part of the course.

Includes Specific and Actual Case Histories

For the “practical session” of the course, we work through a number of case histories (which were all preventable) to let the delegates learning & understanding.

Cover Specific Software Tools

There are three software tools will describe during the course: Maximus—a Integrated Production Modelling tool, Olga-1 dimensional transient code and LedaFlow—quasi 3D transient tool, the instructor will cover full 3D MCFD codes. Furthermore, this course will cover potential challenges to pipeline operation including: surge, hydrate formation, wax deposition, multiphase fluids, and slugging. The causes of these issues, design solutions and subsea operational will be an integral part of the course.

How Does This Course Benefits You?

Maximize Success and Minimize Failure

Maximize success and minimize failure by planning effective flow pattern by understanding the systematic concept of flow assurance and phase behavior of multiphase flow.

Increase Productivity

Increase work performance and productivity by applying competently the fundamental principles of fluid mechanics, heat and mass transfer to analyze typical flow assurance system.

Improve Sufficient Flow Management

Improve sufficient flow management in production system by learning various system analysis software applications.

Additional News: Worldwide Stuck Pipe Cost

Do you know that the industry’s stuck-pipe costs exceed $250 million/year, equivalent to annual GDP of Micronesia?

Stuck Pipe VS Freeing

Do you know that prevention of stuck pipe is far more economical than even the best of freeing procedures?
PetroSync Distinguished Instructor

Paul Fairhurst
Managing Director, Fairhurst Flow Assurance Solution Ltd

Practical & Consulting
Over 30 years of international oil and gas industry experience
Specialize in flow assurance, hydraulic design, multiphase flows and thermal management
Senior Flow Assurance Engineer, BP London, Houston and Bogota (1989 - 2010)
Authored BP guidance documents on Design Issues for Deepwater Development (1993 - 2010)
Training
Chairman of the Imperial College Transient Multiphase Flow JIP, (1981-1989)

Who Needs This Program

The course will be of particular interest to engineers in oil and gas exploration, production and operating companies, consultants, contractors, service providers and equipment suppliers involved in design and operation. In addition, it useful for researchers or managers who wish to understand the technical issues to aid in their decision making.

Job Titles Include:
- Production Engineer
- Flow Assurance Engineer
- Pipeline Engineer
- Material Engineer

Course Schedule

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

**DAY 1**

**Introduction of the Course**

- Flow Assurance
  - The flow assurance environment
  - Multiphase pipeline hydraulics
  - Production chemistry issues
  - Engineering the future

**Fundamentals of Multiphase Flow**

- Definitions
- Flow Pattern prediction
- Pipeline sizing (1), maximum and minimum velocity constraints

**Phase Behaviour & Physical Properties**

- Compositional models, equations of state and phase diagrams
- Black oil models, definition of properties

**Teamwork Exercises: Magnus Flow Pattern Determination**

**DAY 2**

**Production Chemistry**

- Properties of oil and condensate reservoir fluids
- Fluid Sampling

**Oil & Gas Pipeline Design**

- Pipeline sizing (2)
- Thermal management
- Design for wax
- Design for hydrates
- High viscosity issues
- Solids transport
- Pigging

**Slugging Flows (1)**

- Hydrodynamic slugging description and modelling
- CFD comparisons with hydrodynamic slug flow data

**Slugging Flows (2)**

- Terrain induced slug flow
- Severe slugging
- Forces due to slugging
- Piping layout
- Slug catcher design

**DAY 3**

**Hydrates and Wax**

- Description of hydrates and consequences of formation
- Hydrate control methods
- Testing for hydrates
- Description of wax and consequences of deposition
- Rheology of waxes
- Pipeline cooldown and gel re-start
- Testing for waxes

**Gas/Condensate Pipeline Design**

- Pipeline sizing
- Liquid inventory management
- Influence of water

**Case Study:**

- Girassol case study
- Thermal management
- Operating procedures
- Hydrate remediation

**Scale, Asphaltines and Napthenates**

- Scale types, testing and scale management
- Occurance of asphaltines, laboratory testing and prediction
- Properties of napthenates and mitigation

Register For This Course Now!

Kindly fill up your particulars in the registration form placed at the end of this brochure, and send it to us or email to registration@petrosync.com
Course Agenda — 5 Days

DAY 4

System Analysis & PipeSim Software
- Components of pressure loss
- System design
- Optimisation

Maximus Software Demonstration
- Description of Maximus software
- Building a pipeline layout model in Maximus
- Case studies

Transient Flows
- Occurrence of transient flows
- Examples of ramp-ups, severe slugging, pigging, blowdown and cooldowns/warm-up

Class Exercise
- Pompano flowrate ramp-up
- Determine theoretical ramp-up surge
- Slug catcher sizing

DAY 5

OLGA Software Demonstration
- Modelling in OLGA
- Case studies

Subsea Separation and Boosting
- Managing system energy
- Multiphase pump types
- Experience with multiphase boosting
- Description of subsea separation technologies
- Experience with subsea separation

Multiphase Metering
- Why we measure production rates
- Advantages of multiphase metering
- The technical challenges
- The terms and definitions
- The technology status

Subsea Wells and Completions
- Tree configurations and equipment
- Well and completion configurations
- Subsea drilling and installation
- Corrosion and corrosion control
- Erosion, erosion/corrosion, design for erosion
- New technology

Subsea Production Equipment
- Why choose subsea systems?
- What is a subsea system
- Designing a subsea system
- Subsea wells
- Manifolds and tie-ins
- Flowlines and risers
- Maintenance, Intervention and abandonment
- New technologies and the future

You Might Also Be Interested In:

HPHT Drilling Operation
4—7 April 2016 | Bali, Indonesia

Deepwater Drilling Optimization
16—19 May 2016 | Bali, Indonesia
COURSE DETAILS
Title: FLOW ASSURANCE FOR O&G PRODUCTION SYSTEM
Date: 28 MARCH—1 APRIL 2016
Location: BANDUNG, INDONESIA

INVESTMENT PACKAGES (Please Circle)

<table>
<thead>
<tr>
<th>INVESTMENT PACKAGE</th>
<th>DATELINE</th>
<th>FULL MASTERCLASS</th>
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<tbody>
<tr>
<td>Standard Price</td>
<td>25 MARCH 2016</td>
<td>USD 4,295</td>
</tr>
<tr>
<td>Early Bird Offer</td>
<td>4 MARCH 2016</td>
<td>USD 4,095</td>
</tr>
<tr>
<td>Group Discount</td>
<td>25 MARCH 2016</td>
<td>Enjoy 10% discount for groups of 3</td>
</tr>
</tbody>
</table>

Group Discount is based on Standard Price
* To enjoy the promotion & discount offer, payment must be made before dateline
* 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:
- 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 credit card: □ Visa □ MasterCard □ AMEX  Security Code: □□□□
Expiry Date: ___________________________
Card Number: ___________________________
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.