Advanced Electric Submersible Pumps

Design & Analysis

Maximize Oil Production Through ESP System Design, Diagnosis, and Troubleshooting
07th - 11th September 2015 at KUALA LUMPUR, MALAYSIA

PetroSync Distinguished Instructor

DR GABOR TAKACS
Head of Petroleum Engineering Department
University of Miskolc

- Consultant and Lecturer with over 30 years of experience in the Oil & Gas industry
- Specializes in Production Engineering and Artificial Lift
- Chairman of SPE Artificial Lift Technical Interest Group for 7 Years (1997-2003)
- Conducted various well-received production optimization courses around the world including Advanced ESP Design, Gas Lift System and Advanced Sucker-Rod Pumping

Author of Books in Artificial Lift Technology


Course Objectives

- LEARN the ways to analyse the ESP installation by using Nodal Analysis method
- IMPROVE and INCREASE the reliability and safety with ESP system
- LEARN the ways to monitor and troubleshoot ESP Installations to improve well productivity
- OPTIMIZE well inflow performance through latest techniques in ESP systems
- IMPROVE operational production functions through strategic applications of ESP components

Specially Designed for

The course is designed for, but not limited to, production technologists, petroleum engineers, and production engineers, who are directly involved with electric submersible pumps operations

- Production Technologists
- Petroleum Engineers
- Production Engineers
- Field Operators
- Lifting Executives
- Maintenance Engineers

Supported by
The Electric Submersible Pump System (ESP) is considered an effective and economical means of lifting large volume of fluids from great depths under a variety of well conditions. Over the years, the ESP companies, in conjunction with the major oil companies, have gained considerable experience in producing high viscosity fluids, gassy wells, and high temperature wells. With this experience and improved technology, wells that were once considered non-feasible for submersibles are now being pumped economically. This course is designed to provide recommendations for designing ESP systems for special applications including gassy wells, production of fluids with solids, shrouded motors, production through the annular, high temperature and recirculation. This course is provide in depth knowledge of the design and installation of the ESP used in aggressive environment application, delegates can learn how to optimization and troubleshooting in ESP Installation.

**Course Content**

**Day One: Electric Submersible Pumps Operation & Components**

**Introduction to ESP Operations**
- Well Inflow Performance
- The Productivity Index Concept
- Inflow Performance Relationships *(Class Exercise)*

**Hydraulic Fundamentals**
- Tubing Flow Calculations *(Class Exercise)*
- Operational Basics of Centrifugal Pumps *(Class Exercise)*

**Electrical Fundamentals**
- Alternating Current
- Transformers
- Induction Motors
- Electric Cables

**Application of NODAL Analysis**
- Basic Principles

**ESP Components and Their Operational Features**
- The ESP Pump
  - Performance Curves and their Use
  - Pump Types
- The ESP Motor
  - Performance Curves, Startup Conditions
  - Motor Temperature Calculations
- Protectors (Seal Sections)
  - Functions, Types, and Main Parts
- The ESP Cable: Materials, Constructions and Features
- Other Surface and Downhole Components

**IN-HOUSE SOLUTIONS**

PetroSync understands that in current economic climate, getting an excellent return on your training investment is critical. This 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 program, please contact us on +65 6415 4500 or email: general@petrosync.com
## Day Two: ESP Application

### Use of ESP Equipment in Special Conditions
- Pumping Viscous Fluids (*Class Problem*)
- Producing Wells with High GLRs
  - Free Gas Volume Calculations
  - Pump Performance Degradation
  - Utilization of Natural Gas Separation
  - Use of Motor Shrouds
  - Rotary Gas Separators
  - Gas Handling

### Variable Speed Applications
- Variable Speed Drives
- Constructional Details
- Available VSD Types
- Operational Characteristics
- Variable Frequency Generators
- Interaction of VSD/VFG and ESP Units
- Benefits of using VSD/VFG Units

High Well Temperature
ESP Systems for Abrasive Service

*Class Exercise will be provided*

### VIDEO Presentation: Application of Rotary Gas Separators

---

## Day Three: Design of ESP

### Design of Conventional ESP Installations
- TDH Calculations (*Class Exercise*)
- Selection of the Pump
- Selection of the Protector
- Motor Selection
- Selection of the Power Cable
- Economic Selection of Cable Size (*Class Exercise*)
- Selection of Other Equipment

### Installation Design Considering Motor Slip
- Interaction of ESP Motor and Pump
- Design Procedure (*Class Exercise*)

---

### PROGRAM SCHEDULE

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
</tr>
</thead>
<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>
</tr>
<tr>
<td>11:00 – 11:15</td>
<td>Refreshment &amp; Networking Session I</td>
</tr>
<tr>
<td>11:15 – 13:00</td>
<td>Session II</td>
</tr>
<tr>
<td>13:00 – 14:00</td>
<td>Lunch</td>
</tr>
<tr>
<td>14:00 – 15:30</td>
<td>Session III</td>
</tr>
<tr>
<td>15:30 – 15:45</td>
<td>Refreshment &amp; Networking Session II</td>
</tr>
<tr>
<td>15:45 – 17:00</td>
<td>Session IV</td>
</tr>
<tr>
<td>17:00</td>
<td>End of Day</td>
</tr>
</tbody>
</table>

---

## HYBRID TRAINING SOLUTIONS

**FOCUS TRAINING • REDUCE COST • ENHANCED RESULTS**

Over the years, there has been a growing demand for hybrid training programs. It is an excellent option to maximize your training dollar for your specific training needs. We make it possible to run a training program that is customized totally to your training needs at a fraction of an in-house budget!

If you like to know more about this program, please contact us on +65 6415 4500 or email general@petrosync.com
ESP Design for Gassy Wells
- Gas Separator Calculations
- Design Procedure  \((\text{Class Exercise})\)

Design of Variable Speed Drive Installations
- Pump Selection for VSD Service
- Motor Selection

Analysis of ESP Installations
- NODAL Analysis
  - Constant Pumping Speed  \((\text{Class Exercise})\)
  - Variable Pumping Speed  \((\text{Class Exercise})\)
  - Variable Wellhead Pressure  \((\text{Class Exercise})\)

Well Testing of ESP Installations
- The Conventional Method  \((\text{Class Exercise})\)
- Use of VSD Drives  \((\text{Class Exercise})\)

Bottomhole Pressure Calculations
- Static and Flowing Conditions  \((\text{Class Exercise})\)

Power Efficiency of the ESP System
- Power Flow in the ESP System
- Energy Losses and Efficiencies
- System Efficiency

CASE STUDY: The Effect of Surface Chokes on ESP System Efficiency

Monitoring and Troubleshooting of ESP Installations
- Acoustic Surveys and Downhole Measurements
- System Failures
- Ammeter Card Analysis
- Modern Troubleshooting Methods

Special ESP Installations
- Parallel and Series Connected Installations
- Dual Installations
- Alternatively Deployed Installations

NEW AND EMERGING TECHNOLOGIES
- Permanent Magnet ESP Motors
- ESP TUT Motor Systems
- CT-Deployed ESP Systems
- High Head Capacity ESP Pumps
- Variable Frequency Generators

Limited Attendees
The course has limited seats to ensure maximum learning and experience for all delegates.

Certificate of Attendance
You will receive a Certificate of Attendance bearing the signatures of the Trainer upon successful completion of the course. This certificate is proof of your continuing professional development.

Interactive Training
You will be attending training designed to share both the latest knowledge and practical experience through interactive sessions. This will provide you with a deeper and more long-term understanding of your current issues.

High Quality Course Materials
Printed course manual will provide you with working materials throughout the course and will be an invaluable source of reference for you and your colleagues afterward. You can follow course progress on your laptop with soft copies provided.
Dr. Gabor Takacs is a well-known consultant and instructor on Production Engineering and Artificial Lift topics, with over 30 years of teaching and consulting experience. He has conducted various courses and provided consultation services for oil companies in Middle East, South America, Eastern Europe, and Asia.

Dr. Takacs was selected as SPE Distinguished Lecturer and Outstanding Technical Editor for the SPE journal “Production and Facilities.” His organizational involvements and positions include the following:

- Member of Hungarian National Committee, World Petroleum Congress (2002-2007)
- Technical Editor, SPE Production and Operations (2009)
- Chairman, SPE Hungarian Section (1992-1994)

He has more than 90 technical papers to his credit, and holds a Hungarian on Electrical Submersible Pumps Manual. He has authored the following books on Artificial Lift technology, which were all published by PennWell Books, USA.


Dr. Takacs is currently the Head of the Petroleum Engineering Department at the University of Miskolc in Hungary. He was previously the acting director at the Petroleum Engineering Department at the Petroleum Institute in Abu Dhabi, UAE. He also taught at Texas Tech University, USA, and at the Mining University of Leoben, Austria.
COURSE DETAILS
Title: Advanced Electric Submersible Pumps
Date: 07th - 11th September 2015
Location: Kuala Lumpur, Malaysia

INVESTMENT PACKAGES

<table>
<thead>
<tr>
<th>Investment Package</th>
<th>Deadline</th>
<th>FULL MASTERCLASS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard Price</td>
<td>4th SEPT 2015</td>
<td>SGD $ 5,995</td>
</tr>
<tr>
<td>Early Bird Offer</td>
<td>7th AUG 2015</td>
<td>SGD $ 5,795</td>
</tr>
<tr>
<td>Group Discount (3 or more Delegates)</td>
<td>4th SEPT 2015</td>
<td>10% discount for groups of 3 registering from the same organization at the same time</td>
</tr>
</tbody>
</table>

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: _______________________
Email: _______________________
Company: _______________________
Address: _______________________
County: _______________________
Postcode: _______________________

PAYMENT METHODS
☐ By Credit Card :
Please debit my credit card: ☐ Visa ☐ MasterCard ☐ AMEX
Card Number: ___________ Security Code: ___________
Expiry Date: ___________

☐ 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
Bank Code : 7171 • Bank Swift Code : DBSSSGSGXXX • Branch code : 288
Account No : 28898019890 • USD : 0288002682016

All bank charges to be borne by payer. Please ensure that PetroSync Global Pte Ltd receives the full invoiced amount.

AUTHORIZED SIGNATURE

Programme Consultant
Name : Cay Aagen
Email : registration@petrosync.com
Phone : +65 6415 4500
Fax : +65 6826 4322

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.

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 ISSUANCE OF PETROSYNCS CERTIFICATE.

Please accept our apologies for mail or email that is inaccurate or your information with other reputable companies, CANCELLATION POLICY

PAYMENT METHODS

- For credit card payment, there is additional 4% credit card processing fee.

- For credit card payment, there is additional 4% credit card processing fee.

CHARGES & FEE(s)

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.