

2009 ESP WORKSHOP
The Woodlands Waterway Marriott Hotel, The Woodlands, Texas
Continuing Education Classes

ELECTRIC SUBMERSIBLE PUMPING 101

Monday, 27 April 2009 - 8:00AM to 5:00PM
INSTRUCTOR: David L. Divine, P. E.

COURSE DESCRIPTION

This one-day course will provide instruction on the design, installation, and application of electric submersible pumps. All course material will be provided on a flash drive. The student should bring a PC compatible laptop and a calculator to the course. A Certificate of Completion is provided at the end of the course.

COURSE OUTLINE

1. ESP COMPONENTS

This is an introduction to the equipment and accessories that make up the electric submersible pumping system. This chapter also introduces basic sizing principles. The student will solve basic pump, motor and cable problems.

2. WELL PRODUCTIVITY

A brief introduction of the concepts of PI and IPR are discussed along with the importance of correctly matching well productivity to pump performance

3. PUMP SIZING

This chapter carries the student through the steps to correctly size an electric submersible pump (ESP). An example problem is solved, and then the student uses the example to size an ESP.

About the instructor: David L. Divine

David Divine has a Bachelor of Science degree in Electrical Engineering, 1969, from Texas Tech University, and is a Registered Engineer in the State of Texas. Mr. Divine has 27 years experience in the oil industry and has been a member of SPE since May of 1971.

His experience includes service with Texaco Inc. where his duties included production operations, oil field automation, and oil field electrification. While with Texaco, he developed the first practical variable speed submersible pumping system and is the author of several papers on this topic. In 1979 he co-founded Submersible Oil Systems, a company that designed and manufactured a variable speed controller for submersible pumping. After acquisition by Centrilift-Hughes, he served as Vice President over the Systems Division of Centrilift-Hughes. In 1983 he was a co-founder of Electric Submersible Pumps, Inc. (ESP, Inc.). Through his efforts, as Vice President in Charge of Engineering, ESP, Inc. developed all of the current standards for the testing of used submersible equipment and has improved many of the standards for the testing of new equipment. In 1993 ESP, Inc. acquired Trico Submersible Systems in Oklahoma City and re-named it ESP, Inc. Products Division. Mr. Divine was Vice President - Technology for ESP, Inc. In 1997 Mr. Divine left ESP, Inc. to become an independent consultant. Mr. Divine has been presenting seminars and schools on submersible pumping for the past 20 years. He is the co-author of a textbook and software on the subject of electric submersible pumping. Mr. Divine is a member of the Electrical Engineering Academy and the Industrial Advisory Board at Texas Tech University. He is the 1995 recipient of the Slonneger Award presented by the Southwestern Petroleum Short Course to individuals that have advanced the field of artificial lift.

ELECTRIC SUBMERSIBLE PUMPING 102

Tuesday, 28 April 2009 - 8:00AM to 5:00PM
INSTRUCTOR: David L. Divine, P. E.

COURSE DESCRIPTION

This one-day course will provide advanced instruction on the design, installation, and application of electric submersible pumps. Computer software (IBM PC Compatible) for the solution of sizing and efficiency problems will be provided along with the material. The student should bring a calculator and PC compatible laptop computer. The student should have completed ESP 101 or have equivalent experience before taking this course. A Certificate of Completion is provided at the end of the course.

COURSE OUTLINE

- 1. WELL PRODUCTIVITY:** The concepts of PI and IPR are discussed along with the importance of correctly matching well productivity to pump performance. Computer software is used to plot well and pump performance on the same graph. The use of data to diagnose well / equipment problems is also discussed. Problems to strengthen these concepts are worked.
- 2. PUMPING HIGH GOR WELLS:** The effects of gas on the performance of ESP's are studied. Calculations are employed to determine the amount of free gas present at the pump intake. The probability of gas interference is calculated and appropriate measures to prevent gas locking are studied. Problems sizing equipment for gassy wells will be worked.
- 3. PUMPING VISCOUS FLUID:** This section is a study of the effects of viscosity on the performance of submersible pumps. An example problem will be worked and then the student will work a viscous application to predict pump and motor performance.
- 4. VARIABLE SPEED CONTROLLERS:** The effects of speed changes on the ESP are studied. The techniques for designing variable speed pumping systems will be discussed. The student will work through an example problem and then solve a problem using a variable speed controller. The computer software will be used to plot variable speed curves into PI / IPR curves.

About the instructor: David L. Divine

David Divine has a Bachelor of Science degree in Electrical Engineering, 1969, from Texas Tech University, and is a Registered Engineer in the State of Texas. Mr. Divine has 27 years experience in the oil industry and has been a member of SPE since May of 1971.

His experience includes service with Texaco Inc. where his duties included production operations, oil field automation, and oil field electrification. While with Texaco, he developed the first practical variable speed submersible pumping system and is the author of several papers on this topic. In 1979 he co-founded Submersible Oil Systems, a company that designed and manufactured a variable speed controller for submersible pumping. After acquisition by Centrilift-Hughes, he served as Vice President over the Systems Division of Centrilift-Hughes. In 1983 he was a co-founder of Electric Submersible Pumps, Inc. (ESP, Inc.). Through his efforts, as Vice President in Charge of Engineering, ESP, Inc. developed all of the current standards for the testing of used submersible equipment and has improved many of the standards for the testing of new equipment. In 1993 ESP, Inc. acquired Trico Submersible Systems in Oklahoma City and re-named it ESP, Inc. Products Division. Mr. Divine was Vice President - Technology for ESP, Inc. In 1997 Mr. Divine left ESP, Inc. to become an independent consultant. Mr. Divine has been presenting seminars and schools on submersible pumping for the past 20 years. He is the co-author of a textbook and software on the subject of electric submersible pumping. Mr. Divine is a member of the Electrical Engineering Academy and the Industrial Advisory Board at Texas Tech University. He is the 1995 recipient of the Slonneger Award presented by the Southwestern Petroleum Short Course to individuals that have advanced the field of artificial lift.

HOW TO OPTIMIZE ESP PRODUCTION

Tuesday, 28 April 2009 – 8:00AM to 5:00PM

INSTRUCTOR: Sandy Williams

COURSE DESCRIPTION

This one-day course will teach participants to optimize production from ESP wells using available ESP electrical and sensor information.

A Certificate of Completion will be provided to the student.

COURSE OUTLINE

- 1. Candidate Selection and pump diagnostics**
- 2. Recommendations for design optimization**
- 3. Identification of inflow issues**
- 4. Drawdown analysis using ESP sensor data**
- 5. Stimulation recommendations**

SANDY WILLIAMS has worked in the Petroleum Industry for 17 years and is a trainer and consultant specializing in design, optimization and troubleshooting of artificial lift systems. Sandy has worked on a number of projects involving application of automation systems, development of staff competency programs, well modeling and analysis and use of measured data to optimize production. Sandy has authored and co-written a number of technical papers and has been a frequent presenter (and instructor) at ESP and PCP workshops. In his career Sandy has worked for ALP Limited (current employer), Engineering Insights (2 years), Phoenix Petroleum Services (3 years) and Amoco Production Company (9 years) in locations such as Ecuador, United Kingdom, USA, Venezuela and Oman. Sandy is fluent in Spanish and frequently teaches courses in Spanish. He graduated in 1990 from Heriot-Watt University in Edinburgh with an honors degree in Offshore Mechanical Engineering.

FAILURE ANALYSIS

Monday and Tuesday, 27-28 April 2009 – 8:00AM to 5:00PM
**INSTRUCTORS: Failure Analysis Experts from Centrilfit, Schlumberger,
Weatherford and Wood Group ESP**

COURSE DESCRIPTION

This two-day course will provide instruction on basic ESP failure analysis and root cause determination. A tear down and failure analysis procedure will be provided along with actual failure analysis case studies. Hands on inspection of failed components will be discussed.

Industry recognized experts will teach the course and a text, CR-ROM and Certificate of Completion will be provided to the student.

COURSE OUTLINE

DAY 1

1. Introduction
2. Post Failure Requirements
3. Pre-Pull Requirements
4. Pulling the ESP
5. Dismantle Requirements and Procedures
6. Root Cause Determination

DAY 2

1. Case Studies