



Gulf Coast Section

# ESP Workshop

*All courses are subject to change and may be cancelled if minimum participation requirements are not met.*

## **ELECTRIC SUBMERSIBLE PUMPING 102**

**Tuesday, 23 April 2013 - 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 Electronic textbook. 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 ESPs 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 from Texas Tech University, and is a Registered Engineer in the State of Texas. Mr. Divine has 39 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. He co-founded Submersible Oil Systems, a company that designed and manufactured a variable speed controller for submersible pumping. After SOS was acquired by Centrilift-Hughes, he served as Vice President over the Systems Division of Centrilift-Hughes. He was a co-founder of Electric Submersible Pumps, Inc. (ESP, Inc.) As Vice President in Charge of Engineering he helped develop 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 1997 he became an independent consultant. Mr. Divine began working for Baker Hughes Incorporated as a Technical Representative at the Educational Development Center in Claremore, Oklahoma for Centrilift in September of 2002. In July of 2007 Mr. Divine began work with Wood Group ESP, Inc. as a Principle Engineer. Mr. Divine is a member of the Electrical Engineering Academy and has been a member of the Industrial Advisory Board at Texas Tech University. He is the 1995 recipient of the Slonnegger Award presented by the Southwestern Petroleum Short Course to individuals who have advanced the field of artificial lift. Mr. Divine has been presenting seminars and schools on submersible pumping for the past 34 years. He is the co-author of a textbook and software on the subject of electric submersible pumping.