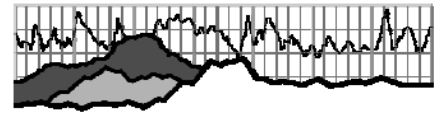


Basic Openhole Log Interpretation

Daniel A. Krygowski

www.Discovery-Group.com

Synopsis/Agenda



The Discovery Group, Inc.

Synopsis: The course assumes no logging knowledge and seeks to establish an understanding of basic petrophysical measurements and interpretation techniques which can be applied to routine tasks, and upon which more complex and advanced information and techniques can be built.

The course:

- Offers a "hands-on" approach to basic openhole well log analysis and interpretation.
- Focuses on the traditional interpretation targets of lithology, porosity, and fluid saturation.
- Introduces a variety of interpretation techniques: computational to visual (pattern recognition), and the use of some older techniques in the context of the availability of newer, more extensive, data.
- Is organized by the targets, or goals, of the measurements, rather than by the physics of the measurements.

The course strives to provide a strong and coherent foundation for the understanding of other, specialized interpretation techniques involving well log data, which are not covered here.

Course topics include:

- An overview of petrophysical well log data acquisition.
- Description of correlation/lithology, porosity, and resistivity logs.
- Determination of lithology, porosity, and fluid saturation from logs.
- Interpretive techniques, both algorithmic and graphical, using logs individually and in combination.
- Interpretation exercises to reinforce the interpretation methods discussed.

Length: Three days

Equipment needed: calculator (with exponent functions), straight-edge, pencil or pen.

Topics for each of the log measurements follow the same sequence:

Interpretation goals

Physics of the measurement, including volume of investigation

Operational parameters: conditions under which the measurement is best made.

Measurement names: tool and curve names from different vendors.

Log example

Interpretation details: details of the interpretation goals

Secondary effects: well environment, formation properties, and assumptions which affect the measurement and its interpretation.

Environmental corrections

Quality control

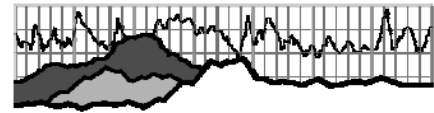
An exercise related to the interpretation goals.

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Agenda: The times shown below are best estimates, based on previous presentations of the course. The times will vary to some extent, depending on the questions and comments of the class. Questions and comments based on the experience of class participants are welcome, and often provide insights to local conditions which would not otherwise be presented.

While formal break times are noted in the schedule, shorter breaks are often taken, as dictated by class needs.

Day 1

8:00 to 9:45	Course logistics, Introduction
9:45 to 10:00	<i>Break</i>
10:00 to 12:00	Correlation/Lithology logs: SP, gamma ray, caliper, tension
12:00 to 1:00	<i>Lunch</i>
1:00 to 2:30	Correlation/Lithology logs, continued
2:30 to 2:45	<i>Break</i>
2:45 to 4:30	Porosity logs: sonic, density, neutron

Day 2

8:00 to 9:45	Porosity logs continued
9:45 to 10:00	<i>Break</i>
10:00 to 12:00	Porosity log combinations.
12:00 to 1:00	<i>Lunch</i>
1:00 to 2:00	Porosity log combinations, continued
2:00 to 2:15	<i>Break</i>
2:15 to 3:30	Nuclear magnetic resonance (NMR) logging
3:30 to 4:30	Resistivity introduction

Day 3

8:00 to 9:30	Deep resistivity logs: induction logs and laterologs
9:30 to 9:45	<i>Break</i>
9:45 to 10:45	Microresistivity logs: sensing close to the wellbore
10:45 to 12:00	Archie's saturation equation and it's parameters
12:00 to 1:00	<i>Lunch</i>
1:00 to 2:45	Saturation and parameters from pattern recognition techniques
2:45 to 3:00	<i>Break</i>
3:00 to 4:00	Bulk Volume Water
4:00 to 4:30	Course and topic summaries

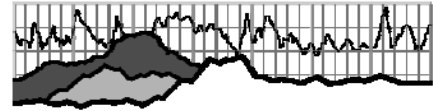
Time for hands-on examples, which the class can do individually or in small groups, is included in the above schedule.

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About the instructor:

Dan Krygowski joined The Discovery Group as a Senior Petrophysicist in late 2006. He has over 30 years of experience in the art and science of petrophysics, and in the development and design of petrophysical software. Dan earned a B.A. in Physics from the State University of New York at Geneseo. After earning M.S. and Ph.D. degrees in geophysics from the Colorado School of Mines (with a focus on petrophysics), he joined Cities Service Company, and worked in Denver and Tulsa. After Citco, he joined Atlantic Richfield Company (ARCO). In both companies, he gained experience in a variety of geologic and geographic areas in both technical and management positions in petrophysics.

After ARCO, he joined Landmark Graphics, and was a member of the PetroWorks development team as the team's petrophysical subject matter expert. He was also involved in interface design and development of documentation and training materials. When Landmark closed its Austin, Texas office, Dan joined Chevron, working in deep Gulf of Mexico and Chad, Africa projects. He also supported internal petrophysical training efforts.

Since the late Cretaceous, Dan has taught the AAPG Basic Well Log Analysis course annually with Dr. George Asquith of Texas Tech University. Dan also teaches Basic Openhole Log Interpretation, a similar, but shorter course, through direct client requests.

In 2004, the AAPG published George and Dan's book, Basic Well Log Analysis, a second edition of George's 1983 similarly-named book which was one of the AAPG's all-time best selling publications.

Dan is a member of the Society of Petrophysicists and Well Log Analysts (SPWLA), American Association of Petroleum Geologists (AAPG), Society of Petroleum Engineers (SPE), Society of Exploration Geophysicists (SEG), the Rocky Mountain Association of Geologists (RMAG), and the Denver Well Logging Society (DWLS). He is a Texas Registered Professional Geoscientist.