

## WHAT IS THIS CLASS ABOUT?

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Increased regulation of wellbore integrity has resulted from safety and environmental incidents and from the controversy surrounding fracturing. In addition, challenges associated with EOR, including CO<sub>2</sub> injection, call for robust assessment of well construction. This course discusses wellbore integrity challenges, practices for ensuring wellbore integrity during drilling, how we evaluate casing and cement, how we prevent wellbore integrity issues, and how we repair and decommission wells.

Most states and provinces have promulgated new regulations. The status of regulatory developments will be reviewed. Previous sessions of the class have featured a comparison of regulations in Texas, Alberta, Wyoming. Because I work to stay on top of new developments, I may feature different content in the future.

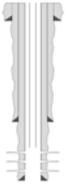
## LEARNING GOALS

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Goals for participants include:

- Recognize how drilling, completion, production and P&A activities achieve wellbore integrity
- Define how to comply with regulations, and how regulations from several states and provinces have changed, including Texas RRC SWR 13, Alberta Directives, and Wyoming Chapter 3
- Define zonal isolation
- Collect data and review well files to identify candidate wells for remediation
- Describe how we achieve wellbore integrity
- Discuss the effect of overpressured, underpressured, and normally pressured reservoirs on drilling decisions
- Review well files and case studies from several areas, including examples from the eagle Ford, Haynesville, Wind River, Tulare, Clinton Sandstone, Joslyn Creek SAGD, Utica, Monterey and Alluvial Aquifers
- Discuss the role of drilling mud, and the importance of mud removal
- Recognize types of wellbore integrity evaluation, including traditional sonic bond logs, ultrasonic logs, caliper logs, pressure tests, Bradenhead tests, surface observations, video logs, impression blocks, and communication to offset wells
- List pros and cons of traditional sonic bond logs vs ultrasonic logs
- Describe traditional cement additives, as well as high performance systems such as sized particle distribution systems, expansive cement, and self-healing cement
- Describe challenges with sustained casing pressure (SCP), microannulus, and low top of cement
- Recognize equipment used in two-stage cementing
- Compare regulations from different states and provinces
- Recognize equipment used in squeeze cementing, such as retainers, packers, and perforating guns





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## WHO SHOULD ATTEND?

- Production personnel who manage wellbore integrity over the life of the well
- Engineers, managers, and regulators who need to understand the physical processes that determine wellbore integrity
- Drilling and completions personnel
- Personnel responsible for plugging and abandonment
- Workover personnel responsible for cement squeezes and casing patches
- Environmental, health, and safety personnel who assess downhole operations

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## TYPICAL COURSE OUTLINE

### **Brief backgrounder on drilling processes**

- Drilling, cementing, leak off tests, limit tests
- Role of mud and mud removal
- Overpressure, fracture pressure and formation stresses
- Sustained casing pressure
- Casing depths: pore pressure and frac gradient

### **Why do we need well integrity?**

- Environmental
- Crossflow between zones, loss of reserves
- Loss of productive capacity
- Loss of part of the fluid into non-productive zones during fracturing or acidizing
- Water shut off

### **Cement: primary and remedial**

- Lost circulation
- Hole cleaning, mud properties and conditioning
- Casing vs. hole size
- Centralization, including horizontal holes
- Reciprocation/rotation of casing
- Density and viscosity hierarchy
- Water ahead, spacers, and turbulent flow
- Cement blends. Traditional and modern systems.
- Two stage cementing, external casing packers
- Do we want “strong” cement? Or flexible cement?
- Microannulus, sustained casing pressure, cracking, gas migration
- Particle size distribution

### **Evaluating well integrity**

- Bond logs, ultrasonic logs





- Lightweight cements
- Casing inspection
- Calipers
- Ultrasonic
- Pressure tests
- Review of well file reports
- Video logs
- Impression blocks
- Surface evidence (subsidence , fluid to surface)
- Effects on offset wells

#### Regulations

- New requirements, with case studies from Wyoming, Texas and Alberta

#### Repairs

- Low top of cement
- Pre-emptive plugging ahead of planned drilling programs
- Squeeze cementing
- Other types of repairs, including casing patches, sidetracking, and expandable casing

## CERTIFICATE

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This class is available on demand through EUCI. EUCI is accredited by IACET, and the course is 0.8 CEU's. A certificate can be issued to participants who want documentation of continuing education credit.

## INSTRUCTOR

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Lisa Denke graduated from University of Wyoming in 1993. She took a job cementing, acidizing and fracturing wells with Dowell Schlumberger in Worland, Wyoming, and transferred to Bakersfield, California with Schlumberger in cementing. She worked for Texaco in production, including high temperature steam fracturing in Cymric field, with the attendant wellbore challenges.

Working for Aera as a drilling/completions engineer gave her the opportunity to work on a variety of wells, from high volume programs with hundreds of wells per year, to horizontals with foamed cement, and quad completions with mud-to-cement conversion. At Berry, she had the opportunity to install fiber optic capillary strings in horizontal wells, as well as successfully shepherding new water disposal project permits through the regulatory process in old oilfields, with the attendant plugging of legacy wells, including wells dating from the 1800's. She has worked in the DJ Basin as a consultant for compliance with the Colorado Horizontal Offset Policy, and currently consults in that area.

