Introduction

Well Integrity and Zonal Isolation

• **Downhole Equipment Design**
  • Well Construction
  • Reservoir Characterization

• **Update, Assess, Monitor**
  • Update Well Diagram
  • Utilize Diagnostic Tools as Needed to Assess
  • Monitor Well

• **Contingency Plan**
  • Chain of Command
  • Options for Remedial Work
  • Regular Planning Meetings

• **Equipment Maintenance and Personnel Training**
Introduction

Existing Regulations on Well Integrity:

• DOGGR Regulations in Title 14
• API Standard 65-2, “Isolating Potential Flow Zones”

Existing Regulations may be influenced by events which have already changed regulations for Gas Storage Fields and OCS Operations
Introduction

Definition of well integrity: NORSOK D-010

“Application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids throughout the life cycle of a well.”

There are various facets to well integrity, including accountability/responsibility, well operating processes, well service processes, tubing/annulus integrity, tree/wellhead integrity and testing of safety systems.

Wellbore Construction: Barrier Diagrams

Barriers change depending on the phase of well life:
- Drilling
- Primary Production
- Various Artificial Lift Methods
- Secondary or Enhanced Recovery
- Workovers
- Abandonment

The diagram should be updated any time a material change is made in the wellbore.
Reservoir Characterization

Pore Pressure from EMW, DST or pressure build up analysis—ensure casing can withstand burst or collapse

Fracture Pressure from leak off test, or step rate test—ensure formation can withstand pressure
Are You Worried?
Are You Worried?

![Abandoned Oil Well Diagram](image_url)
Well Update and Assessment

Start with an updated Well Diagram

Diagnostic Tools

• Cased Hole Well Logs:
  ➢ Cement Bond, may include casing condition
  ➢ Casing Condition (Magnetic Flux, Caliper),
  ➢ Noise-Temperature: casing leaks or fluid movement behind pipe

• Downhole Video vs. Camera: Fiber Optic vs. Electric Cable

• Pressure Tests: Areas of potential compromise
What monitoring could you do to detect these leaks?
Case History 2

Aliso Canyon

Well Inspection Process at Aliso Canyon Storage Facility.mp4
Conclusions

- It’s important to update well information each time well is pulled
- Obtain diagnostic information as appropriate, document findings, and make someone accountable to review and react to results
- Design a reliable monitoring program and make someone accountable to review and react to results
- Have a contingency plan in place for emergencies
- Maintain equipment and train personnel
Questions?