Well Design and Execution for Data Acquisition in the Delaware Basin

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WPX Delaware Basin Overview

[Map showing Delaware Basin with highlighted areas and labels]

Note: Delaware acreage map does not include recently announced divestiture of Nine Mile Draw Acreage.
Real-Time Analytics Driving Well Design

PECOS STATE MONITORING PROJECT

PILOT/MONITOR WELL

- Contiguous 806’ core running from 3rd Bone Spring through Wolfcamp B
- Equipped with Microseismic geophones, permanent external pressure & temperature gauges
- Strategically placed to monitor fracs during completion, overall well performance and depletion through life of the well

PERMANENT DAS-DTS FIBEROPTIC INSTALLATION

- Successfully installed in the Pecos State 39-2H well and completed all frac stages without damaging the fiber

BENEFITS

- Optimize well spacing and landing targets
- Improve completion design
- Develop best practices for choke and flow management
- Optimize artificial lift
Development Well Design

Delaware Basin 4 String Design

- 170 Wells Since Q1 2017
- 7” Casing Drives Design
  - Pore Pressure Ramp
  - Anhydrite
  - Brushy Canyon
- Completion Design Requirements
  - Rate
  - Pressure

Surface
17-1/2” Hole

1st Intermediate
12-1/4” Hole

2nd Intermediate
8-3/4” Hole

Curve
8-3/4” Hole

Lateral
6-1/8” Hole

13-3/8” Surface
Bell Canyon
9-5/8” Intermediate 1
Cherry Canyon
Brushy Canyon
Bone Spring
Avalon
1st Bone Spring Sand
2nd Bone Spring Lime
2nd Bone Spring Sand
3rd Bone Spring Lime
3rd Bone Spring Sand
Kick off Point
Wolfcamp Top
7” Intermediate 2
4-1/2” Production Liner

Wolfcamp Top
Brushy Canyon
Cherry Canyon

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Well Design – Bottom Up

Objectives
- Core Size
- Fiberoptic Jewelry
- Microseismic data
- Completion Design

Design
- Production Hole Size
- Production Casing Size

Challenges
- PPFG

Design
- Intermediate Casing Design
Pilot Hole Well Design

Objective:
- 800-ft of contiguous 4" core
- Acquire openhole wireline logs
- 7 external pressure gauges
- Case and suspend well for vertical microseismic array

Design:
- 4" core → 8-3/4" hole size
- Pore pressure → 9-5/8" shoe depth
- 9-5/8" shoe depth → engineered casing design
- Core/log analysis → drilling fluid selection
- Service provider selection

Challenges:
- Trip schedule, mud weight, and well control
- Managing the transitions
- Formation specific coring runs
Fiberoptic Installation Well Design

**Objective:**
- External fiberoptic installation
- Heel and toe pressure gauge installation

**Design:**
- Fiberoptic jewelry $\rightarrow$ 8-3/4” hole size
- Lateral tortuosity $\rightarrow$ RSS application
- Inability to rotate casing $\rightarrow$ dedicated reamer run
- Pore pressure $\rightarrow$ 9-5/8” shoe depth
- 9-5/8” shoe depth $\rightarrow$ engineered casing design
- Service provider selection

**Challenges:**
- Crew engagement and attention to detail
- Curve design
- Managing the transitions
Conclusions

► Understand the objectives
  - Identify the challenges
  - Fit for purpose well design

► This is NOT development
  - Detailed pre-planning allows educated real-time decision making
  - Question the “knowns”

![Graph showing Temp (°F) vs. Depth (ft)]