Hydraulic TBG Anchor Results from Uintah Basin Wells

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Black Gold Pump & Supply, Inc
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Overview/Outline

Following will be the high level discussion points

- What are hydraulic TBG anchors
- Uintah field & wells overview
- Evolution of installs as they occurred over time
- Current status of installs and lookback at effectiveness
What are hydraulic TBG anchors

How do they work?

• Set by hydraulic differential to hold TBG in place for rod pumping

• Live slip engages into side of Casing

• Stays set as long as there is a hydraulic differential between fluid in TBG and fluid in CSG

Diagram courtesy of Black Gold Pump & Supply, Inc. Signal Hill CA
How Hydraulic TBG Anchor Works

How does the hydraulic anchor work?

SET!
High Tubing PSI

Fluid To Surface

Teeth Set

PUMP

Tubing PSI

Casing

SPE 171351
Testing of Hydraulic Tubing Anchors
Walter Phillips
What are hydraulic TBG anchors

How they differ

• Don’t require mechanical manipulation to set/unset
  – Saves rig time
  – Improves safety

• Much larger cross-sectional area for flow to go by
  – Less issue with debris build-up on anchor sticking prod string
  – Greater ease for gasses to flow by

EX: 61% Greater Bypass Flow area in 7# 26# CSG
(7.215sq in vs 4.475sq in)

Diagrams courtesy of Black Gold Pump & Supply, Inc. Signal Hill CA
Uintah field wells

- **Brundage Canyon & Lake Canyon**
  - Area of installs discussed

- **Waxy Crude**
  - Pour point ~ 120deg F

- **Gassy Production**
  - Field level ~ 4 MCF/STB

- **Low Water**
  - < 50% Wcut field level
Uintah field wells

Well construction

• Prior to 2012
  – Vertical wells 40ac spacing
  – TD’s ~ 5000’ Green River formation completions
  – 5-1/2” CSG x 2-7/8” Prod TBG

• 2012 onward
  – Went deeper to Wasatch zones common to be 6000’-7000’
  – Wells drilled on pads 40ac spacing
  – 1300’+ reach S wells
  – 5-1/2” CSG x 2-7/8” Prod TBG
Evolution of hydraulic anchor installs

Beginning to current practice

• When did install progress begin?
  – 2012: more development drilling and ‘S’ wells

• Why did install progress begin?
  – More & more stuck mechanical anchors
    • EVERY week 2-3 rig days were spent trying to get a stuck mechanical anchor out of the hole with a 3 rig maintenance program
  – More & more wells found not to have mechanical anchors set upon follow-up well maintenance
    • Setting proper tension was difficult to balance with J-55 TBG and 35k lb rated shear pins in anchor
Progress of Hydraulic TBG Anchor Installs

When/how did install progress ramp up and expand

- **APR 2013:** Had four well pilot install
- **OCT 2013:** Decision to installed into ~ ½ of new development wells after 6mo trial program
- **APR 2014:** Migrated into installs in ALL new development wells
Evolution of hydraulic anchor installs

- Started with only new development wells with 1300’ + reach
- Migrated into installs in ALL new development wells
- Went to installs in existing wells with mechanical anchors on maintenance pulls where there was need to pull TBG and ANY issue was seen with stuck/dragging or un-set mechanical anchor
Evolution of hydraulic anchor installs

- Since Q3 2014 (end of data on prior slides)
  - All new development wells received hydraulic TBG anchors
  - Many existing wells that had issues on TBG pulls had mechanical anchors laid down and replaced with hydraulic TBG anchors
- As of today there have been approximately 300 hydraulic TBG anchor installs in the Brundage Canyon & Lake Canyon areas of the Uintah Basin Wells

- NOTE: The presenter (Anthony D. McDaniels, P.E.) was the Senior Production & Completions Engineer for these wells between the end of 2012 and the beginning of 2015 for Berry Petroleum then Linn Energy upon their acquisition of Berry Petroleum in Dec 2013
Current status of installs

Looking back at effectiveness

• Total of nearly 300 wells have had hydraulic TBG anchors installs with the following minor issues
  – One 4 well battery had incorrect burst discs installed
  – Couldn’t pass through well heads in part of our field
• Turned out to be a good thing
Current status of installs

• What problems were solved
  – Anchors were always set when checked
  – Rig time to set/unset disappeared

• Went from 2-3 rig days/wk on pulling anchors to almost zero w/in 6 mo period of ramping up installs
Potential Savings/Impact

- How much savings could this all be worth?
  - Assumptions:
    - Hydraulic TBG Anchor Cost ~ $2k more than Mechanical
    - Mechanical TBG Anchors were costing at minimum TWO rig days per week in pulling/fishing ops (field level)
Potential Savings/Impact

• How much savings again?
  • NOTE: Estimating a $600k benefit does NOT include additional benefits such as:
    – Less production down time
    – Additional rig pull days occurring due to adding wells to field
    – Wells pumping today that could have been left down or shut-in
SUMMARY

• From 2013 – 2015 nearly 300 Hydraulic TBG anchors were installed in the Uinta Basin (Brundage & Lake Canyon)

• A four well pilot went to installs in ½ all new wells in first 6 months - then installs in ALL new wells in next 6 months

• For wells that didn’t have hydraulic anchors initially installed, if there were issues pulling TBG the old mech anchors were laid down and replaced with hydraulic

• Couple mild ‘learning pains’ from installs

• Could easily infer from data that anchors easily paid for themselves in this field and continue to do so!
More conversation?

QUESTIONS???
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