A New Generation of Well Integrity Evaluation Software

How is the next generation motivated by oil industry of 2015 in CEE region

Conference

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Visegrád, 19 November 2015

Society of Petroleum Engineers
Agenda

- Challenges in Well Integrity Evaluation
- Cement Barrier Verification
- Integrated Cement Evaluation Workflow (INVIZION)
  - Case Studies
  - Reports & Deliverables
- Benefits & Conclusion
- Q&A
Increased Focus on Well Integrity

API Standard 65 – part 2
- Industry accepted design & execution minimum requirement and recommended practices
  - Job QA/QC and Execute as per design
  - Objectives met Y/N.

API RP 96 – Deepwater Well Design & Construction
- Cemented riserless casing string to support well

NORSOK D-010
- Casing cement shall be verified to ensure a vertical and horizontal seal.
- Cumulative interval with acceptable bonding is required to act as a permanent external WBE.
- All cumulative intervals shall have formation integrity. Minimum accepted bonding interval length defined.

Railroad Commission of Texas
- Rule 13 Key provisions for logging
- Requires TOC over all productive/corrosive zones
- now defined by area
Challenges in Well Integrity

- Industry Drivers for Well Integrity
  - General Safety & Regulations: From “should do” to “must do”
  - Increased challenges during Well construction

- Avoid zonal communications
- Cross depleted zones (and/or face lost Circulation)
- Cover Salt zones
- Avoid APB/SCP

Well complexity requires
- Advanced planning
- Multidisciplinary team
- Cross Domain Data
- Reliable software platforms
- A new generation of well integrity evaluation
Cement Barrier Verification

Current Methods:
- Pressure Testing
- Inflow test/negative pressure test
- Pressure matching
- Monitoring returns to surface
- Temperature log
- Tagging (cement plugs)
- Sonic & Ultrasonic logs

What about other wellbore data?
- Open hole logs: GR, caliper, survey, resistivity, etc
- Pore/frac gradients
- Formation tops, rock types, fractures zones

What if:
We could increase assurance of Cement Evaluation process by using all available operational elements to bring full a Well Integrity picture?

Was job executed as planned?

FIT passed or not?

Does bond log indicate sufficient isolation?
Integrated Cement Evaluation Workflow

Objectives, formation characterization, drilling, cement placement, acoustic logs: Now we can correlate and Deliver interpretation with high degree of confidence (post job or while drilling)
Integrated Cement Evaluation Workflow

Objectives, Formation characterization, Drilling: What the hole is telling us?
- Cement placement?
- Operational Events analysis
- How is your barrier placed?
- TOC based on Hydraulics.

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Simulate annular fluid placement based on job acquired data.

Correlates all logs and fluid placement forecast.
- TOC and vertical/horizontal seal interpretation

Increases Interpretation confidence by using all available elements to qualify WBE

Achieve Well Integrity objectives.
- What is the real reason behind APB/SCP?
- Improve investors' confidence
Case Study Alaska - Optimize Drilling Operations

Challenge

- Determine TOC and minimize rig waiting time.
  Low temperature around TOC.
- Small density contrast between fluids

Solution

- Use Invizion Evaluation workflow to predict TOC.
- Provide optimal time to log based considering contamination at TOL.
- Use ultrasonic wireline logging differentiate all solids behind casing.

Result

- Logged the well 27 hrs. after cement job (typically 42 to 72+ hrs.)
- Saved ~15–45+ hours in WOC rig costs.

Effective Workflow – Improve Operations

Rig Time Savings

- Conventional
- Invizion

Mud: 10.4 ppg
Spacer: 11.0 ppg
Lead Slurry: 11.4 ppg
Case Study NAL – Channels Identification

Challenge
- Properly isolate gas bearing zone.

Solution
- Layout was generated within 4 hours of the Isolation Scanner logs being processed.
- Cementing placement information and OH logs already displayed in the same layout hence Top of solids was easily identified.

Result
- Using high resolution IBC and cross domain expertise, it was possible to interpret a post placement water channel on the annular wide side.
- Possible to interpret the lead and tail cement slurries transition along channels forecasted in the cementing predictive model of the workflow.
- No gas was observed in the string.
- Best practices for future cement job design and placement were used for future strings.
Evidence all available data relevant to zonal isolation has been used to comply with Cement Element Acceptance Criteria requirements.

Well Integrity Data storage and retrieval at will even years after the well is drilled.
Conclusion

- Increased assurance on Cement Well Barrier Element qualification
- Regulatory compliance
- Design optimization from lessons learned
- Standardization and efficiency
- Accessible Well Integrity file
- The next generation of oilfield well integrity evaluation platform.

Underground risk characterisation

Today

Future

Improved confidence
Well Integrity Evaluation

Questions?