Well integrity life cycle

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5. Isolation
6. Wells Operating envelope
7. Systems and maintenance during operation
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This presentation is meant to create a discussion on what is important to consider and how we can improve the way we plan, design, make, operate and end a well with a Well Integrity Life Cycle approach.
Well Life cycle - timeline

- Historical focus during construction
- Current focus during construction
- Future focus during construction
Design and Plan

- Many reasons to choose a design but in a well integrity perspective it is of the uttermost importance to highlight the following:

  - Use a design that is optimized with respect to the formation in the specific area (to make sure to have integrity in all relevant layers)

  - Design envelope fit for purpose

  - Materials used (corrosion/erosion etc)

  - Reliability of equipment

  - Monitoring capabilities

  - How to avoid Sustained casing pressure, X-flow and how to have "the best defense" against collapses.
Design and Plan

• Plan:
  • Plan should have input from well integrity personnel or well integrity personnel should be involved in the planning.
  • Plan must always be revised by key personnel
  • Plan with contingences (plan for the unplanned)
  • Avoid unplanned ”quick fix”.
  • Plan the Work and Work the Plan (a plan is a live document).
Placement of casing shoes

- Where we place the casing shoes is not only important for the drilling phase of the wells life cycle, it has also a big influence on well integrity in a life cycle approach.

- All casing shoes that are set in formation that has enough strength to withstand reservoir pressure will give you increased safety and options with regards to barriers against a reservoir.

- Placement of casing shoes and the isolation of these is a deciding factor to avoid sustained casing pressure including leaks of hydrocarbons into annuluses.

- Smart thinking with a life cycle approach with regards to placement of casing shoes can increase the lifetime of the well and reduce cost in a P&A phase.
Isolation

- Isolation is probably the single most important barrier element and one of the most difficult to establish and verify.

- When we isolate we are trying to re-establish the seal that the formation had prior to penetrating it when drilling.

- Good isolation reduces overall risk and reduces risk of sustained casing pressure.

- Good isolation can increase well lifetime and reduce cost in workovers and P&A.

- We need more isolation tools (medium) in our toolbox and increase our efforts on methods/technology to be able to lift medium. This to ensure proper isolation in all phases.
Wells Operating envelope

- Every well that we make must have a clear operating envelope.
- Make sure to stay within the operating envelope.
- If we have any incidents that takes us outside the operating envelope with regards to loads etc., this shall be documented, reported and investigated.
- Avoid any unnecessary strain on the well e.g. evacuated annuli etc. whenever possible.
- Use the well for the purpose that it is designed for.
Systems and maintenance during operation

- Training.
- Management system
- Proper handover process and documentation.
- Preventive maintenance program on all relevant equipment and at a frequency that is optimized for the well.
- Competent personnel and enough resources to maintain the wells.
- Important with document control and steering systems, to be able to trend equipment and sources of failure.
- Preventive maintenance is meant to be a proactive system to minimize the risk of failure.
- Experience transfer.
Slot recovery and P&A

- How we design, drill, complete, operate, intervene and maintain a well will have an influence on P&A.

- P&A should be done as soon as possible when a well is no longer producing.

- It is crucial that a good P&A (securing) is done on existing wellbore before re-use of the slot. Failing to do so can cause unintentional leaks into formation or/and a leak into the new well.

- Good isolation when building a well makes it more likely to get an appropriate P&A and will in most cases reduce cost.
Well Life cycle - timeline