Well Integrity Definitions

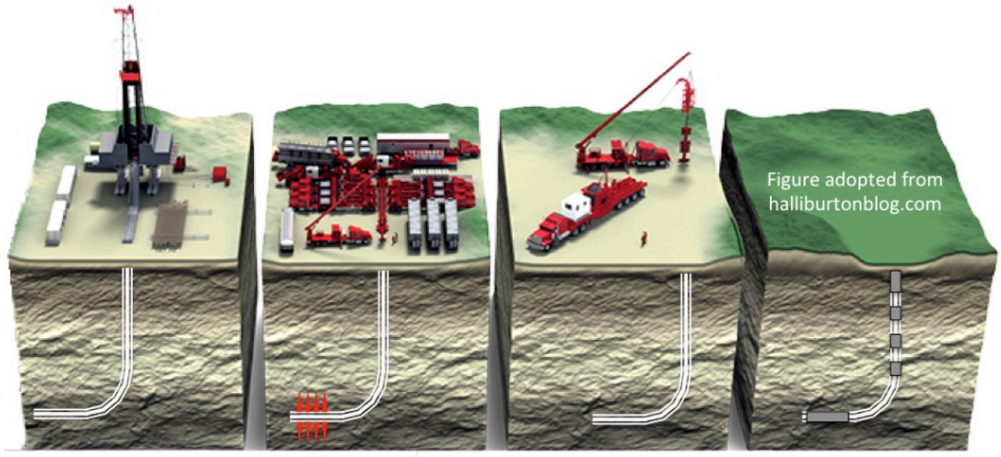
WIP WELL INTEGRITY PLATFORM

WIP Knowledge

Michael Prohaska, July 2017

Well integrity is defined by the common applied standards NORSK D-010[1] as "application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids throughout the life cycle of a well". In general, well integrity engineers must assure that a well has lowest possible down-times (and losses of production) due to well integrity related work-over. During abandonment well integrity engineers also assure that regulatory well flow restrictions are properly in place.

Well integrity is critical in all stages during the life of a well, from well construction, completing, producing to finally abandoning of well installations (see Figure[2]). The terms 'well barrier failure' and 'well integrity failure' are differentiated[3]. 'Well integrity failure' by definition is used for cases where all well barriers fail to establish leakages into the surrounding environment (e.g. groundwater, soil, atmosphere). As wells have typically several barriers, a well integrity failure is usually rare and redundant barriers are available to take over leakage loads. 'Well barrier failure' is used to refer to the failure of individual or multiple well barriers that has not resulted in a detectable leak into the surrounding environment. However, the failure of one individual barrier is a 'well integrity issue' as it weakens the whole installation and thus contributes to the 'loss of well integrity'.



Well Construction: Well control barriers by mud, cement, safety valves, wellhead, blow-out preventer. Primary cement job evaluated, remedial cementing sometimes required.

Completion: Cement barriers may fail under hydraulic stress during perforation and fracturing.

Production: Cement barriers subjected to long-term degradation and fatigue failures due to dynamic stresses in the wellbore. Tubing may corrode. Sustained casing pressure requires costly work-over.

Plug and Abandonment: Perfect barriers required by regulations. Long term integrity monitoring beyond abandonment desirable.

References

1. NORSOK D-010, Well integrity in drilling and well operations, Rev. 3, August 2004
2. Figure adopted from halliburtonblog.com
3. King, G. E and King, D. E: „Environmental Risk Arising From Well-Construction Failure," SPE 166142, SPE Journal Paper - 2013