

Current Zonal Isolation Regulation and Standards: A Compare and Contrast Review in Plug and Abandonment

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Abstract : Well-integrity is one of the major elements considered for drilling geothermal, oil, and gas wells. Well-integrity is minimizing the risk of unplanned fluid flow in the well bore throughout the well lifetime. Well integrity is maximized by applying technical concepts along with practical practices and strategic planning. These practices are usually governed by standardization and regulation entities. Practices during well construction can affect the integrity of the seal at the time of abandonment. On the other hand, achieving a perfect barrier system is impracticable due to the needed cost. This results in a needed balance between regulations requirements and practical applications. The guidelines are only effective when they are attainable in practical applications. Various governmental regulations and international standards have different guidelines on what constitutes high-quality isolation from unwanted flow. Each regulating or standardization body differ in requirements based on the abandonment objective. Some regulation account more for the environmental impact, water table contamination, and possible leaks. Other regulation might lean towards driving more economical benefits while achieving an acceptable isolation criteria. The research methodology used in this topic is derived from a literature review method combined with a compare and contrast analysis. The literature review on various zonal isolation regulations and standards has been conducted. A review includes guidelines from NORSOK (Norwegian governing entity), BSEE (USA offshore governing entity), API (American Petroleum Institute) combined with ISO (International Standardization Organization). The compare and contrast analysis is conducted by assessing the objective of each abandonment regulations and standardization. The current state of well barrier regulation is in balancing action. From one side of this balance, the environmental impact and complete zonal isolation is considered. The other side of the scale is practical application and associated cost. Some standards provide a fair amount of details concerning technical requirements and are often flexible with the needed associated cost. These guidelines cover environmental impact with laws that prevent major or disastrous environmental effects of improper sealing of wells. Usually these regulations are concerned with the near future of sealing rather than long-term. Consequently, applying these guidelines become more feasible from a cost point of view to the required plugging entities. On the other hand, other regulation have well integrity procedures and regulations that lean toward more restrictions environmentally with an increased associated cost requirements. The environmental impact is detailed and covered with its entirety, including medium to small environmental impact in barrier installing operations. Clear and precise attention to long-term leakage prevention is present in these regulations. The result of the compare and contrast analysis of the literature showed that there are various objectives that might tip the scale from one side of the balance (cost) to the other (sealing quality) especially in reference to zonal isolation. Furthermore, investing in initial well construction is a crucial part of ensuring safe final well abandonment. The safety and the cost saving at the end of the well life cycle is dependent upon a well-constructed isolation systems at the beginning of the life cycle. Long term studies on zonal isolation using various hydraulic or mechanical materials need to take place to further assess permanently abandoned wells to achieve the desired balance. Well drilling and isolation techniques will be more effective when they are operationally feasible and have reasonable associated cost to aid the local economy.

Keywords : plug and abandon, P&A regulation, P&A standards, international guidelines, gap analysis

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