A Step Towards Pro-active and Sustainable Elimination of Sustainable Annular Pressures

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Abstract

Objectives/Scope: This work explains a new method to pro-actively eliminate the risk of Sustainable Casing Pressure (SCP), especially SAP B, i.e., in the annulus area between the production casing and the intermediate casing. SAP B is a common E&P Industry challenge. It is an irreversible process after it has started, leading to wells being shut-in, MAASP to be jeopardized, B-annulus pressures to be routinely bled-of and an eventual capital intense well work-over.

Methods, Procedures, Process: Gas migration from the reservoir up into the well will be stopped by a bismuth alloy barrier that is V0 rated and gas tight because of the unique expansion mechanism during barrier formation. A comprehensive R&D program was executed which will be concluded with the offshore field deployment of 9-5/8” x 13-3/8” Thermally Deformable Annular Packer (TDAP) Technology, being a world first.

Results, Observations, Conclusions: Firstly, the unique sealing mechanism of bismuth alloy gets explained and how it prevents SAP- B in a pro-active manner. Thereby, creating high value from a sustainability perspective going together with an economic benefit. This will be proven by a quantification of the business case whereby emission and economic benefits related to the proactive installation are a magnitude lower i.e., less than 5% of the future emissions and cost involved by remedial work (excluding the cost of production deferment and emissions from pressure release). Secondly, the paper describes the results of the rich R&D work undertaken, whereby the annular bismuth alloy barriers were tested for withstanding up to 5000-psi pressure differential, having been formed in drilling fluid, clear brine, and cement. Thirdly, the offshore field implementation will be described. In particular, the novel planned well design and deployment of the annular packer to be set in clear brine for maximum pressure integrity with a V0 rated seal.

Novel/Additive Information: This the industry’s first downhole utilization of bismuth alloys to be used as the material from which packers are built at this size. In addition, the operational sequence is designed such that both positive and negative pressure tests of the formed packer are possible in order to maximize confidence in successful isolation of any potential gas leaks.