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A Methodology for Integrated Seal Assessment and Risking

An integrated workflow for seal assessment and risking is proposed. The methodology considers six key parameters that can be combined into a single value indicative of overall risk for the presence of a sealed trap. The approach is based on simple tenets regarding the requirements for both cap (top) and fault seal. A cap rock seals if it has membrane sealing properties, continuously covers the trap and is not cut by open fractures. Hence the probability of (success of) cap seal is given by: Pcap=i x j x k, where i is the probability of cap rock capillary seal, j of cap rock coverage of the trap, and k of the cap rock not being cut by open fractures. These parameters can be risked for different (economic) column heights.

A fault trap is sealing if both the cap rock and the fault are sealing. Further, a fault seals if deformation processes have created a membrane seal or if it juxtaposes sealing rocks against reservoir rocks, and the fault has not been reactivated post-charge. Hence the probability of fault seal is given by: Pfault={1-[(1-a) x (1-b)]} x c, where a is the probability of fault plane seal, b of juxtaposition lithology seal and c the probability that the seal has not been breached due to fault reactivation post-charge.

Thus, the overall probability of trap integrity is expressed as Ptrap=i x j x k {1-[(1-a) x (1-b)]} x c Recommended techniques for assigning a probability value to each of the parameters are also outlined.