Recommendation against MASD dispensation for HSE risk wells

SUMMARY

The Collision Avoidance Work Group recommends that health, safety or environmental (HSE) risk offset wells should always be subject to a suitably conservative Minimum Allowed Separation Distance (MASD) rule, and that dispensation from such rules should not be allowed. In particular, the probability of the drilling assembly failing to penetrate the offset well in the event of a collision cannot be reliably quantified and therefore does not justify dispensation against a HSE risk MASD.

DISCUSSION

The probability of drilling through an offset well's producing or injecting string can be split into two components:

P1, the probability of contact between the bit and the offset casing; a function of well separation and relative position uncertainty

P2, the probability of drilling through the casing; a function of the drilling tools used, drilling parameters, formation type, offset well monitoring for early warning of contact, etc.

The overall probability of penetration is the product of these two probabilities ($P1 \cdot P2$).

For the purposes of this discussion, we will assume that P1, the estimate of probability of contact, is valid or at least appropriately conservative. This assumption is reasonable, given informed and honest application of the standard methods. The ISCWSA has published several papers and internal documents that facilitate the calculation of valid estimates of relative position and safe MASDs.

P2, the probability of penetration once contact is made, is not quantified in any formal or objective way. The following are examples of actions/circumstances (sometimes referred to as mitigating actions) that are commonly assumed to reduce the probability of penetration:

- Multiple casing strings protecting the tubing
- Jetting instead of drilling
- Rotary drilling instead of motor drilling
- Drilling with a mill-tooth bit instead of a PDC bit
- Drilling with a dull or “shirt tail” bit
- Drilling with low ROP
- Monitoring the shakers for cement/steel
- Monitoring offset wellhead vibration
- Monitoring offset casing annular pressure
- Low angle of incidence between wells
- Soft formation

The Collision Avoidance Work Group has considered the effectiveness of such actions and circumstances, with the objective of providing guidance to the Industry.

The consensus of the Group is that such actions may be sensible practices in close pass situations, but their effectiveness is not predictable and they cannot reliably ensure that penetration will not occur. Therefore we do not recommend their use as justification for dispensation against the MASD criterion that would otherwise be applied to a HSE risk offset well. Their use in allowing a reduced MASD should be restricted to offset wells that do not represent a HSE risk.

Even if penetration does not occur, a collision with an offset well will result in some degree of damage to the casing. It may be damaged immediately as a direct result of the collision or it may be damaged by subsequent drilling and tripping activities prior to the reference well being cased. The extent of this kind of damage is unpredictable, but it can be severe enough to reduce the structural integrity of the offset well and be the cause of failure at a later date. This possibility reinforces our recommendation that a separation distance specified for HSE risk wells should not be compromised.

Unlike the examples listed above, magnetic ranging may better determine the relative position of the offset and reference well, and thereby modify the probability of well to well contact (P1). However, for use in HSE risk situations, the method used must provide a quantifiable and valid uncertainty estimate that can be reliably delivered during drilling operations. The modified position uncertainty can then be used in the clearance calculation to determine if the reference well passes the HSE risk MASD criterion.