

Bit balling guidelines

BIT BALLING

Balling factors

- **Clay /shale lithology with water based mud** – even with highly inhibitive muds
- Calcite content in clay may promote. Highly reactive clays with large cation exchange capacities most likely – test offset cuttings
- **Promoted by high bore hole hydrostatic pressure** - from 5000 – 7000 psi, balling almost cannot be resisted in a water based system even if all planning actions taken. This is suggested by the DEA 90 study
- **High weight on bit**
- **Poor projection of bit cutting structure** due to inappropriate bit choice or bit wear
- **Poor bit hydraulics** – low HSI as well as low flow rate
- **Poor open face volume (junk slot area)** on PDC bits

Recognition

- **ROP** - less than expected in soft rock. 5-10 m/hr may still be possible but will decrease with time
- **Torque** – less than expected and may show decrease with time
- **Added weight to bit resulting in static or negative ROP reaction.** This will be associated static or decreasing low levels of surface torque. May see some short lived transit initial responses to WOB change.
- **Standpipe pressure** – *increase by 100-200 psi with a PDC bit with no associated increase in flow.* Pressure increase may disappear when bit is pulled off bottom

Planing Actions

- **Select bit with maximum cutting structure projection** – steel tooth preferred over similar insert bit. Steel tooth bit has greater intermesh of teeth compared to an insert bit to help clean cutting structure.
- **Bit nozzles.** Do not use extended nozzles or high flow tubes. Some jetting action must be directed onto the bit cutting structure. Use tilted nozzles e.g. HCC clean sweep, Reed Mud pick or triple centre nozzles (HCC C3 option) to direct some flow onto the cones of the bit.
- **In larger bit sizes use centre jet** – do not block off.
- **Ensure good HSI for bit.** Ideally >250ft/sec in bigger bits, from 2.5-3 in bits < 12 ¼” but the higher the better. Do not maximise flow rate at the expense of HSI. 0.5-1HSI **will not clean the bit** in a balling environment.
- **Water based mud system should be inhibitive.** Silica mud alone will not prevent balling. Additions of specific additives, mainly glycol at 3-4% has been shown to be very effective at maximising penetration rates in water based mud and allowing more WOB to be run. (As was case in Skarv from 1500m in 17 ½” hole section).
- **Large face volume on PDC bits,** very open designs are required.
- **Do not run high weight** on bits in balling prone formations. If ROP falls do not increase WOB as a response. Alert crew to this.

Actions Once Balling Has Been Detected

Bits can be cleared is balling is detected early enough and actions taken.

- Reduce WOB on ROP drop, pick bit up off bottom as quickly as possible
- Increase flow rate if possible
- Spin bit off bottom with high RPM and high flow for 5 minutes
 - Or fan bit off bottom – 0.3m off bottom, pump hard and rotate bit for 5 mins. Successfully cleared bit.
- Return to drilling with very low weight
- Prepare to pump pills
 - nut plug pill – to stir up cuttings
 - high concentration glycol pill (15-20%)
 - fresh water pill – leave to soak and try to dissolve/loosen balled material
- Hope that lithology become more silty or sandy which may help clear bit
- Prepare to trip if these actions are not successful and chose more optimum, bit, hydraulics nozzling arrangement or mud system.