

# Hole cleaning,

## Hole cleaning, deepwater directional wells

The key to optimising hole cleaning in directional wells is through integrating a good well plan, mud properties and drilling practices, supported by careful rig-site monitoring and observation.

### Well Plan

- **Hole angle** - Deviated wells require higher annular velocities than vertical
- **Hole size** - Plan large diameter hole sections closer to vertical
- **Hydraulics**
  - Plan for high flow rate *Large diameter dp, minimise restrictions in mwd, motor, collars*
  - BHA Design : *Run what you need.*
  - Select nozzles to balance ROP optimisation required to clean the bit & bottom of the hole
  - Mud pumps - *Determine flow rate and horsepower requirements for all critical sections*
- **Slide Drilling** – Select best bit, BHA to maximise use of rotary drilling *i.e. to stir-up cuttings beds*
- **BHA** - Select simple BHA with high bypass area to assist tripping in & out of hole
- **Casing Programme** - Plan minimum rat-hole consistent with safe running of casing
- **Floating Vessels** - Consider using riser booster pump when drilling at low flow rates
- **Planning Tools** - Use Programmes / Hole Cleaning Charts / Guidelines / Stuck pipe handbooks / Guidelines

### Mud Properties

- **Mud Chemistry** - Ensure chemical compatibility to prevent cuttings swelling
- **Wellbore Stability** - Avoid hole enlargement (*washout & break-out*)
- **Flow Regimes** - Generally use thick muds in laminar flow (*unless ECD is critical*)
- **Mud Rheology** - Select muds with high YP/PV ratios and enhanced low shear viscosity
- **Pump Rate** - Use DEAP hydraulics to determine minimum mud flow rate

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## Drilling Practices

- **ROP** - Control instantaneous drill rate to avoid overloading annulus with cuttings
- **Pump Failure** - Stop drilling and circulate until full pump capacity is restored
- **Slide Drilling** - Conduct rotary wiper trip after prolonged periods of sliding
- **Viscous Pills** - Use only when essential. Take special care with lo-vis pills to maintain high flow rate
- **Dense Pills** - Use only when essential. Limit volume to avoid fracturing formation
- **Tripping** - Circulate the hole clean prior to tripping. a single bottoms up is not sufficient
- **Monitor the hole** – Always wipe the string prior to connection to monitor drags !
- **Excessive drags** – ( Slackoff and overpull ) Work through tight spots ensuring the pipe is free in opposite direction to drag. Work gradually to predetermined maximum overpull ? sklack off limits
- **Jarring** – Know and understand how the jar works
- **Backream** - *Only when essential* . Control maximum backreaming rate
- **Lithologs** – Have mud loggers prepare one for tripping

## Rig Site Indicators

- **Cutting size & shape** - Rounded cuttings indicate poor carrying capacity
- **Cuttings Return** - Use ROP to estimate anticipated cuttings rate at shakers
- **Torque & Drag** - Use Drillstring simulator to predict torque and drag. ***Look for deviations from trend***
- **Erratic Torque / SPP** - Look for indicators of cuttings beds & packing-off
- **Trend Analysis** - Compare drag trends on subsequent trips to indicated presence of cuttings beds
- **Hole Fill** - Monitor string weight for indications of fill on bottom.