

This article describes an effective way to respond in case a drill-string is perceived to be differentially stuck.

The objective of the method is to effectively reduce the differential-pressure between wellbore and formation by reduction of wellbore hydrostatic by displacing heavy-fluid inside the string with light-fluid. Reduction/removal of differential pressure will increase the potential for the pipe to come free and operations to resume. This can be done in a safe and quick manner.

This generic procedure, that is very similar to and inflow-test, outlines the requirements to be in place and the steps to follow in case of a differentially stuck pipe event. The actual set up may differ slightly from rig to rig.

PREPARATION – what to have in place for efficient response to differential sticking

Run a multi-cycle circulation tool (e.g. Well-Commander®) as part of the BHA as close to the bit as possible. For ball operated tools this is likely on top of any of the other BHA components.

For sub-sea operations the choke and kill lines should have the fluid-weight as the well-bore.

Have a volume of light fluid (Base-oil, Water, etc) available. Ideally the available volume matches, at least, the string capacity plus surface line volume.

RESPONSE – when string is expected to be differentially stuck, see figure 1 for rig-up.

1. OPEN Multi-Cycle Circulation Tool (MCCT); e.g. drop the opening-ball. Drilling mud-weight inside the string.
2. Install a FOSV below the single above the rig-floor for added control and safety.
3. Line up mud pumps for pumping light-fluid down the string.
The Choke and the Valve 2 upstream of the Choke should be CLOSED.
4. Line up on light-fluid with mud pump and displace string with light fluid. Ensure surface volume is considered.
5. Once displacement of light-fluid is complete record the backpressure on the string.
Backpressure should equal the difference in hydrostatic between inside and outside of the drill-string.
6. Lock in max torq and set-down weight.
7. CLOSE Annular BOP, with minimal closing pressure.
Line up trip tank to circulate over the Annular, to check for leaks.
8. Isolate the mud-pump by CLOSE Valve 1 and OPEN Valve 2.
9. Reduce backpressure in stages (e.g. 100 psi increments) by bleeding light-fluid via the choke.
Wait 10 minutes each increment dropped, to confirm pressures are stable and well is not kicking.
The following table is an example of planned reduction in hydrostatic for each reduction in backpressure:

BP reduction	0 psi	100 psi	200 psi	300 psi	
EMWt at MCCT	9.5 ppg	9.2 ppg	8.9 ppg	8.6 ppg	

10. When the desired reduction in hydrostatic is reached work (jar) string free, if required.
**Note: If at any time it is not possible to bleed off backpressure it is likely well hydrostatic is at balance with formation pressure; i.e. formation pressure is pushing back on the string.
Stop bleeding off and work string.**

Regardless the result (free or not free) of the release-attempt the next step is to restore the hydrostatic balance in the wellbore.

11. With the Annular-BOP still shut, CLOSE the Choke and Valve 2. OPEN Valve 1 and apply the original backpressure back on top of the column of light-fluid, pumping light-fluid with the mud-pump.
At this point, with the back-pressure restored, the system should be balanced.
Note: Any gauge reading casing-pressure should now read zero.
12. OPEN BOP.
13. Rotate the string while slowly pulling back a stand (to place BHA in different position in hole).
Keep string rotating.
14. Keep annulus full via trip tank and U-tube out base oil from string in a controlled manner.
Mud Engineer to observe returns.
15. Once back flow has stopped, break out stand and rack back.
Break off each connection leaving a high stump, engage TDS after racking stand and commence rotation/slumping prior to engaging mud pumps. Have single prepared in mouse hole, just in case it is required. Only commence circulation when string is rotating free).
16. Continue to back-ream out of the hole to a “safe” point above the potential differential sticking zone.
17. CLOSE the MCCT.
18. Consider adjust the mud-weight for drilling ahead or pulling out of hole.

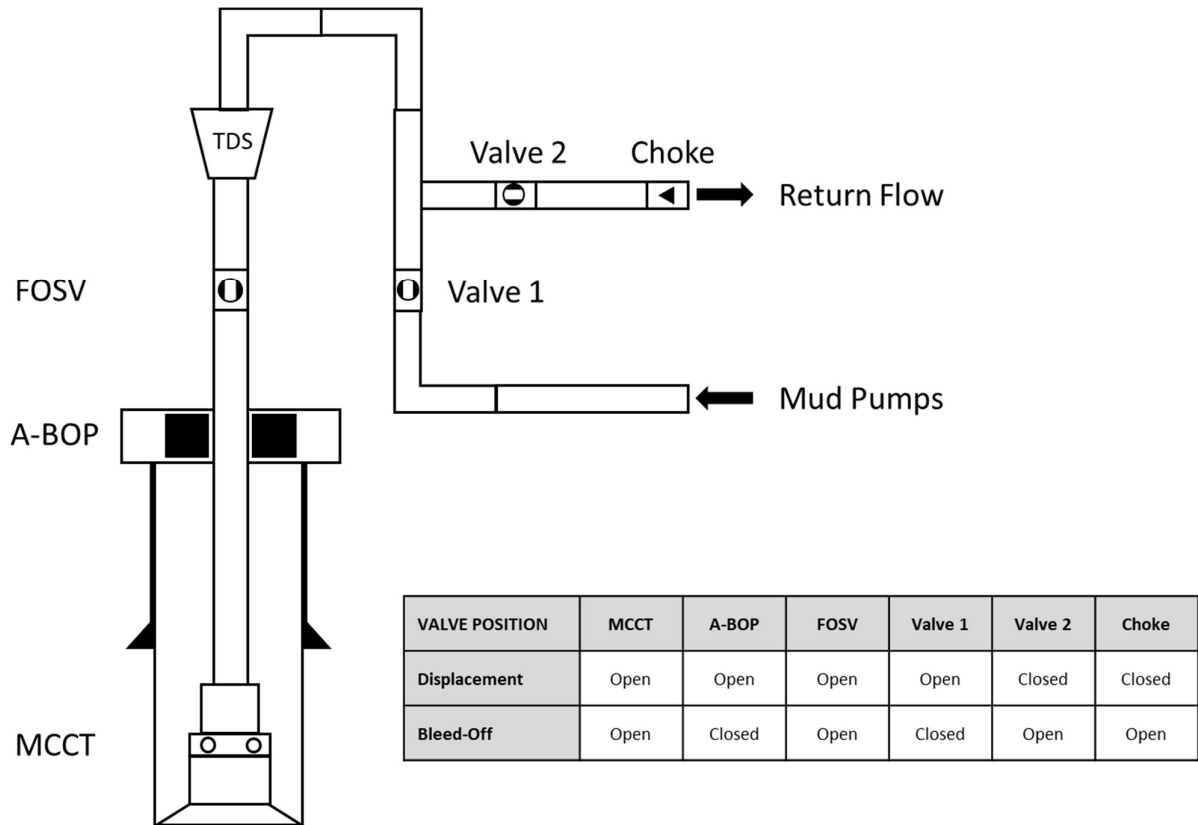


Figure 1 - Rig-Up