Conductor Jetting Guidelines, Campos Basin - Brazil

The notes below were prepared to guide the jetting operation for our BS-2 well in the Campos Basin offshore Brazil. The operation was successful, and gave time savings with respect to drilled and cemented conductor.

However, it is emphasised that jetting is an empirical process, because of its strong dependency on soil conditions. Accordingly, what works for one area may not work in another. Operators are therefore strongly advised to consult local experience if available.

Planning

1. **Site survey**: check carefully for permeable layers (sands, pebbles, etc.), as these may stall the motor. Jetting is usually only advised in clay-only formations of soft to medium stiffness (2 kPa/m max).
2. **Conductor design**: five joints if at all possible, flush OD connectors. Four joints is necessary at some locations, for which it is not possible to jet five. Jetting 36" pipe is harder than 30", so deep water wells, which require 36" for conductor strength, may require four joints rather than five. As a general rule, you are better off making a good job of jetting four joints, than trying to jet five where the soil conditions don’t allow it, and unduly reducing soil strength via excessive reciprocation. The right number of joints is therefore determined by local conditions, and what works at one site may not work at another. Consult local knowledge if available.
3. If possible, a guidelinelless system should be used, to avoid potential guideline twisting during drill-jetting.
4. **BHA**: most of the BHA can be as standard for 26" hole. Jetting-specific features are:
   - **Bit**: position with respect to the shoe is critical. Normal practice West of Shetland is to set the bit 3-5" inside the shoe. However, bit positions up to 3" outside the shoe have been used successfully in other locations (GoM, Brazil). Jetting with the bit outside the shoe increases ROP and reduces the need for reciprocation, but increases the risk of broaching. Consult local experience if available.
   - **Motor**: a low-speed motor should be used (e.g., 9 7/8" F2000 Dynadrill) to give good torque at low flow rates.
   - **DCs**: use heavy collar (9 1/2") low down in the BHA to get weight to the bit.
   - **Drill-ahead tool** (DQ CADA or similar).
   - Jars are not usually run, due to interaction with the drill-ahead tool.
   - A guide funnel may be used to assist with casing stabbing. If so, ensure interference checks are correctly made.
   - Straight motors have traditionally been employed, although recently bends of up to 1 deg have successfully been used. Some operators have found this makes reciprocation more difficult.
5. Consider the need for high-strength DP to enable the required pick-up for reciprocation.
6. A mud mat may be used, to give additional support to the conductor early after jetting. Practice varies in this respect.
7. **Casing design:** cement the first inner string to surface if at all possible. This gives the conductor axial support from the first string, and avoids relative movement. A good quality cement job is important, i.e., bring cement up to nearly inside wellhead.

**Operations**

1. Before starting jetting, calculate the weight below the drill-ahead tool. Limit the set-down weight to 80% of this, to avoid accidental unlatching. Set the number of shear pins in the drill-ahead tool accordingly.
2. Stab the conductor into the seabed under self-weight, keeping pump rates to the minimum required to stop the bit plugging (150-300 gpm).
3. **Flow rates:**
   - Penetration < 50 ft: as low as possible initially. Use the ROV to watch for broaching around the outside of the conductor, especially at low penetrations, and reduce flow rate if necessary. Then ramp up to 700 gpm.
   - Penetration > 50 ft: continue watching for flow broaching. If OK, ramp up to 1300 gpm by 100-150 ft penetration, but reduce when nearing TD (see 5 below).
4. Only reciprocate if absolutely necessary, e.g., to avoid getting stuck and increase ROP. Experience with West of Shetland sites is that frequent reciprocation is necessary after the first couple of joints, and that it is not possible to jet more than five joints even with reciprocation. Pick up only the minimum distance required to break skin friction (usually less than 10 feet), then set back down again.
5. Try not to reciprocate within the last 15-20 ft of TD unless essential to avoid getting stuck, and reduce the pump rate to the minimum possible.
6. Expect ROPs of around 50 ft/hour, usually reducing with depth. If the ROP increases towards 100 ft/hr, reduce the pump rate, as high ROP is an indication of soil fluidisation and/or excessive loss of skin friction.
7. Once TD has been reached, hold the conductor weight on DP, and allow a soak time for soil healing, as follows:
   - Low ROP and/or high skin friction over final joint: 4 hours.
   - High ROP and/or low skin friction over final joint: 6 hours.

**Often, lower end soak times can be satisfied just by the preparation time for the next operation(s). Do not set down any weight during soaking (i.e., this will prevent drilling ahead). Use the heave compensator if available, as rig heave delays soil healing.**

8. At the end of the soak period, proof test the conductor by picking up the buoyant weight of the first inner string. If the conductor moves, allow more soak time and repeat. If the second proof test is unsuccessful, it may be necessary to recover the conductor and respud.
9. When drilling out of the shoe for the next hole section, use the minimum possible pump rate until the hole is well established.
10. When running the first inner string, hold the string weight on DP during cementing. This minimises conductor loads, allows more time for soil healing, and reduces risk of conductor subsidence. Cement prior to setting rigid lockdown; this gives extra buoyancy and allows
more time before setting weight onto the casing string. Ensure that the wellhead flowby areas enable this to be done without interfering with the preload mechanism.