



# Weatherford®

Controlled Pressure Drilling® (CPD®) Services

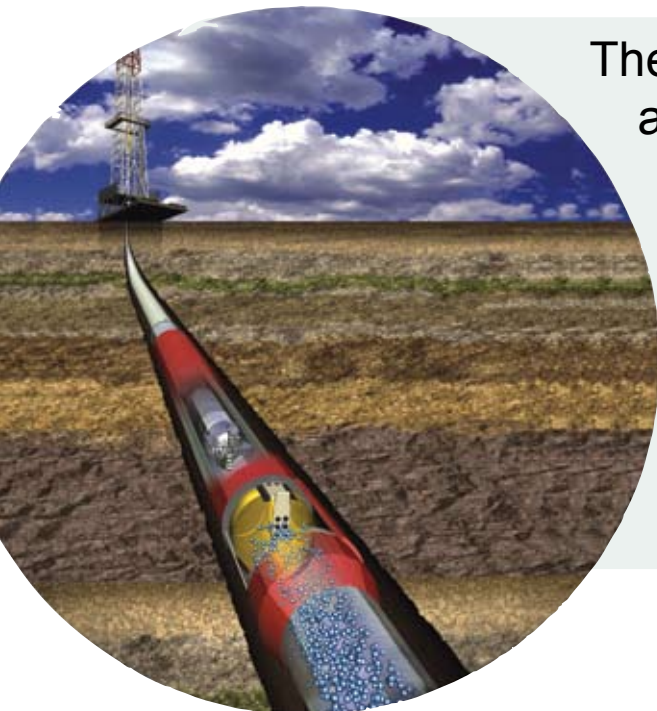
## Application Answers

# Safe and Efficient Change-Out of Bottomhole Assemblies During Underbalanced Drilling Operations

## The DDV™ Downhole Deployment Valve

### Challenge

During the drilling and completion phases of underbalanced wells, one of the biggest challenges operators face is the safe, efficient installation and retrieval of tubulars and bottomhole assemblies (BHAs) on a repeated basis with pressure at surface. Conventional approaches, such as killing the well, snubbing techniques, or extended drawdown to reduce bottomhole pressures, present their own problems and do not contribute to the overall safety and effectiveness of the operation.



The *DDV* tool provides a viable alternative to snubbing, extended drawdown, or killing the well, and facilitates safe and efficient installation and/or retrieval of drillstring and completion assemblies during underbalanced drilling operations.



### Answer

Weatherford's *DDV* tool—run as an integral part of the casing string at a pre-determined depth—addresses these concerns and provides for the elimination of snubbing, extended drawdown, and the need to kill the well, thereby allowing safe installation of drillstring and completion assemblies during underbalanced drilling (UBD) operations. In addition, use of the *DDV* tool increases well productivity by reducing formation damage.

With the valve in the closed position, pressure is isolated below it, and operations can be conducted above it to run BHAs with their variable running ODs under zero-pressure conditions and at regular tripping speeds. Once the valve depth is reached, pressure is applied from above to equalize, the valve is opened, and the tubulars and BHAs can be stripped to total depth below the *DDV* tool, using a rotating control device (RCD) and/or conventional blowout preventers (BOPs) sealing on standard pipe ODs, and drilling can resume.

Once total depth has been reached, the same procedure is followed in reverse to remove drilling BHAs for the last time. Pressure is isolated below the flapper and evacuated above before the final tripping operation. The completion process can then be conducted in a similar manner, with the completion packer assembly being stripped below the *DDV* tool and conventionally set and tested.

Involving Weatherford during the design stage of the well can ensure optimal placement of the *DDV* tool to fulfill well objectives.

### Constraints

Live-well conditions present many safety considerations, in particular pressure at surface. The problem is how to change out BHAs in conditions of pressure at the surface during UBD operations. Historically, only three methods for overcoming this challenge have been available:

- *Killing the well.* This option is not viable, as it negates the whole point of drilling underbalanced, namely elimination of formation damage.
- *Performing snubbing operations.* Snubbing presents its own set of challenges, including safety issues, footprint, mobilization and setup time and cost, reduced tripping speed, short lubricating capabilities, and increased personnel needs.
- *Using extended drawdown to reduce forces.* Flowing the well for an extended period of time can lead to formation damage, such as near-wellbore depletion, and time sensitivity. In addition, emissions and pollution are issues, as are safety and lost drilling time.

None of these approaches is desirable; and, in any event, they may not be operationally possible in all cases. All of these issues can be addressed by the use of the *DDV* tool.

### Features, Advantages and Benefits

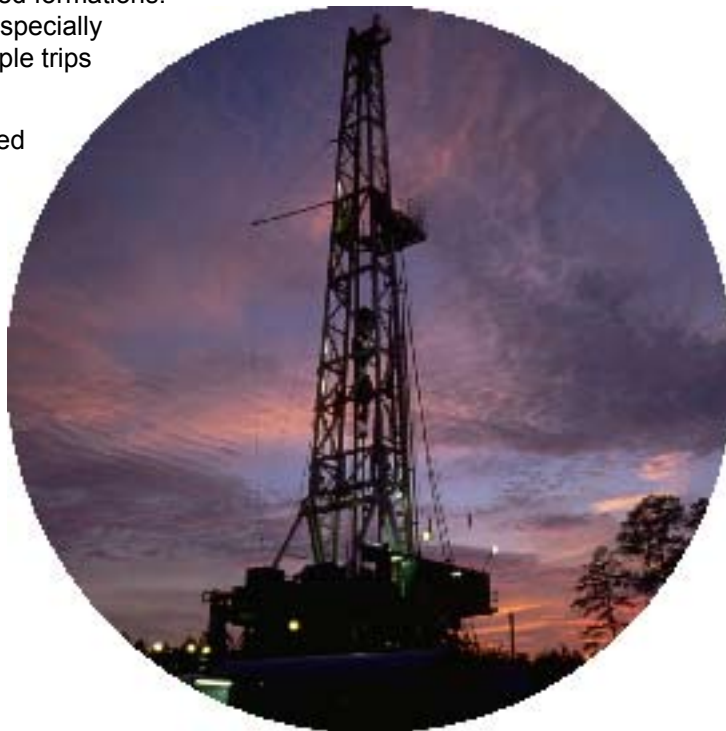
- The *DDV* tool allows operators to run BHAs and tubulars into the well without killing it. Using the *DDV* tool to maintain the well in an underbalanced state removes the requirement to pump and recover fluids. In cases of particular well profiles, specialized fluids may be needed to minimize formation damage.
- Pressure is isolated below the *DDV* tool at a depth where the forces being exerted by pressure are less than the mass of the BHA and the tubulars below (pipe-light conditions). The BHA can then be stripped into the well, using a conventional BOP and/or RCD sealing around a standard pipe OD.
- The variable ODs of the BHAs, whether in the drilling or completion phases, can be staged into the well without changing BOP rams, thus accelerating operations and enhancing safety. Tripping times and risk exposure are reduced, as tubulars are not being hydraulically manipulated into and out of the well under pressure.



- Complete BHAs can be staged into the well in a single run during both the drilling and completion phases, eliminating the need for multiple trips.
- Only one person is required to operate the *DDV* tool, as opposed to a complete snubbing crew.
- The *DDV* tool has no physical footprint on the rig floor.
- The *DDV* tool is installed once, whereas snubbing equipment must be rigged in and out for each trip.
- The well is not flowed for an extended duration without pipe in the hole, maintaining the ability to kill the well in the event of an emergency.
- BHAs and tubulars are handled at the surface, using conventional techniques, which enhances personnel and operational safety.
- The well is maintained in an underbalanced state below the *DDV* tool, reducing the chance of migrating to an overbalanced condition when drilling depleted formations. This advantage is especially relevant when multiple trips are required.
- Emissions associated with flaring are reduced, and loss of nonrenewable resources is minimized, helping to avoid environmental issues.

### Operational Outline

1. Install and test the *DDV* tool.
2. With the *DDV* tool closed and integrity-tested, deploy the long downhole assembly, using the casing as a lubricator.
3. Increase pressure on the casing string to equalize the pressure across the *DDV* tool, and pump through it.
4. Apply pressure to the opening control line to open the valve and continue into the well under pressure, stripping the running tubulars through a rotating control device (RCD) or using conventional coiled tubing or wireline pressure-control equipment.
5. To retrieve the assembly, pull out of the hole to a point above the *DDV* tool, and close it by applying pressure to the closing control line.
6. Bleed off surface pressure to verify closure, and retrieve the long downhole assembly.





## Controlled Pressure Drilling® (CPD®) Services

Weatherford's CPD® services help optimize drilling, testing and production processes to increase the net present value of your assets. We achieve this through an industry-exclusive package of services that includes:

**Evaluation** expertise to quantify potential *CPD* benefits • **Controlled pressure engineering** experience for better well planning • **Project execution** expertise with *CPD* project managers, wellsite engineers and supervisors and equipment specialists • **Largest fleet of surface and subsurface pressure control equipment** • **Performance tracking experience** for continual improvement • **Optimization process tuned for exploitation.**

Learn more about the DDV™ downhole deployment valve, its unprecedented record for reliability and operational success, and how it can be used to enhance drilling and completion operations by maintaining underbalanced conditions. Contact your local Weatherford representative, visit [weatherford.com](http://weatherford.com), or write to [ddvanswers@weatherford.com](mailto:ddvanswers@weatherford.com).

The no-snub, no-kill answer.