Weatherford®

DDV® Downhole Deployment Valve

Improve efficency

Reduce risk

Pressure Isolation

Drilling

Evaluation

Completion

Production

Intervention

Closed-Loop Drilling

- Air drilling
- Downhole tools
- Fluid systems
- Managed pressure drilling
- Pressure-control equipment
- Underbalanced drilling

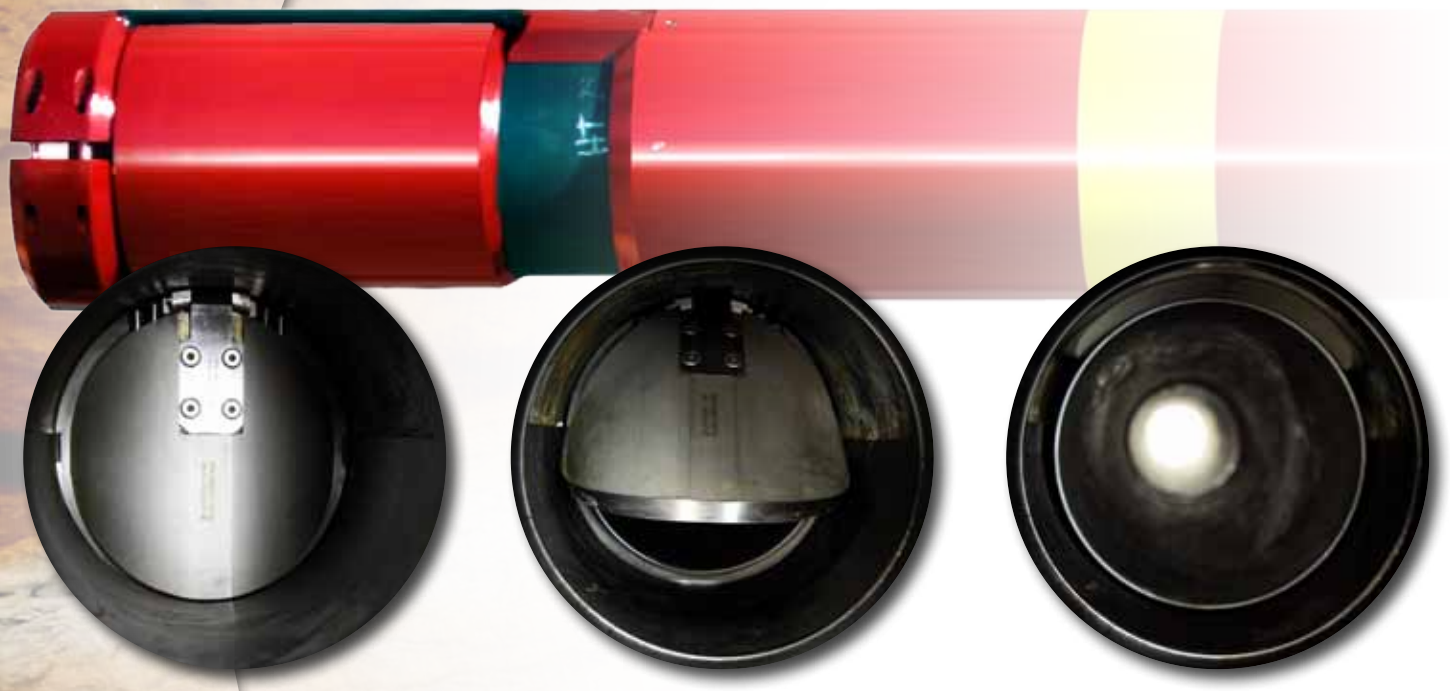
Deeply dependable.

Isolate reservoir fluids and geohazards downhole to enhance safety while improving tripping efficiency.

DDV® Design

From the drawing board to industry-leading technology in just over a decade

The *DDV* system is used to isolate critical wells worldwide in a range of applications. In underbalanced and near-balanced conditions, the system offers a viable alternative to conventional tripping techniques to enhance safety and efficiency, as well as minimize formation damage. And, in managed pressure and closed-loop drilling operations the system offers maximum protection to personnel, assets and the environment while tripping and when pipe is not in the hole.



2000
Weatherford develops industry's first *DDV* system.

2001
Weatherford completes the industry's first successful downhole isolation valve installation with the *DDV* system.

2002
Weatherford completes seven *DDV* installations.

2003
Weatherford develops 9 5/8-in. system in response to industry need and completes nine installations.

2004
Weatherford introduces two additional 7-in. systems and completes fifteen installations.

2005
Weatherford inaugurates specialized *DDV* training program for support personnel and develops 7-in., NACE-certified system. 32 *DDV* installations completed.

2006

Total *DDV* installations reach 100.

2007

64 installations completed.

2008

Weatherford develops 7-in., NACE-certified system with a higher pressure threshold. 97 installations completed.

2009

Weatherford develops second-generation 9 5/8-in. system and begins developing *DDV* technologies based on casing specifications, enabling installations at greater depths and higher temperatures.

2010

Weatherford develops 7 5/8-in. system. 36 installations completed.

2011

Weatherford implements *DDV* Quality Control Plan to ensure continued performance excellence and global standardization and develops 10 3/4-in., NACE-certified system for hostile environments. Total *DDV* installations exceed 350.

DDV® Deliverables

Applying the Technology to Optimize Drilling, Completion and Re-Entry

DDV technology has opened up new possibilities in a variety of applications. In underbalanced and near-balanced operations it presents an alternative to conventional tripping methods to enable faster, safer tripping, while minimizing formation damage. It is also ideally suited for closed-loop drilling and managed pressure drilling (MPD) applications, providing an added measure of security.

Affording Maximum Protection to Personnel and Assets during Closed-Loop Drilling

Challenge: Especially pertinent in deepwater and high-pressure/high-temperature (HP/HT) environments, closed-loop drilling offers an effective means to protect personnel and assets; it enables the use of specialized techniques, such as MPD, and associated technologies, like rotating control devices and the Microflux™ control system. During closed-loop drilling operations, however, handling kicks when tripping out of the hole or when pipe is not in the hole presents a risk.

Answer: *DDV* technology creates an additional protective barrier, further reducing risk to personnel, assets and the environment when tripping or changing the bottomhole assembly (BHA) during closed-loop, as well as conventional drilling operations. It also minimizes the potential for swabbing resulting from forces created when pulling drilling assemblies out of holes.

Eliminating the Need for Conventional Underbalanced Tripping Methods to Enhance Safety and Efficiency

Challenge: Weatherford employs Secure Drilling℠ techniques—which include underbalanced drilling and completion—to mitigate formation damage and pressure-related hazards, such as high-pressure zones and fluid losses. The same underlying conditions that necessitate these practices also require the use of specialized tripping methods. Conventional approaches—such as killing the well, snubbing or extended drawdown—tend to reduce drilling efficiency, elevate the risk of formation damage, add costs and undermine safety.

Answer: A viable alternative to conventional tripping techniques in underbalanced, near balanced and live well conditions, *DDV* technology creates a reliable barrier to isolate pressure below the valve. In so doing, it helps ensure safe, efficient installation and retrieval of BHAs, tubulars or completion assemblies at standard tripping speeds.

Optimizing Deployment of Long, Complex Assemblies

Challenge: Inadequate length of a lubricator assembly can undermine safety and increase rig time when installing or recovering long, complex assemblies during drilling and completion operations. This is especially true in underbalanced, near-balanced and live well conditions.

Answer: Permanently or temporarily installing a *DDV* system as part of the casing effectively converts the casing into a subsurface lubricator that can accommodate long and complex assemblies during drilling and completion operations.

Improving the Economics of Pressurized Mud-Cap Drilling (PMCD)

Challenge: A variant of MPD, PMCD minimizes costly mud losses and associated nonproductive time (NPT) when drilling in highly depleted zones or cavernous formations. The technique necessitates killing the well before pulling the BHA out of the hole, however, adding time and costs to PMCD operations, especially when several trips are required.

Answer: *DDV* technology eliminates the need to kill the well when tripping, reducing the time and associated costs of PMCD operations. In some cases, *DDV* technology can make the otherwise cost-prohibitive application of PMCD economically feasible.

Averting Swab Effects When Tripping

Challenge: When drilling in reservoirs with narrow pore-pressure/fracture-gradient windows, tripping can induce swab, potentially inducing fluid losses or kicks and adding time and costs to your operations in the process. Multiple trips exacerbate the problem.

Answer: *DDV* technology helps you control the wellbore-pressure profile effectively without inducing swabbing to avoid inducing kicks and losses and the associated NPT and added costs.

Operation:
When a trip is required the BHA is positioned above the *DDV* system, which is then closed by the surface control unit. Pressure is bled off above the *DDV* system and the well is monitored to confirm isolation. The BHA is tripped without pressure at surface and at conventional speeds.

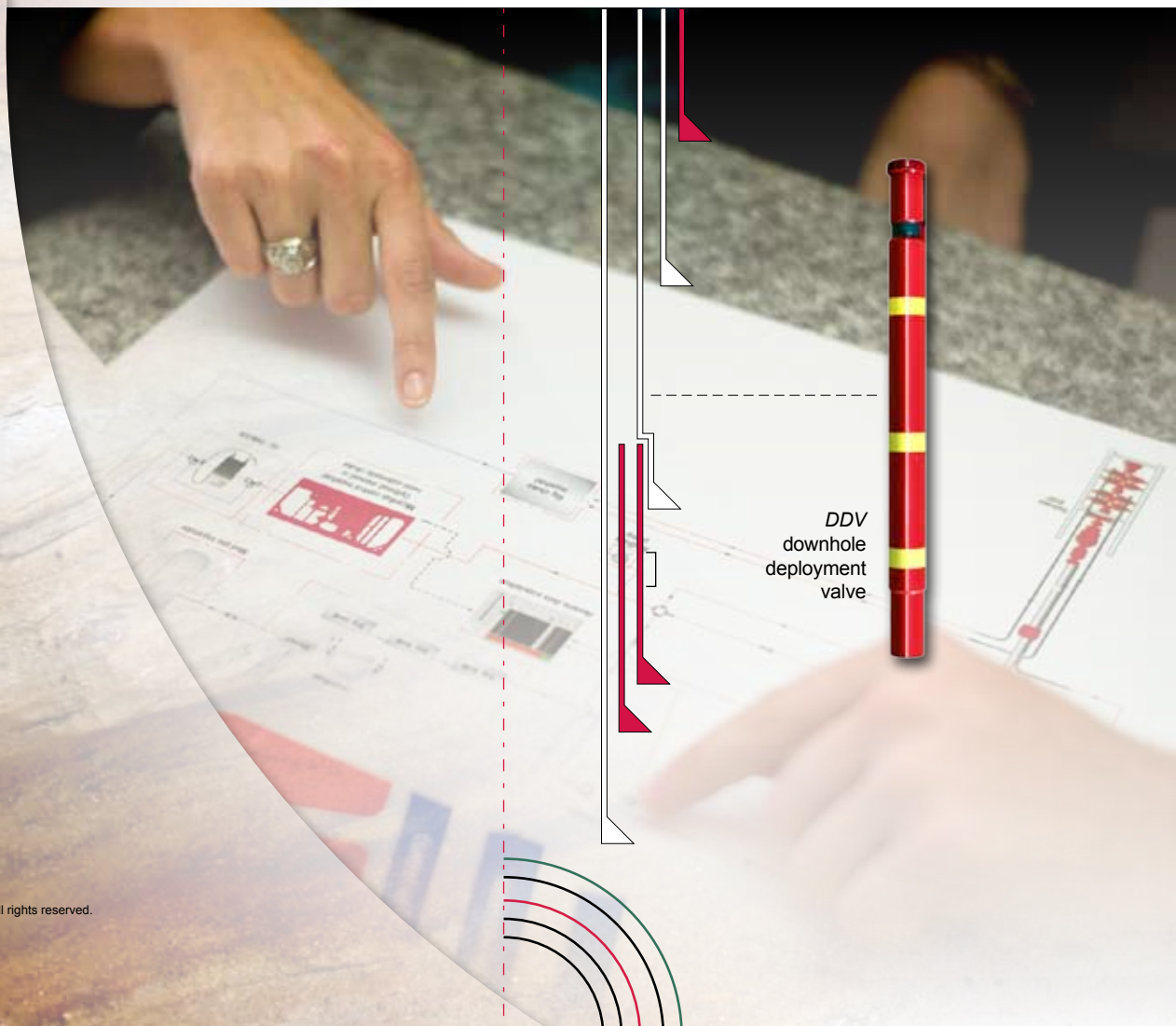
The DDV® Difference

Coupling a Cutting-Edge Design with In-Depth Expertise

We have continued to enhance *DDV* technology to meet the demands of increasingly challenging operating environments. For example, we engineer the system in accord with casing specifications so that *DDV* technology does not become the proverbial weak link in the chain. But at Weatherford, we also know it's not just about building better technologies. Our people have been instrumental in the success of the *DDV* deployment system, from its early stages of development to installations throughout the world.

Laying a foundation for service excellence through dedicated training.

In addition to developing *DDV* technology, we created associated training programs for *DDV* support personnel. The tailored classroom, field- and Web-based instruction helps ensure that they are well versed on the product and well prepared to meet your operational objectives. With an active competence-assurance program, we also assess their skills on an ongoing basis. Less than six years after the inception of the program, more than 250 individuals received specialized *DDV* instruction.



Maximizing reliability with the *DDV* Quality Control Plan (QCP).

The QCP is designed to cover all aspects of quality—people, process and equipment—from early planning through installation and operation of the *DDV* system. Pursuant to our *DDV* QCP, the valves undergo rigorous testing before being deployed in the field.

Tracking performance to optimize results.

The Weatherford Performance Tracking System contains extensive data on actual *DDV* installations throughout the world. We use it to select *DDV* models suitable for given operating conditions and in ongoing research-and-development (R&D) initiatives to optimize *DDV* performance.

Backed by robust engineering resources.

Our experts custom-engineer the *DDV* system to fit into your well design. We have deployed the system in a variety of demanding environments including sour, HP/HT and ultra-deep and are actively engaged in R&D efforts to evolve the technology for more demanding environments as needed.

DDV® Deployments

Our deeply dependable *DDV* system has enha for operations throughout the world.

Western Canada

DDV Technology Enables Drilling of Exploration Well from Slant Rig

A unique operating environment precluded the use of a snubbing unit to trip tubulars and deploy a long, complex logging suite and intricate completion assembly. *DDV* technology overcame the challenges to enable safe, efficient tripping; the operation marked the first such application of *DDV* technology.

Texas, USA

DDV Technology Saves Three Days, US$350,000 in Horizontal Well

A *DDV* valve was set at 6,600 ft (2,012 m) measured depth (MD) as an integral part of the 7-in. casing in a horizontal, Austin Chalk well. It eliminated the need to kill the well during drilling, reducing total tripping time by three days and saving the client US$350,000.

Venezuela

DDV Technology Reduces Rig Time, Associated Costs While Tripping in a Live Well

Using *DDV* technology during drilling and completion operations eliminated the need to kill the well, thereby minimizing rig time and costs associated with tripping in a live well. The approach also illuminated a viable technique for performing future workovers in similarly underbalanced conditions.

nced safety and efficiency

North Sea

DDV Technology Reduces Tripping Time by Three Days, Saves £400K

Deployed as an integral part of the casing and set at 12,800 ft (3,901 m) MD, _DDV_ technology eliminated the need to kill the well while tripping out of the hole, saving the operator approximately £400,000 (US$780,000).

The successful operation marked the _DDV_ technology's first offshore application.

South Sumatra, Indonesia

PMCD, _DDV_ Technologies Enable Cost-Effective Drilling, Completion of Big-Bore Gas Wells

Weatherford designed a dual-_DDV_ system to maximize safety during tripping and completion operations in an overpressured, highly fractured limestone reservoir.

The specialized system effectively protected personnel and assets, in accord with client objectives; it also limited fluid losses and facilitated drillstem testing, well testing and logging.

Papua New Guinea

Dual-_DDV_ System Enables Safe Tripping, Completions in Overpressured, Fractured Reservoir

Weatherford designed a dual-_DDV_ system to maximize safety during tripping and completion operations in an overpressured, highly fractured limestone reservoir. The specialized system effectively protected personnel and assets, in accord with client objectives; it also limited fluid losses and facilitated drillstem testing, well testing and logging. On a subsequent well, the _DDV_ system isolated pressure 53 times over a 324 day period.

Secure Drilling℠ Services

Weatherford's *DDV* systems are part of a broad range of *Secure Drilling* products and services designed to mitigate drilling hazards related to wellbore pressure profiles and ultimately, to optimize life-of-well performance.

Personnel and asset protection.

The use of technologies, such as *DDV* valves and rotating control devices (RCDs), to protect wellsite personnel and rig equipment is a cornerstone of our *Secure Drilling* methodology.

Detection and management.

We use advanced drilling technologies, like the Microflux™ control system, to detect kicks and fluid losses expeditiously. We couple that equipment with specialized techniques—including MPD and all its variants—to effectively manage wellbore pressure profiles during operations.

Reservoir evaluation.

We draw on our extensive evaluation capabilities to obtain pertinent reservoir data—such as pore pressure, fracture gradient, hydrocarbon composition—that inform drilling and completion decisions.

Performance optimization.

Leveraging reservoir data and other resources, we design and implement strategies to optimize life-of-well performance.

DDV® Downhole Deployment Valve

Deeply dependable.

To learn more about reducing risk, improving tripping efficiency and minimizing formation damage in underbalanced and near-balanced conditions with our field-proven, *DDV* downhole deployment valve, contact an authorized Weatherford representative, email **ddvanswers@weatheford.com or visit weatherford.com/ddv.**

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