

DRILLING SERVICES

JETSTREAM[®] RFID CIRCULATION SUB

Maximizing the efficiency of
challenging offshore drilling
operations



DRILLING & FORMATION EVALUATION

WELL CONSTRUCTION
COMPLETION & STIMULATION
PRODUCTION



Weatherford[®]

UNLOCK THE POTENTIAL OF YOUR DRILLING OPERATIONS.

Experience the freedom of selective, unlimited actuation with the JetStream RFID circulation sub.

The key to unlocking the full potential of your drilling operations has two components: the ability to adjust operations for unanticipated challenges and the ability to complete the job in as few trips as possible. With three positions, multiple applications, and dynamic activation options, the JetStream RFID circulation sub gives you the power to achieve maximum drilling efficiency and operational flexibility.

OPEN THE DOOR TO MANY POSSIBILITIES

- Increased annular velocity
- Clean wellbores and blowout preventer (BOP) stacks
- Lower nonproductive time (NPT)
- Efficient spotting of lost-circulation material (LCM) and kill-weight fluids

GET A HANDLE ON EFFICIENCY

Many circulation subs can clean wellbores, spot remediation fluids, and jet BOPs—but not all three in one trip. The JetStream sub is different. Because there is no limit to the number of actuations, you can use

a single JetStream sub as many times as needed to execute multiple operations without tripping out. The ability to run multiple JetStream subs in tandem—with subs at different, strategic positions along the drillstring—gives you additional functionality and flexibility.

KEEP ALL OPTIONS OPEN WHILE DOWNHOLE

A single deployment of the JetStream sub enables several different applications:

During drilling:

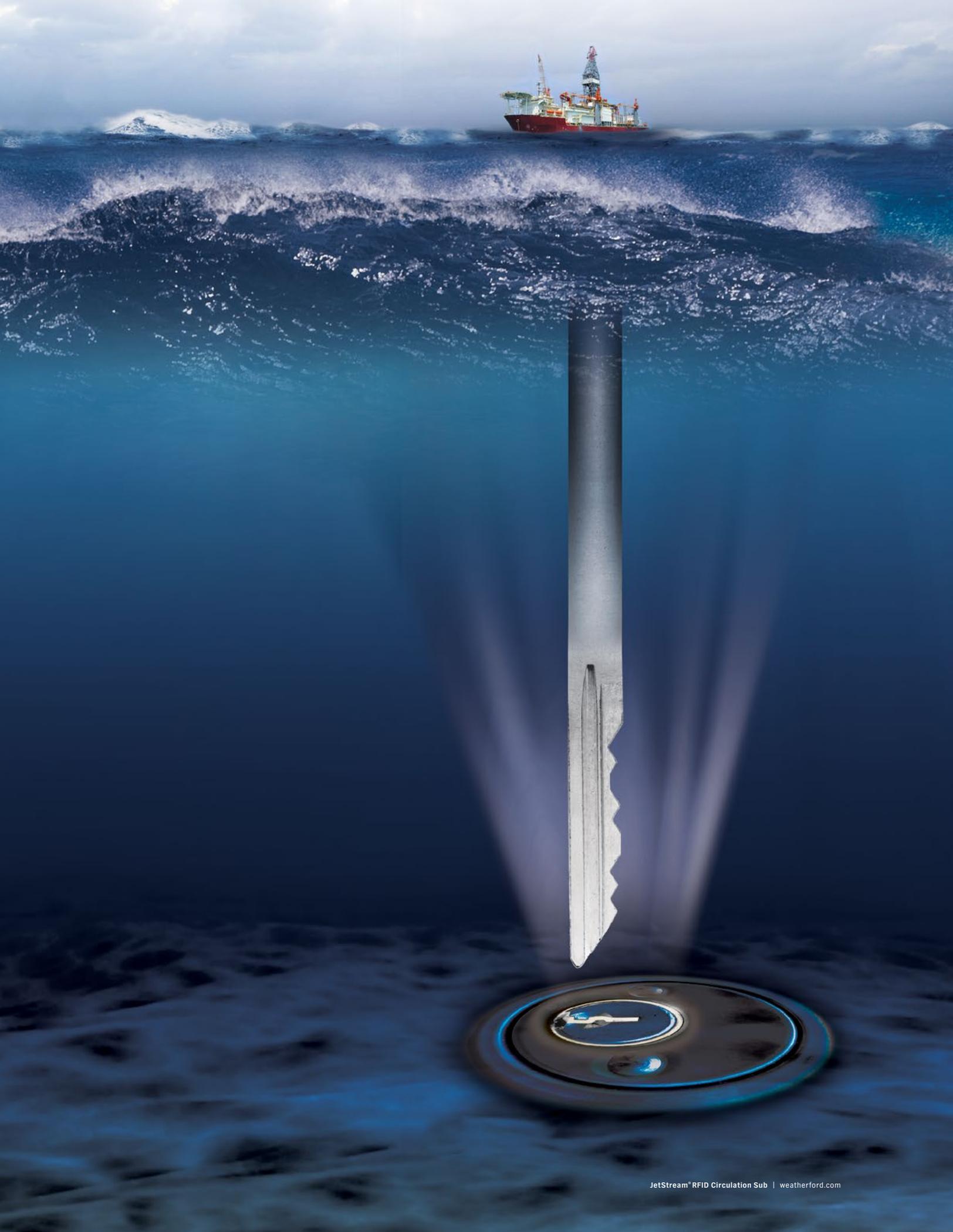
- Boosts annular velocity for more effective wellbore cleanup

For remediation:

- Precisely spots LCM and kill-weight fluids to restore mud flow

After drilling:

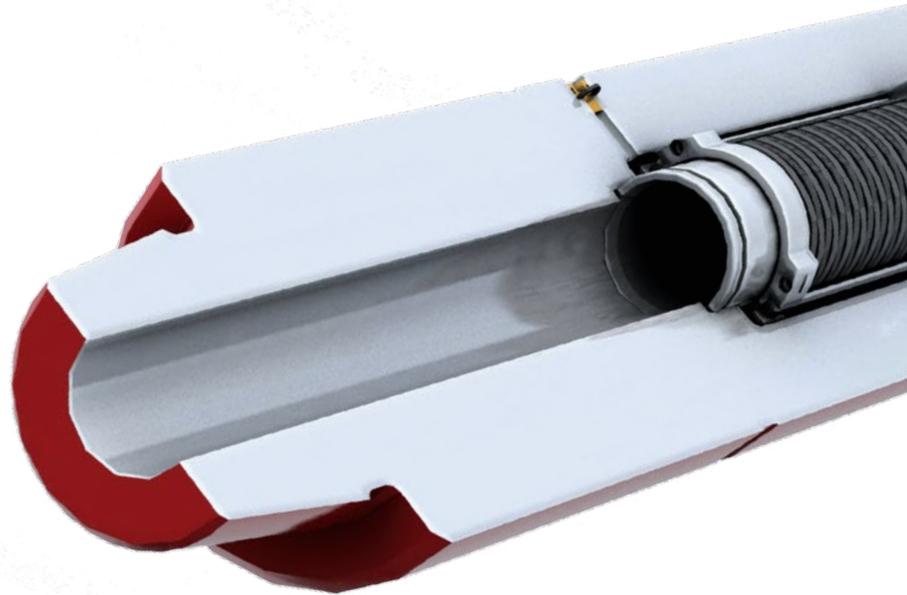
- Produces turbulent flow downhole for hole cleaning
- Jets subsea BOPs and wellheads



THE MASTER KEY

How downhole RFID technology enhances operational flexibility

In addition to the first RFID-actuated circulating valve, the JetStream sub features a number of other advanced technologies.

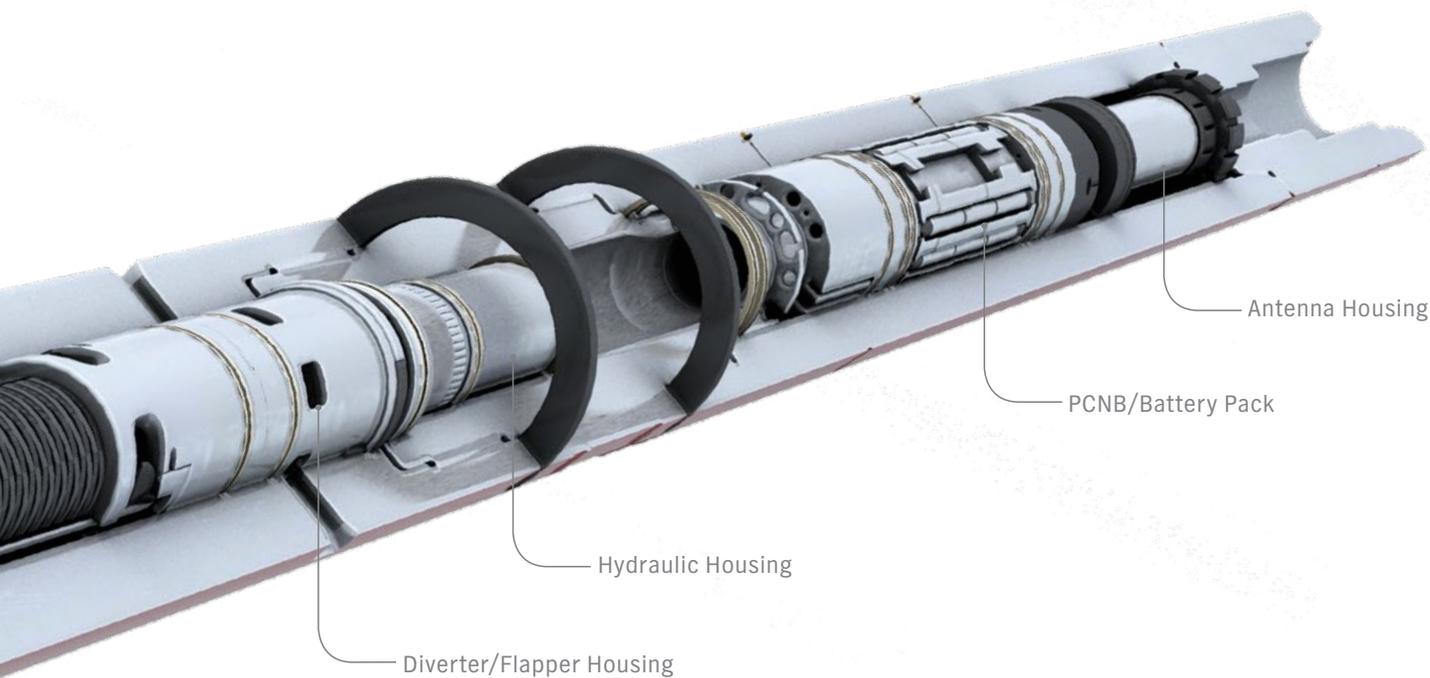


When seeking to boost the flow of fluids from one area to another, one of the simplest solutions is to remove any obstacles from the path. The JetStream sub accomplishes exactly that by eliminating bulky mechanical actuators and their associated risks, which enables full through-bore flow and maximizes the total flow area.

Unlike most circulation subs on the market, the JetStream sub is controlled using RFID—short for radio-frequency identification—technology. Our field specialists program multiple RFID tags at the surface, which enables on-demand deployment of the tags throughout the operation. When the driller needs to actuate the sub, an RFID tag is dropped from the surface and communicates commands to the sub as it flows past the tool. Upon receipt of the RFID signal,

a hydraulic pump driven by a battery-powered electric motor moves a sleeve into one of three pre-configured positions: open, closed, or our unique split-flow position.

RFID technology offers several advantages over traditional actuation devices. In the absence of bulky balls, seats, darts, and pins, the inside diameter (ID) remains at full bore throughout the drilling process. The result is higher annular velocity and turbulent flow. The JetStream sub also saves time by enabling selective, unlimited activation of a series of subs without the need to pull out of hole. Finally, because the JetStream sub does not rely on downhole hydraulics for actuation, the tool is effective in a variety of applications, including low-flow and underbalanced drilling operations.



ONBOARD MEMORY

The circulating valve logs all downhole events, including time, drillpipe pressure, hydraulic pressure inside the sub, temperature, and battery capacity. An i-Rabbit close-proximity wireless communication device enables data to be quickly retrieved and displayed on a vertical strip chart.

LARGE ID AND PORT FLOW AREA

At 8.25 in.² (5,502 mm²)*, the port flow area of the JetStream sub is among the largest in the industry. The sub also features a large ID that is not restricted by bulky balls or seats and remains at full bore throughout each operation. The fullbore ID boosts flow rates and enables operators to access tools in the lower bottomhole assembly (BHA).

*Measurements are for the 7-, 8.25-, and 9.5-in. tool sizes. The 5.25-in. tool has a port flow area of 3.9862 in.² (2,571.7 mm²).

SPLIT-FLOW POSITION

The JetStream sub can be configured with an option to open the ports and the diverter simultaneously to clean out cuttings while drilling. The split-flow position is especially useful in drilling-with-liner and low-flow operations.

ADJUSTABLE NOZZLES

Numerous nozzle configurations enable you to define how the flow is split between the annulus and the BHA. By controlling the amount of fluid that is diverted, you can adjust the total flow area and boost annular velocity.

BACKUP SYSTEM

A pressure cycling sequence is available for backup communication.

MOVE BEYOND OPEN AND SHUT.

The technology that enables versatile, on-demand use of the JetStream sub also gives you the freedom to selectively actuate any valve in a string of RFID-compatible tools. Each RFID tag deployed with the JetStream circulation sub communicates one of three commands:

CLOSED POSITION

Ports closed, diverter open

Enables unrestricted, full through-bore flow during drilling



OPEN POSITION

Ports open, diverter closed

Redirects fluids back to the surface with high-velocity, turbulent annular flow for efficient wellbore cleaning



SPLIT-FLOW POSITION

Ports open, diverter open

Simultaneously diverts a customizable percentage of the flow through the wellbore and boosts annular velocity, which enables you to clean out cuttings while drilling



REAL RESULTS

1.5 DAYS AND \$350,000 SAVED

in the Caspian Sea

Weatherford deployed the JetStream sub above other BHA components that included a conventional underreamer. Because the JetStream sub has a large ID and no ball seats, the driller was able to access and use tools on the lower end of the BHA to perform several operations during the same trip.

By minimizing the number of trips required to complete drilling, the JetStream sub saved the operator 1.5 days of offshore rig time valued at approximately US \$350,000. The sub also helped to achieve high flow rates, high annular velocity, and turbulent flow, which contributed to better hole clean-out and improved wellbore integrity.

TOTAL DEPTH ACHIEVED

in a challenging North Sea well

Anticipating the risk of total fluid loss while drilling through a soft, porous formation in a critical offshore well, the operator chose to deploy a JetStream sub. At approximately 10,446 ft (3,100 m), the fluid loss rate reached 300 bbl/hr (48 m³/hr) and the team actuated the JetStream sub into the open position using preprogrammed RFID tags.

During the 14-day drilling operation, the team actuated the JetStream sub 16 times to spot 29 LCM pills. Precise spotting enabled the driller to bring the loss rate below 20 bbl/hr (3 m³/hr) and reach a total depth of 14,048 ft (4,282 m). Without the efficient and precise LCM spotting provided by the JetStream sub, the operator may have been forced to abandon the asset.





Unlock the potential of your drilling operations with the versatile, efficient JetStream RFID circulation sub. Visit weatherford.com/jetstream to connect with our performance drilling professionals.



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