

FORMATION EVALUATION

WIRELINER FORMATION TESTING AND SAMPLING TECHNOLOGY

Innovative designs that deliver representative fluid samples and precise pressure gradients every time

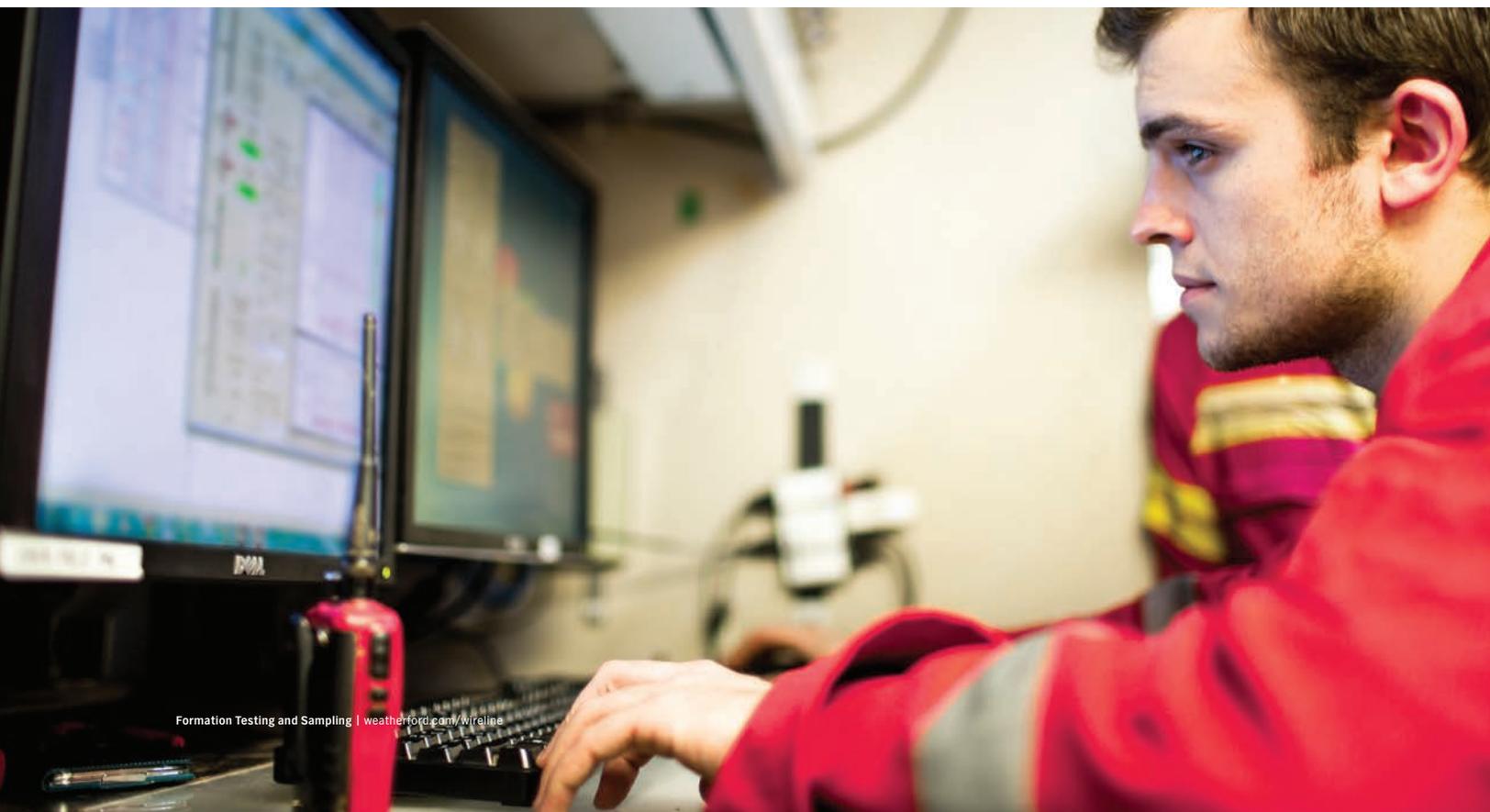
■ DRILLING & FORMATION EVALUATION
WELL CONSTRUCTION
COMPLETION & STIMULATION
PRODUCTION


Weatherford[®]

WE PROVIDE FORMATION TESTING AND PVT FLUID SAMPLING IN A **WIDE RANGE OF CONDITIONS**

Formation pressure and sampling data is critical to understanding your reservoir, but acquiring this data has its challenges. Weatherford offers modern technologies—including the reservoir evaluation system (RES) and the Compact™ formation sampler (MFTD)—to provide the measurements and samples you need to evaluate your reservoir. Optimized for challenging well geometries, our wireline technologies enable testing reservoirs and taking PVT samples efficiently while minimizing sticking risks during data acquisition.

We offer a formation testing solution for nearly any application, including basic pressure measurements in tough conditions, high-integrity PVT samples in exploration wells, and advanced formation testing in complex reservoirs. In extreme hole conditions where wireline logging is deemed impossible, we can deploy the MFTD using our patented Compact well shuttle conveyance to acquire pressure tests in memory.



Broad scope of applications

Our versatile tools enable you to obtain formation pressure data in any well type—including low-angle, high-angle, and horizontal wells—and in wells with restricted areas. Weatherford is the only company that can log holes ranging from as small as 3-7/8 in. (98 mm) up to 22.5 in. (571.5 mm).

Efficient operations

Our MFTD is a centralized and completely electromechanical tool that sets and retracts much faster than standard hydraulic tools. In addition, our MFTD features the shortest flowline storage in the industry, which results in faster stabilization times for more efficient operations. These combined features save significant rig time—and make the MFTD stand out as the first choice to obtain pressure test data.

Our RES also provides class-leading pretest flowline storage for the same efficiency gains as the MFTD. Capable of obtaining multiple samples, the RES tool has dual flowlines that can increase the pump-out rate, deliver faster cleanout, and allow for customizable sample-collection configurations, such as the focused sampling technique. The RES also provides flexible placement of system modules and true backup pump-out.

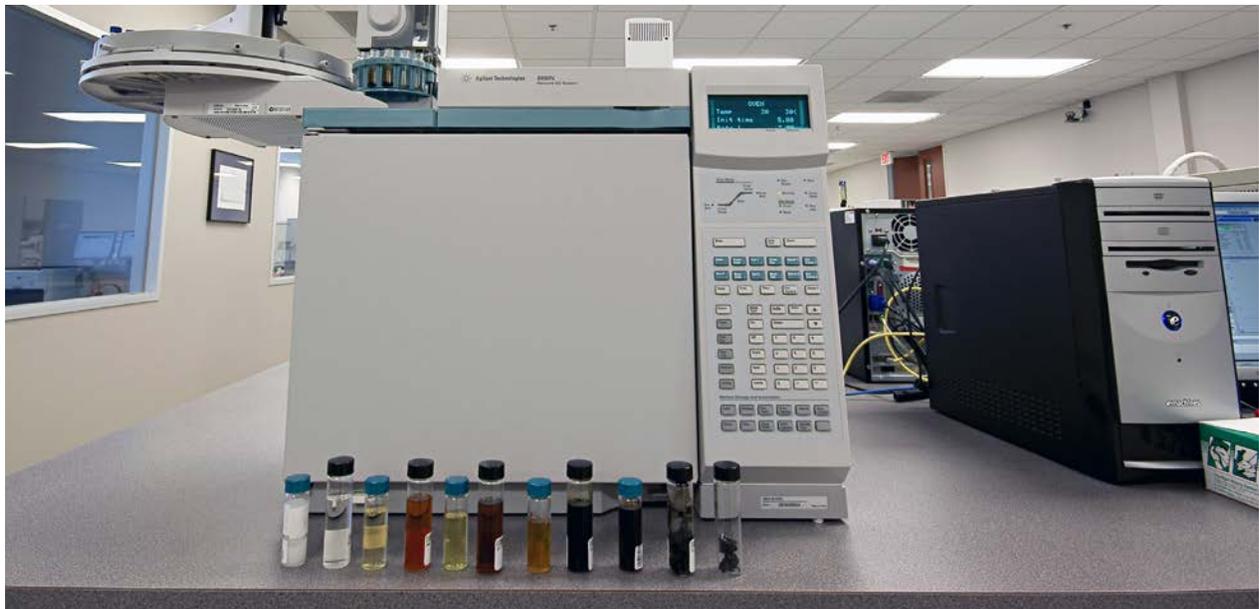
Complementary technologies

Our MFTD and RES can both be used in difficult scenarios to increase operational efficiency. For example, we can perform basic pressure tests using the MFTD, which has the best track record among its peers for pressure testing without sticking. Then we can take PVT samples using the advanced RES for full fluid identification and efficient cleanout.

This order of operations limits the exposure of the larger and more advanced RES to obtaining samples or conducting advanced formation testing, such as mini drillstem tests (mini-DST), minifrac, microfrac, and vertical interference tests (VIT).

Flexible designs

Our tool designs are modular, which gives you the flexibility to run just the modules you need in your tool stack. Depending on the exact needs of your data acquisition program, you can run a few or all of the modules in the respective tool systems.



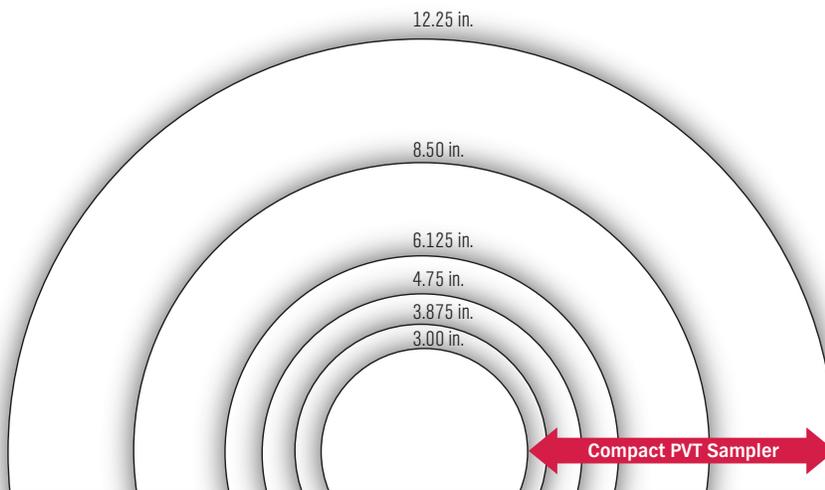
Formation Testing Capabilities: Weatherford offers an extensive portfolio of formation testing services that includes our wireline technologies and logging-while-drilling (LWD) techniques. We also offer offsite laboratory services for core and sample analysis by Weatherford Laboratories.

COMPACT™ FORMATION SAMPLER (MFTD)

The slimmest, self-centering design
for quality testing and reliable sampling

Small, light, and easy to operate, the MFTD captures true flowing PVT samples in slim boreholes and through pipe. The innovative design of the MFTD automatically centers the tool body to optimize pad contact with the wellbore for a reliable pressure-testing seal and a reduced risk of differential sticking. The slim profile allows for running the tool past restrictions smaller than 3 in. (76 mm) and for operating the tool in boreholes of up to 14 in. (356 mm).

The MFTD has multiple conveyance options: It can be deployed on monocable, on heptacable, and in memory without wireline, which is particularly advantageous in offshore environments. You can use recorded or real-time pressure data acquired by the MFTD to calculate formation pressure gradients, determine fluid contact levels, determine fluid mobility, and define formation permeability. The latest advancements in this technology enable the tester to take up to three PVT samples with basic fluid identification.



Compared to conventional formation testers, the MFTD can operate in slimmer holes.

Location: Russia



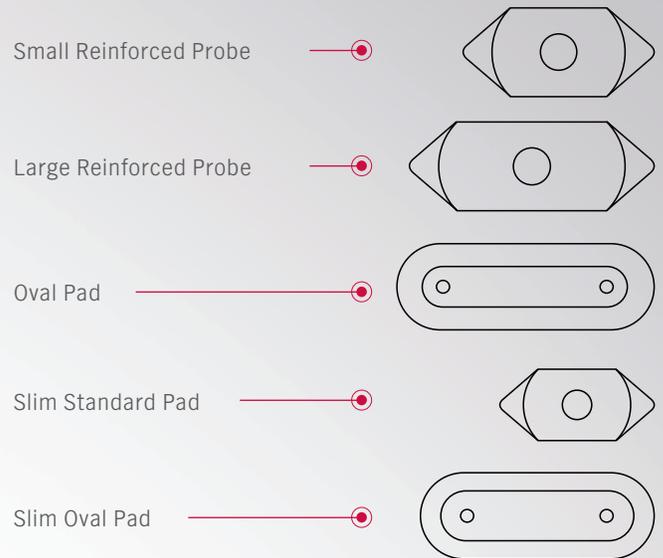
COMPACT™ FORMATION SAMPLER COLLECTED PVT SAMPLES THROUGH 3.5-IN. TUBULARS IN WORLD FIRST

Weatherford proposed the MFTD to collect three PVT samples in each of four 4 7/8-in. (123.8-mm), deviated sidetrack wells. Deployed through pipe, the 2.4-in.-OD MFTD minimized the risk of stuck tools and wellbore instability. The quality samples and pressure data—acquired in an average per-job operational time of 27 hours—helped to optimize production efficiency.

Features

- Centralization of the tool reduces contact area and differential sticking
- Hydraulic-free design adds reliability and efficiency to operations
- A unique tool design enables fast setting and retraction
- 2.4-in. (61-mm) trim enables acquisition of data otherwise unobtainable through drillpipe in open holes
- Memory capability enables multiple deployment options to obtain pressure data in difficult wells
- Three sample chambers provide basic sampling capabilities

MFTD probe options



Applications

- Development wells
- Wells with severe doglegs
- Slim holes
- Complex well geometries
- PVT samples

MFT Specifications

TOOL		MFTD for pressure testing and sampling	MFT for pressure testing
OD	Minimum trim	2.40 in. (61 mm)	
	Standard trim	2.75 in. (70 mm)	
	Large trim	3.5 in. (89 mm)	
Length		85 ft (27 m)	13.68 ft (4.17 m)
Weight		751 lb (341 kg)	108 lb (49 kg)
Maximum temperature rating		320°F (160°C)	
Maximum pressure rating		15,000 psi (103 MPa)	
Maximum borehole diameter		14 in. (355 mm)	

RESERVOIR EVALUATION SYSTEM (RES)

The slimmest advanced formation tester
with the leading flowline storage
for maximum efficiency

As the slimmest advanced formation tester on the market, the RES reduces the chances of sticking without sacrificing data quality. The 4.5-in. tool can be run in holes from 5-1/2 to 14-1/2 in. with no need for additional hardware. Redundant features, including dual quartz gauges and dual flowlines, enhance reliability and bring efficiency and predictability to formation testing operations.

The RES also features class-leading flowline storage and high-volume sampling capacity. You can run two pump-outs in the same tool stack for more efficient cleanout and focused sampling operations. Advanced formation testing capabilities of the RES include VIT, minifrac, microfrac, pressure transient analysis, and mini-DST.



Developed by Weatherford and compatible with both RES and MFTD technologies, the versatile, DOT-certified, nitrogen-compensated PVT bottles can hold up to 700 cc of formation fluid.

Location: Iraq



RESERVOIR EVALUATION SERVICES

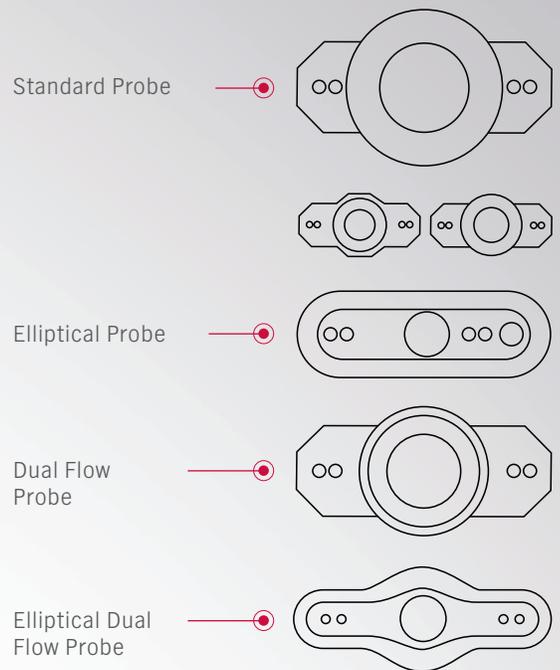
OBTAINED CRITICAL WATER SAMPLE WITH ZERO STICKING ISSUES

In a low-permeability onshore well in which other companies had failed to acquire water samples, Weatherford deployed the MFTD to obtain pressure data and to assess borehole conditions. Data from the MFTD enabled the operator to run the RES to the optimal depth and retrieve two samples for PVT laboratory analysis.

Features

- Uniform 4.5-in. OD (slimmest in the industry) reduces sticking risks
- The lowest pretest flowline storage in its class results in faster stabilization times
- Dual flowlines enable quicker sampling cleanout
- Dual quartz gauges increase the reliability of pressure readings
- Flexible dual-packer spacing of 1.6 to 16.4 ft (0.5 to 5 m) isolates a larger area for formation testing
- Large sample bottle is DOT-certified and H₂S rated, which protects sample integrity
- High-articulation pad conforms to uneven surfaces to seal tightly for accurate pressure readings
- Fluid measurement tool provides calibrated fluid density, viscosity, resistivity, and dielectric measurements
- Patented technology enables optical fluid analysis to determine contamination and take reliable samples

RES probe options



Applications

- Clean PVT sampling
- Focused sampling
- Downhole fluid analysis
- Tight reservoirs
- Advanced formation testing

RES Specifications

OD	4.5 in. (114.3 mm)
Maximum temperature rating	347°F (175°C)
Maximum pressure rating	20,000 psi (138 MPa)
Maximum borehole diameter	22.5 in. (571.5 mm)



Visit **weatherford.com** to learn more about increasing reservoir certainty by using our robust portfolio of formation testing and sampling technologies.



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