

Water Sampler Temperature Pressure

Scientific Application

The Water Sampler Temperature Pressure (WSTP) tool is a self-contained, battery-powered tool adapted to an Inner Core Barrel assembly that is deployed in the Bottom-Hole assembly (BHA) of the Advanced Piston Corer/Extended Core Barrel (APC/XCB) or the Rotary Core Barrel (RCB) using the Collected Delivery System (CDS). The WSTP can be used to sample pore fluids in sediment, borehole fluids, temperature.

The WSTP consists of a Sample Chamber and electronics (timer and temperature data recorder) that are contained within the Inner Core Barrel; only the strong shaft and probe tip (containing the sampler filter and temperature sensors) protrude beyond the bit. A pressure case protects the electronics from water damage.

Operation

The tool is lowered down the drill string on the coring wireline with a 5–10 min pause above the mudline to check recorder performance and water temperature. The tool latches into the BHA with the bit just above the bottom of the hole. The driller maintains circulation to keep the hole bottom clear of fill. The probe protrudes ~1 m ahead of the bit and is pushed into the formation by lowering the BHA. The probe is held in the formation for 10–15 min to obtain enough data for extrapolation of in situ temperature. The tool is also capable of taking a column water sample from anywhere in the hole.

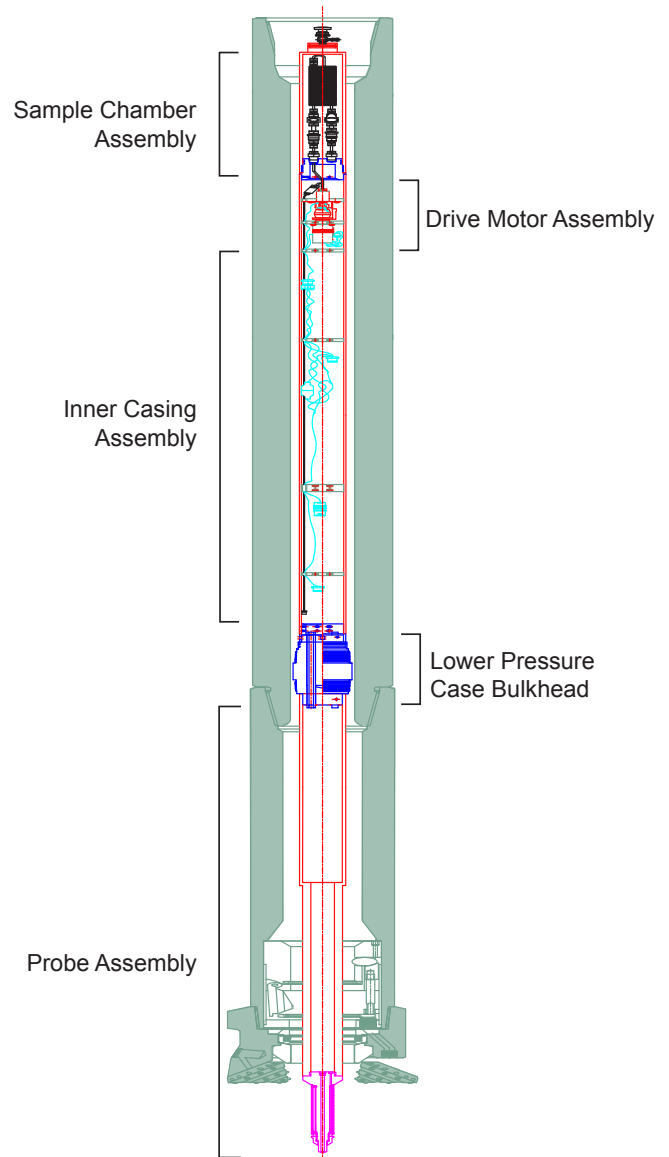
Features

Compatibility

The WSTP is compatible with the APC/XCB and RCB BHA and coring systems.

Multiple Temperature Measurements

During a single deployment by wireline, the WSTP can measure temperatures at multiple depths in the



WSTP in the BHA.

water column and open wellbore, and it can be pushed into soft to stiff sediments and washed ahead (i.e., advanced with high circulation rate without rotation) for multiple measurements.

Titanium Components

Many of the parts of the WSTP can be either titanium or stainless steel. The stainless steel parts are the most

commonly used because of cost considerations but for certain experiments, the science staff may request that titanium be used (Ti may require long lead times and/or custom fabrication due to availability). No matter which metal is chosen, the two cannot be mixed.

Specifications

Outside Diameter

2¹/₄ in. outer diameter body with 4 in. outer diameter Landing Shoulder

Probe Tip Extension Beyond Bit Face

XCB fully extended: 49 in.

XCB fully retracted: 42 in.

RCB: 37¹/₂ in.

Length

XCB: Fully extended: 511.9 in.

RCB: 498.6 in.

Maximum Overpull Strength

100,000 lb

Pressure Rating

10,000 psi (6500 mbrf depth)

Temperature

Normal Range: 0°C to 100°C

Maximum Electronics Temperature: 85°C

Resolution: 1 mK

Fluid Sample

10–15 mL in 1/8 in. stainless steel (SS) or titanium tubing coil

1000 mL in SS overflow chamber (contains 75 mL distilled load water and drill water)

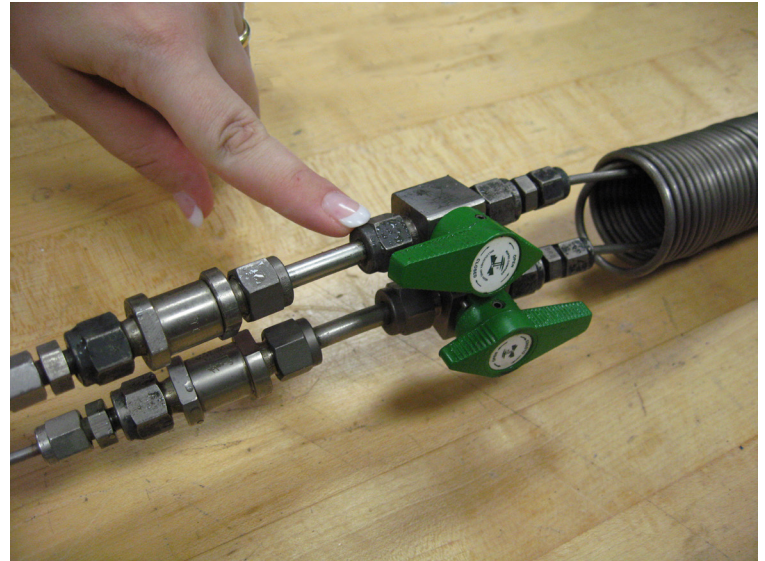
Operating Range

Temperature

The standard tool is rated to 85°C.

Formation

The WSTP can be deployed in soft to semiconsolidated sediments (e.g., chalks or firm clays) where the probe



WSTP valves and stainless steel coil.

can penetrate without damage or formation fracture. It has been used to 400 mbsf depths.

Limitations

The probe must be held stationary for ~10 min in undisturbed sediments to obtain good temperature data. The weight required to push the probe into sediments and hold it stationary depends on sea conditions and sediment strength (~5000–14,000 lb without the CDS; ~5000–7000 lb with the CDS). Inadequate weight may allow the probe to move (adding frictional heating or fluid movement around the probe). Excess weight may push the probe deeper (adding frictional heating, fracturing the formation, or allowing fluid movement).

The tool must be set properly before deployment to avoid premature operation or excess waiting time on bottom.

The Probe Tip cannot be used in hard rock (e.g., chert, dolomite, limestone, or basalt).

WSTP measurements using the RCB BHA should be taken at depths only where hole conditions are stable and sufficient weight can be maintained to hold the probe stationary.

Very shallow sediments may not support the minimum 5000 lb weight required for heave compensation.

Hole depth must be >100 mbsf to support the BHA.