MDCB

Motor Driven Core Barrel

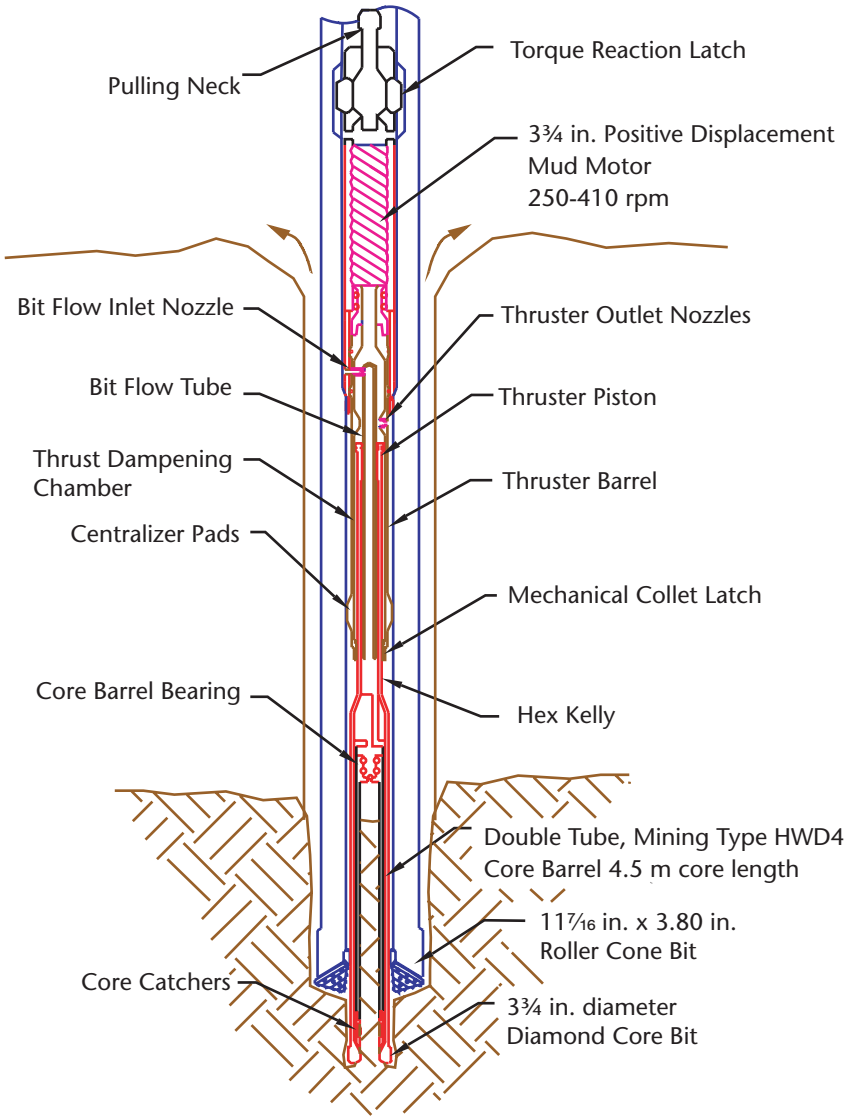
OCEAN DRILLING PROGRAM
www.oceandrilling.org

Scientific Application

The Motor Driven Core Barrel (MDCB) is a wireline-retrievable coring system compatible with the Advanced Piston Corer/Extended Core Barrel (APC/XCB) bottom-hole assembly (BHA). It is designed to improve core recovery in formations that are difficult to APC/XCB core (e.g., hard fractured crystalline rock, interbedded hard/soft formations, and friable conglomerate and reef materials). The MDCB is typically used to recover intermittent short intervals (a few 4.5 m cores) because of the handling time (~1 hr) to prepare the tool for consecutive coring runs.

Tool Operation

The MDCB can be run interchangeably with the APC/XCB coring systems with the addition of a latch sub to the BHA. The MDCB consists of a motor section, thruster section, inner core barrel section, and a narrow-kerf core bit. The motor section is powered by the hydraulic force of fluid pumped down the drill string, which causes the motor to rotate. The thruster section uses hydraulic force to provide weight on bit (WOB) and advance the inner core barrel. The inner core barrel section has a 4.5 m core tube with a thin-kerf core bit on bottom; the core diameter is 2.25 in. (57 mm).



Schematic of the MDCB tool.

Design Features

1) Diamond Core Mining Technology

Compared to the APC/XCB coring system, the MDCB operates at higher revolutions per minute (rpm) with lower WOB and uses narrow-kerf surface-set diamond-impregnated as well as geoset and tungsten carbide core bits to recover cores from friable, laminated hard/soft, and crystalline formations.

Benefit: The MDCB applies less drilling stress to the formation, which may improve core quality and recovery in friable, fractured, or crystalline formations.

2) Positive Displacement Mud Motor

Downhole rotation and torque are produced by a Baker-Hughes Inteq Mach 1P positive displacement mud motor with a 7:8 lobe rotor/stator power section.

Benefit: The motor rotates the bit; therefore, drill string vibration is eliminated.

3) Thruster Unit

Hydraulic force is translated into WOB, and interchangeable nozzles optimize WOB at various flow rates.

Benefit: The WOB can be controlled to provide a more uniform application of weight to the diamond bit, thereby improving diamond bit life and recovery.

4) Core Barrel Assembly

A modified version of a standard Christensen Mining Products HWD4 inner core barrel provides a nonrotating core tube to receive the core sample into a clear plastic liner.

Benefit: Reduces rotational torque and stress in cores to improve core quality and recovery.

5) Diamond Core Bits

A 3.75 in. (95 mm) outer diameter (OD) core bit is used to trim a 4.5 m long × 2.25 in. (57 mm) diameter core. Optional bit types include: narrow-kerf diamond-impregnated or surface-set diamond bits as well as geoset and tungsten carbide core bits.

Benefit: Different bit cutting structures can be selected for each MDCB run, based on the anticipated formation, to optimize core quality and recovery.

6) Interchangeability

With the addition of a latch sub, the MDCB can utilize the same BHA as the APC and XCB.

Benefit: Eliminates extra pipe trips to change the BHA.

Specifications

Tool size OD	3¾ in. (95 mm)
Motor pressure	1160 psi
Pump rate	190 gpm
Power	96 hp
Bit speed	410 rpm
WOB	2000–8000 lb
Max. torque	1250 ft-lb
Bit flow rate	15–35 gpm
Efficiency	83%
Core diameter	2.25 in. (57 mm)
Core length	4.5 m

Rig floor flow test of the MDCB.

Limitations

Diamond coring does not work well in soft or unconsolidated granular formations.

The core length is 4.5 m, which requires more wireline and handling time than typical 9.5 m APC/XCB cores.