

# Half-Length Advanced Piston Corer

## Scientific Application

The Advanced Piston Corer (APC) is crucial for obtaining the highest quality core sections for high-resolution climate and paleoceanographic studies. However, the APC can encounter challenges when formations become too firm (may require drilling over) or have alternating hard and soft layers (may result in poor core recovery).

The Half-Length APC (HLAPC) is a new shorter (4.7 m) version of the APC created to address both of these challenges. It can be used to recover high-quality cores from short intervals of soft sediment between hard layers (e.g., ooze/chalk between chert layers), which have been difficult to recover with other coring tools. The HLAPC can also be used to extend the depth of a piston core hole, while recovering better quality core compared with the longer APC coring system. The HLAPC requires more operational time than APC coring.

Both the APC and HLAPC are hydraulically actuated piston corers designed to recover the highest quality, least disturbed core samples in soft to very firm sediments. Such sediments are not easily recovered with rotary coring.

## Operation

When coring in formations with interbedded layers of soft and hard materials, the initial hole is cored to determine the depths of the hard materials. The ship is offset a few meters, a second hole is cored, and the Extended Core Barrel (XCB) is used to drill through the hard layers. Once through the hard material, the HLAPC is deployed to recover the thin, soft to firm sediment below. Alternating these coring systems is continued until the bit passes below all of the hard layers.

As coring goes deeper below the seafloor, the sediments tend to become firmer. Eventually, the APC core barrel begins to either stick in the formation, requiring drilling over the core barrel to free the barrel from the formation, or will not penetrate with a complete 9.5 meter stroke. Additionally, the firmer formation may result in degraded core quality with the longer stroke APC coring



**Half-Length APC being  
deployed on the rig floor.**

system while increasing the risk of a bent or broken core barrel. The HLAPC allows the hole to be advanced using piston coring, which typically provides better core samples, than forcing the traditional APC deeper or switching directly to the XCB.

The HLAPC core barrel is lowered to the bottom of the drill string on the coring wireline. Pump pressure is then applied to the drill pipe, which severs shear pins and strokes the core barrel 4.7 m into the sediment. The inner core barrel, containing the core, is then retrieved by wireline. After core retrieval, the bit and BHA are advanced 4.7 m, and the process is repeated.

## Features

### Compatibility

The HLAPC inner core barrel is deployed in the same BHA as the APC and XCB. All tools are interchangeable depending on formation and no time is spent for bit trips.

### Wireline Deployment

The HLAPC core barrel is deployed using the coring wireline to avoid premature release of the shear pins.

### Core Orientation

Core orientation is not available at this time, but can be developed. Nonmagnetic core barrels can be used with the HLAPC to avoid disturbing the remnant magnetic signature.

## In Situ Temperature Measurement

Special APC shoes can be run to record the in situ formation temperature while taking a core.

## Specifications

### Core Diameter

6.2 cm (2.44 in)

### Maximum Length

4.7 m (15.4 ft)

### Piston Force

23,000 – 28,000 lb at  
2300 – 2800 psi pump  
pressure

## Typical Operating Range

### Formation

Firm to very firm sediments

### Depth Range

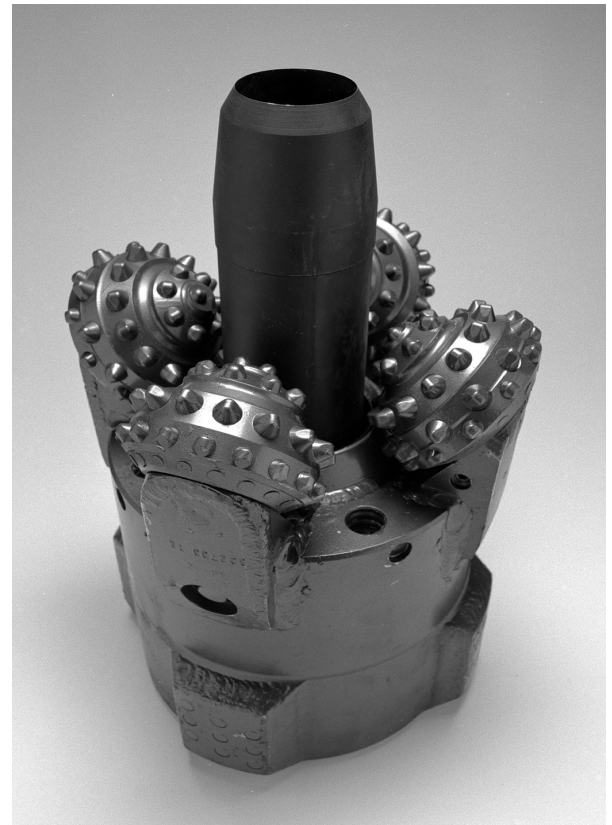
APC depth range is seafloor to as much as 300-400 m below seafloor (mbsf). The HLAPC depth ranges are not well documented yet, but will work within these depths and probably deeper.

### Mean Recovery

~100% in soft sediments (see *Limitations*)

### Rate of Penetration

9.5 m to ~25.0 m of core/  
hr (depends on depth/wire-



**APC piston shoe extending through APC/XCB bit (shown upside down).**

line time). Rate of penetration typically decreases with depth.

### Quantity of Cores on Deck

1 to 3 cores/hr depending on water depth and formation.

## Limitations

Does not penetrate or recover granular formations (such as sand) or hard layers (such as chert). Core barrel may stick in firm sediments and require drillover, although this occurs less often with the HLAPC than for the APC.