The Value of a Digital Water Column Echogram – Distinguishing the True Bottom

How the CEESCOPE™ and CEE ECHO™ echogram output provides the ability to track the bottom on two sonar frequencies and differentiate between loose silt and mud over a harder more compacted surface.

The CEESCOPE™ and CEE ECHO™ can operate in single channel 200 kHz or dual channel 33 kHz and 200 kHz modes with a dual frequency transducer. For surveys where the bottom may be poorly defined, especially if active dredging is taking place, a dual frequency system is mandatory. Low frequency sonar, typically 24 – 33 kHz penetrates further through water and bottom sediment, allowing bottom detection even through significant layers of suspended and loosely deposited non-compacted material. Indeed, if resuspended material is in high concentration, a 200 kHz echo sounder will be rendered useless with the sonar completely attenuated before it can reach the “real” bottom. The high frequency channel may identify the upper, soft bottom surface and the low frequency channel reports a deeper sub-bottom surface of more compacted material below, for example undisturbed sediment during an active dredging operation where suspended material has been allowed to resettle above. Combining the dual frequency approach with the CEESCOPE’s real time echogram display allows the surveyor to develop a better understanding of the bottom morphology and determine the most appropriate soundings to report. Figure 1 shows a typical echogram where siltation has covered a harder bottom surface with about 2m of deposits.

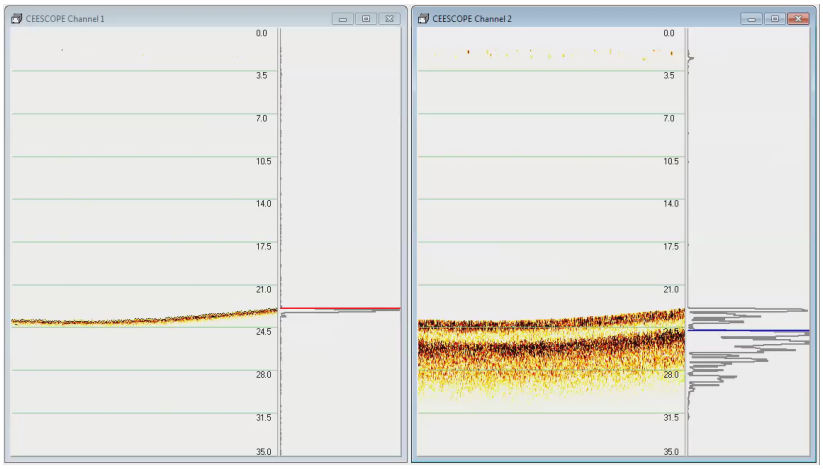

Figure 1. CEESCOPE™ digital echogram showing two distinct bottom layers.

The use of multi frequency data for investigating sub-bottom characteristics is a qualitative tool; the CEESCOPE echo sounder is designed to report the depth and not provide detailed sub bottom stratigraphy - a powerful Sub Bottom Profiler is needed for that. However, the CEESCOPE may be used successfully for surveys that include a need to determine relatively limited sludge buildup – for example waste water or industrial water settling lagoons.

Figure 2 shows a CEESCOPE echogram from an industrial settling pond, with the horizontal axis representing a distance of around 400m (1310ft). Unlike Figure 1, where the two echo sounder channels are shown on separate plots, in this case the channels are superimposed. The results in Zone A show the pond bottom liner, with a thin layer of deposited material – essentially this is an empty cell. The berm at the boundary with Zone B marks the start of active deposition. The lined bottom can be seen continuing through this region with an increasing thickness of very loose deposits above. The 200 kHz high frequency tracks the upper surface of deposits throughout. The low frequency penetrates down to the liner, 10m (33ft) below. In Zone C, compaction of sediment and a reduction in water content has caused the 33 kHz sonar to no longer penetrate enough to reach the liner 20m (66ft) below the surface.

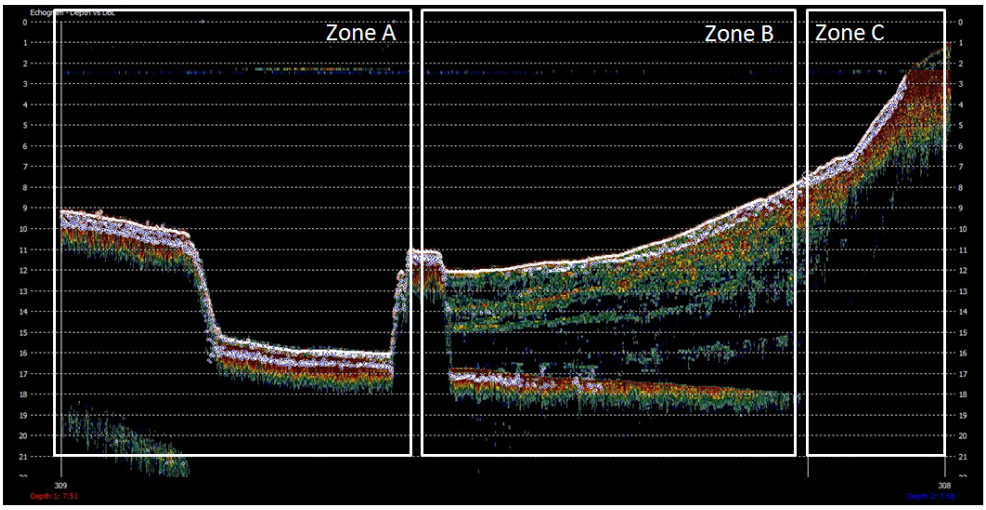

Figure 2. CEESCOPE™ echogram from an industrial settling pond viewed in HYPACK®.

Hydrographic survey processes commonly call for a dual frequency approach; the addition of a full water column digital echogram in the CEESCOPE and CEE ECHO maximizes the available data for survey production. Additionally, viewing the echogram in real time allows echo sounder settings to be adjusted to track the desired bottom surface and minimize the need for post processing adjustment.