APPLICATION NOTE

App. Note Code: 2Q-T
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Effects of Sediment Size on OBS® Measurements

CAMPBELL SCIENTIFIC, INC.®
WHEN MEASUREMENTS MATTER

Effects of Sediment Size on OBS® Measurements

This application note includes results from tests performed by the U.S. Navy Civil Engineering Laboratory. The test results show how the OBS-3 responds to sand, mud, and flocculants. Sediment size has the second largest effect on OBS® measurements.

Size effects do not degrade OBS measurements when the sediment size remains constant. If it changes unpredictably, however, water turbidity and suspended solids concentration (SSC) will appear to change even though it has not.

Tests on OBS-3 sensors performed by the U.S. Navy Civil Engineering Laboratory with ground-glass particles indicate that the response of an OBS-3 sensor to angular clear material, expressed in Volts per grams per liter, declines in proportion to the grain diameter raised to the power –0.6 (see Figure 1). The Navy results are relevant to translucent angular particles of minerals like quartz and calcite in the silt–sand size range. They illustrate the general effect of particle area on an OBS signal.

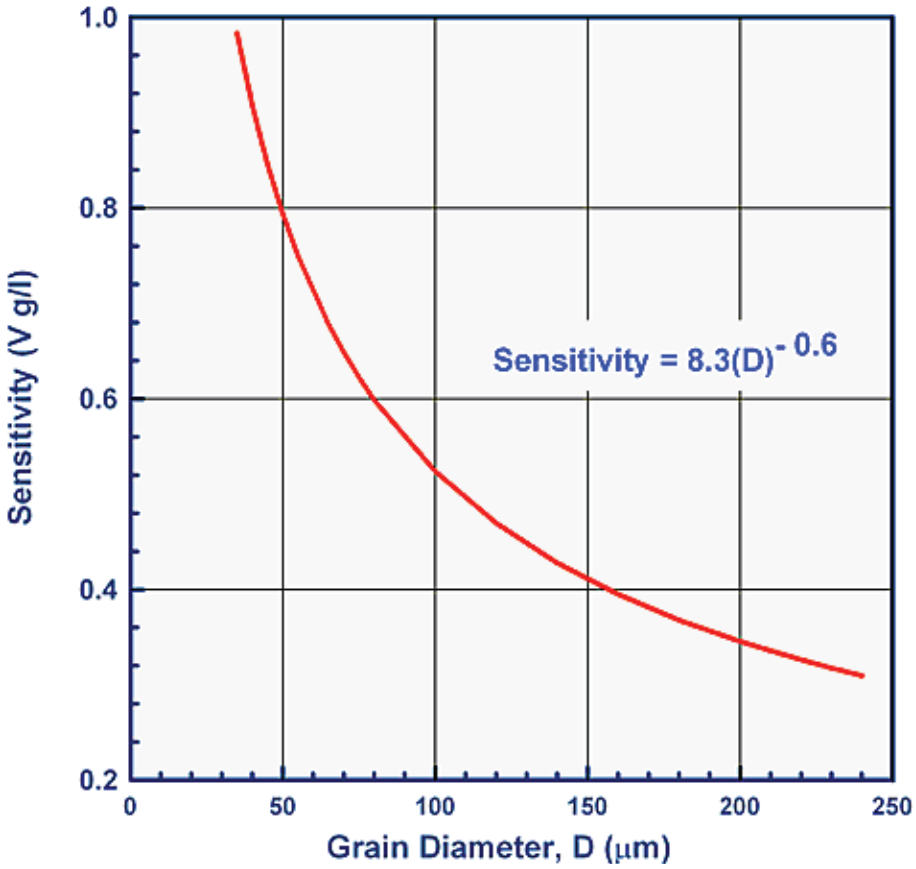

Figure 1. Test results show that the response of the OBS-3 sensor declines in proportion to the grain diameter raised to the power of -0.6.

For example, one gram of silt, with a grain size of 10 microns, suspended in a liter of water (SSC = 1000 mg l^{-1}) might produce an OBS signal of 1 Volt; whereas a gram of sand with a grain size of 100 microns would produce only a 0.25-Volt signal, with other factors such as shape and mineral composition being the same.

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Our experience is that variation of sediment size can result in OBS sensitivity varying more than a factor of 200. The Navy tests and our own sediment calibrations underscore the importance of sediment calibrations (see Figure 2) and restricting use of OBS sensors to systems in which the material size does not vary during a monitoring campaign.

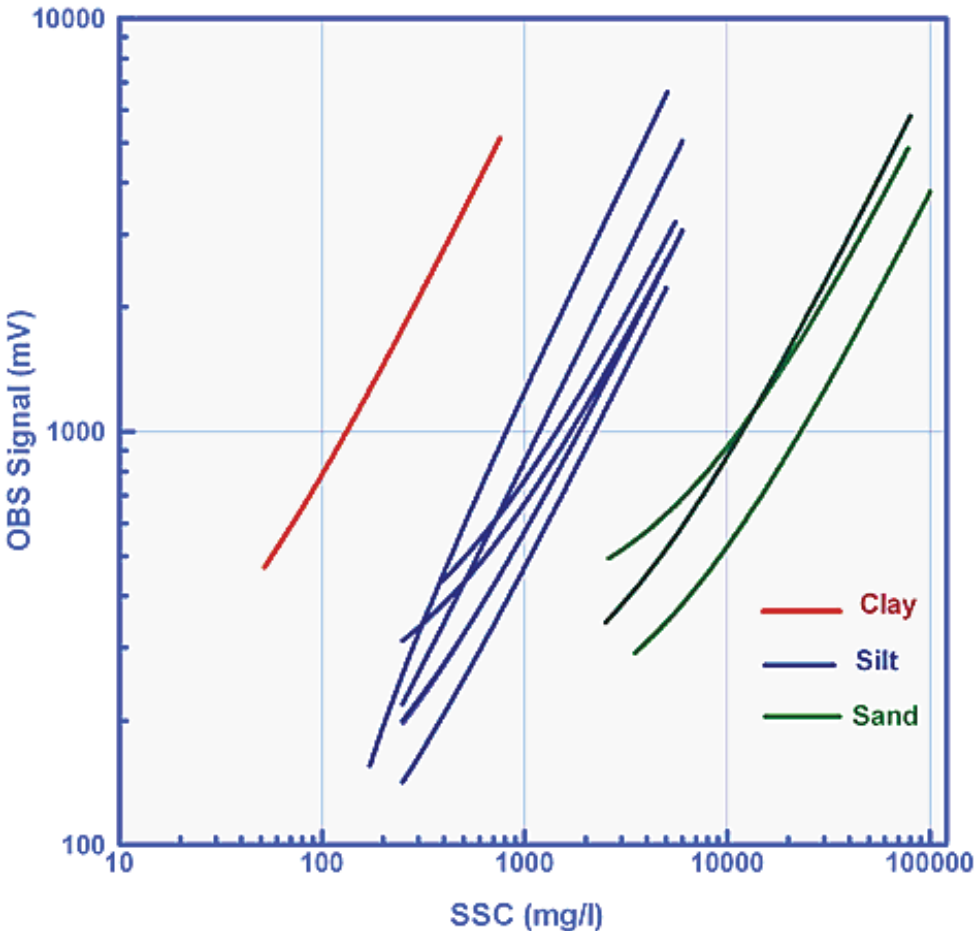

Figure 2. Graph shows the sample calibrations for sand, silt, and clay.

References

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