App. Note Code: 2Q-X

APPLICATION NOTE

Effects of Fouling on the Lens of Optical Back-scatter (OBS) Sensors

CAMPBELL SCIENTIFIC, INC.®
WHEN MEASUREMENTS MATTER

Effects of Fouling on the Lens of Optical Backscatter (OBS) Sensors

This application note provides information about biological and chemical fouling on the lens of optical backscatter (OBS) sensors.

General Information

Users should be concerned about fouling on the lens of an optical backscatter (OBS) sensors. This is because the window of an OBS sensor must remain clean for the sensor to accurately measure light scattering. Any material that buildups on the window will change how the sensor "sees" the sample through its window. Depending on whether the sensor detects more or less light, it will indicate more or less turbidity or suspended sediment. Chemical films, biological growth, and dirt all affect sensor accuracy.

Figure 1. An OBS sensor fouled with a tannin-based film.

Chemical Film Example

An example of a chemical film is shown in Figure 1. This chemical film produced the apparent decline in background turbidity shown in Figure 2. The film was a tannin-based compound common in streams and swamps.

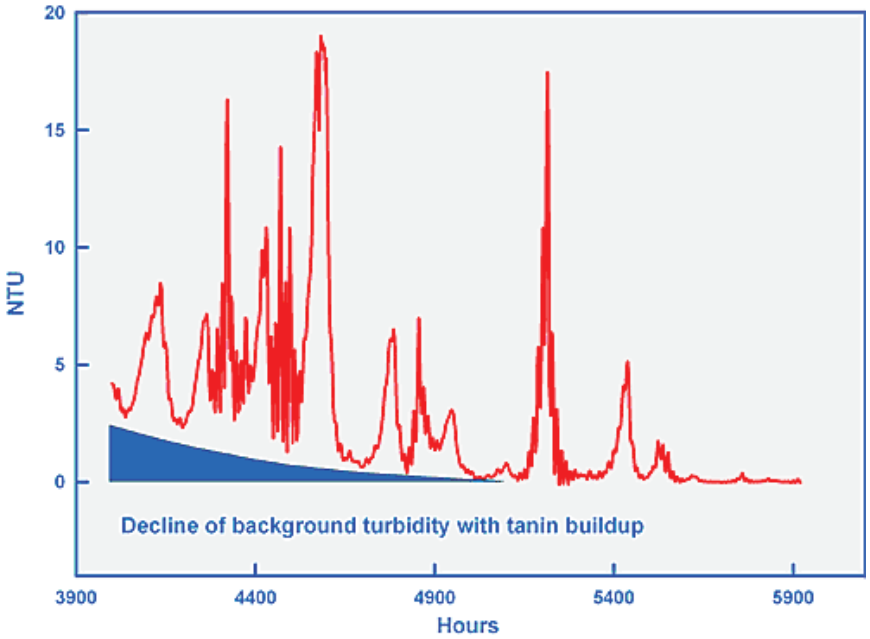

Figure 2. This graph shows the affect that a tannin-based film had on the OBS measurements

815 W. 1800 N., Logan, UT 84321-1784 (435) 753-2342

Biological Growth Examples

Barnacle growth on moored OBS sensors is very common in a shallow marine environment. Figure 3 shows barnacle growth over the infra-red-emitting diode (IRED) and photodetectors of an OBS sensor moored off the California coast. The barnacles obscured the light emitter and produced declining turbidity.

Figure 3. The barnacles on this OBS sensor produced erroneously low turbidity readings.

Fouling does not always result in an apparent decline in turbidity. For example, rapid algal growth on an OBS sensor in Tampa Bay caused turbidity to increase (see Figure 4). This occurred because algae grew into the sample volume and reflected light into the photodetectors, which created a turbidity-like signal. The resulting effects were both severe and rapid in onset (~1 week).

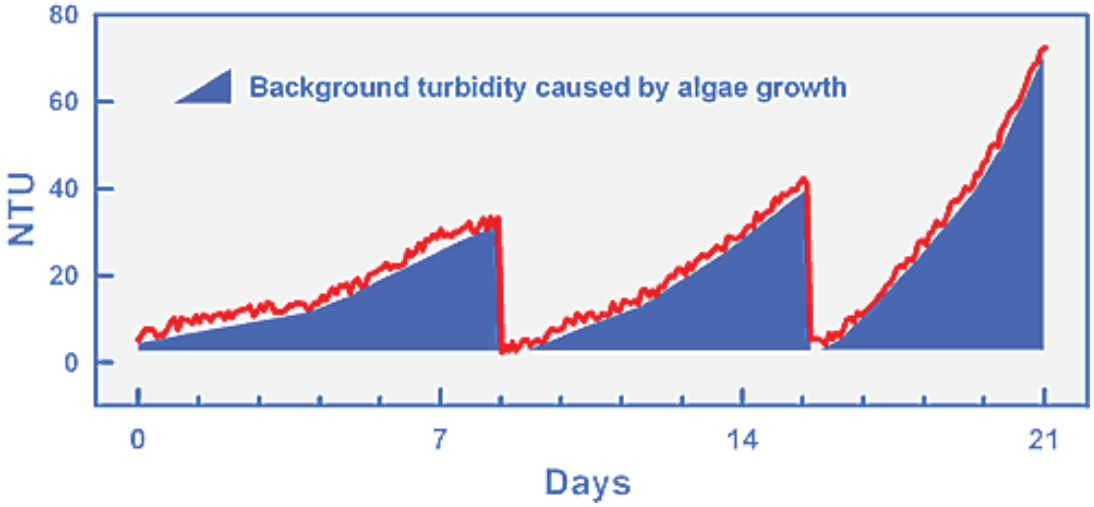

Figure 4. An OBS sensor deployed in Tampa Bay was fouled with algae. As this graph shows, the algae reflected light into the photodetectors resulting in a turbidity-like signal.

Reference

Schoellhamer, D. 1993. Biological Interference of Optical Backscatterance Sensors in Tampa Bay, Florida. 1993. Marine Geology. Vol.110, pp. 303-313.

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