



## **Turbidity**

### *What is Turbidity?*

Turbidity was discovered in 1865 by Italian astronomer Angelo Secchi. Turbidity is an optical property of water and is a measure of the water's clarity. In other words, can you see through a water sample (the water is clear and clean) or is the water cloudy and opaque? Turbidity can be caused by suspended particulates such as silt, sand, clay, algae, organic and inorganic matter, mud, bacteria, or chemical precipitates.

### *Why do we measure Turbidity? What is the significance of studying Turbidity?*

Turbidity readings can be used as a good indicator of the amount of pollution in water (water quality) for a variety of uses, from your city's drinking water to monitoring aspects of the environment.

Measuring turbidity in drinking water can indicate the presence of pathogens and other contaminants such as lead and mercury which are all harmful to human health. Domestic water supplies typically undergo some type of water treatment. Turbidity can interfere with the chlorination process in drinking water treatment plants, giving pathogens an ideal place to hide. Turbidity can also affect the taste and smell of domestic water supplies. Additionally, high turbidity can indicate that tanks and pipes of these treatment systems may be filling with mud and silt which can damage the valves and taps, leading to system malfunctions or damage.

In aquatic environments like streams, rivers, and oceans, highly turbid water can negatively affect marine life. Suspended sediments in the water hinder fishes' ability to find food, avoid predators and can also clog their gills. Turbidity can block sunlight which can thwart photosynthesis and the growth of aquatic plants and algae that fish feed on. Turbid water is also warmer water; this can lead to lower amounts of dissolved oxygen in the water which can smother aquatic organisms.

Other applications for turbidity measurements include:

- chemical sciences
- pharmaceutical sciences
- environmental sciences
- food and beverage industries
- hydrological and geological sciences
- oceanography
- medical sciences
- Limnologists
- petrochemical industry

### *How does a Turbidity sensor work?*

GoSense kits contain a nephelometric sensor which detects how light energy scatters when it hits the surface of a water sample.





A light beam passes through the water and hits a photosensor on the other side of the container. A second sensor measures the light scattered at right angles by any solids in the water. The turbidity is calculated based on the ratio of the two light intensities.

If the light scatters significantly, this indicates high turbidity due to an elevated level of suspended solids in the water. As the amount of these suspended solids increases, the water's turbidity increases.

*What data is collected? Units of measure?*

Turbidity is usually measured in nephelometric turbidity units (NTU) and generally ranges from 1 to 4,000. The lower the NTUs, the lower the turbidity. For example, drinking water should have a turbidity of 5 NTUs or less (ideally below 1 NTU).

#### Resources

[U.S. Geological Survey](#)

[Environmental Protection Agency](#)

[United States Department of Agriculture](#)

[Centers for Disease Control](#)

[NOAA](#)

<https://sensorex.com/2021/09/13/understanding-the-science-behind-turbidity-sensors-and-how-they-work/>

#### Extension Activities

##### **Light 1 and 2**

##### **Brightness**

#### Glossary

[Clarity](#) (noun): the quality or state of being clear

[Contaminant](#) (noun): something that contaminates

[Contaminate](#) (verb): to soil, stain, or infect by contact or association; to make impure or unfit for use by adding something harmful or unpleasant

[Gills](#) (noun): an organ (as of a fish) of thin plates or threadlike processes for obtaining oxygen from water

[Opaque](#) (adjective): not letting light through; not transparent

[Particulates](#) (noun): a substance made up of very small separate particles

[Pathogen](#) (noun): a germ (as a bacterium or virus) that causes disease

[Photosensor](#) (noun): a type of electronic component that enables the detection of light

[Photosynthesis](#) (noun): the process by which plants and some bacteria and protists that contain chlorophyll make carbohydrates from water and from carbon dioxide in the air in the presence of light

[Precipitate](#) (noun): a usually solid substance separated from a solution or suspension by chemical or physical change

[Sediment](#) (noun): the material from a liquid that settles to the bottom; material (as stones and sand) deposited by water, wind, or glaciers

