

Turbidity: Monitoring Applications

Often Maligned Analysis Gains
Widespread Appeal

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Maligned?

➤ What is an NTU?

- # particles? No
- mg/L solids? No
- optical density? No
- No direct correlation to a NIST SRM or equivalent standard
- Formazin standard
- NTU or FTU has been used no matter the technology
...light source/detector arrangement

Maligned?

- Optical measurement dependent on:
 - Particle shape, size, distribution
 - Particle color or darkness
 - Optical properties of water and dissolved matter imparting light absorbing or scattering effects.
 - Bubble interference



Maligned?

- Aren't there better, NIST traceable analyses available?:
 - Particle counters?
 - Particle size analysis?
 - Gravimetric determination of TSS or SSC?
 - Even UV/Vis for %T / Optical Density?
 - Traceable standards
 - Spectrophotometers are all generally the same
 - Not sensitive to very small concentrations of particles

Maligned?

- No detailed industry standard or mandated optical configuration
 - USEPA and ISO design parameters allow for various interpretations or wide enough specifications for inherent differences in sensor outputs.
 - How should one choose a sensor?
 - 90 degree scatter, forward scatter, back scatter?
 - With or without multiple detectors/ratio method?
 - Visible spectrum light source or NIR?

Widespread Appeal

- Relatively inexpensive analyzers for determining low concentrations of very small particles in treated water.
- Expensive technologies aren't foolproof
- Surrogate for costly, labor intensive sampling and testing.
- Inline and in-situ monitoring provide real time / online analysis.

Widespread Appeal

- Ease of calibration routine
- Ease of sensor manipulation for data collection.
 - External data logger connection
 - Internal data logger
 - Even direct interface with PC for online communication w/ Windows® Hyperterminal



Applications – Water Quality

- Drinking water production
 - In process / treatment - coagulation
 - Source water / plant influent
 - Filtration efficiency
- Wastewater
 - As suspended solids – TSS
 - In process
 - As effluent to surface water



Applications – Water Quality

➤ Surface waters

- Light penetration
- Point source pollution
- Non-point source pollution
- Natural erosion
- Man influenced erosion
- From acid mine drainage



Applications - Sediments

- Surrogate for suspended sediment concentration
 - Sediment influx, upwelling, transport and deposition
 - Flowing waters and associated discharge points
 - Dredging and drilling operations
 - Beach erosion



Applications - Industry

- Process water
- Dissolution
- Crystallization
- Filtration efficiency
- Waste stream



Applications – Food/Beverage

- Bottled water
- Beer, wine, spirits
- Soda, juice
- Dairy



Applications - Biotech

- Including pharmaceutical, biomedical and bacteriological industry
 - Process water
 - Dissolution testing
 - In-vitro diagnostics
 - Cell culturing

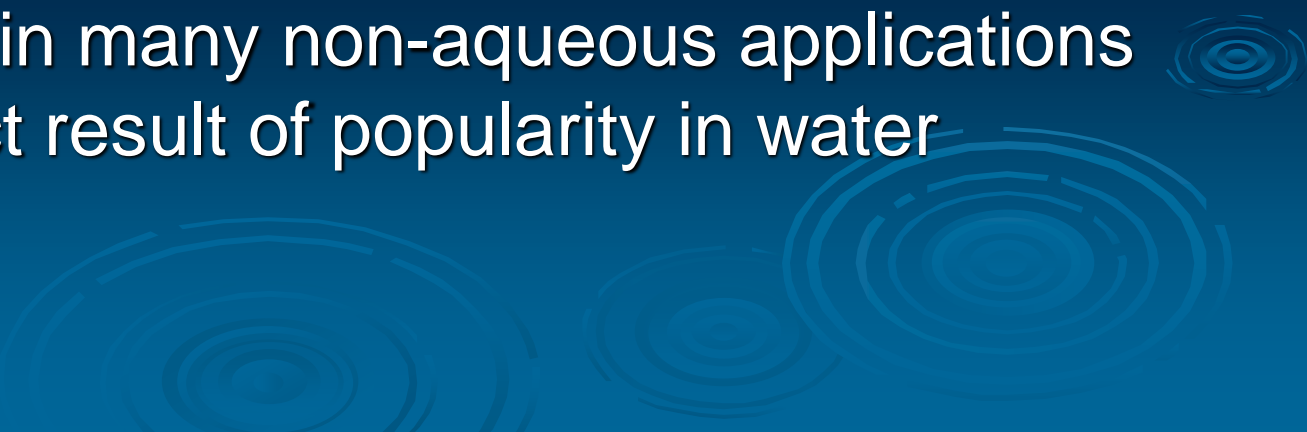


Applications – Non-aqueous

- Diesel fuels
- Chemical processing
- Pulp and paper



Conclusion

- Turbidity monitoring sensors:
 - Are very sensitive water analysis tools
 - Are relatively inexpensive
 - Save time and money from very labor intensive tasks such as sampling and analysis
 - Can be utilized in a wide variety of studies
 - Are used in many non-aqueous applications as a direct result of popularity in water analysis.
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