chemtronic
Waltemode GmbH

Optical or Acoustic

Process measurement of liquids

- **Turbidity**
- **Colour**
- **Oil in Water**
- **Water in Oil**
- **Oil on Water**

Ultrasonic Particle Monitoring

What does ultrasonic Particle Measurement mean?

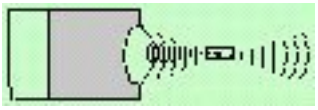
The ultrasonic particle measurement is used to detect non-dissolved (suspended) particles in a liquid, similar to a turbidimeter.
Due to the fact that turbidity is an optical effect, the acoustical method is named as particle or concentration measurement.

Method of Measurement

Equal to a sonar system, the acoustic probe will transfer ultrasonic pulses into the measurement sample. When the acoustic pulses hit particles inside this sample a part of this ultrasonic energy will be reflected as an echo.
The quantity and intensity of these echoes will be detected, evaluated and shown as measurement values.

What do we mean by “Particle”?

In this case, particles are described as pieces, with a different speed of sound as the carrier liquid. This term “particle” not only describes solids as minerals, metals, organic cells, etc., but it also includes components like free oil in water, gas bubbles, etc.. Turbidity caused by colloids, proteins, polymers, etc. will not be detected in a water based solution. These materials consist to a high degree of water and will not show a difference in speed of sound as water.



The ultrasonic pulses hit the particles and will be reflected as echoes.

Comparison of different Measurement Methods

The ultrasonic measurement method is not directly comparable with optical turbidity measurements.
Even in case the same calibration method is used at an optical, as well as at an acoustical instrument, the measured products can show deviating measurement results in this both systems. This deviating behavior is caused by different particle size distributions inside the different samples, compared to the particle size inside the calibration liquid. Depending on particle size distribution, different measurement methods will respond different.

Typical Measurement Units

ppm:	**P**arts **p**er **m**illion
mg/l:	Milligrams per Litre
gr/l:	Grams per Litre
% TSS:	Percent Total Suspended Solids

Please pay attention:

Measurement units based on the Formazin turbidity standard (like e.g. NTU, FTU, FNU, EBC), are typically not used for the acoustical measurement method.
Formazin creates polymer based turbidity without particles (see the above definition of a particle), therefore formazin will not create acoustic reflections (echoes).

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Typical ranges

The ultrasonic measurement system model AS3/AT3 is used for the detection of low, as well as of high particle concentrations. The resolution of the system at lower ranges is at 0.1 ppm and better. The maximum range is at approx. 20.000 ppm (2 %), higher ranges can be possible depending on product.

When will an ultrasonic particle measurement be used

The ultrasonic particle measurement is used for applications where optical systems will not (or poorly) work.
Another wide range of applications is where systems with extreme low maintenance and extreme high long term stability are required.

Advantages of an acoustical particle measurement

- No wearing parts
- Free of maintenance
- Long term stability
- Insensitive to coatings on the probe
- Self cleaning effect caused by the ultrasonic energy
- Lowest range approx. 0 – 1 ppm
- Highest range approx. 0 – 20,000 ppm
- Measurements in black, extreme coloured, opaque liquids
- Measurements in light sensitive liquids
- Not effected by ambient light
- 1” probe technology
- Easy installation in open channels or basins, tanks, etc.
- Easy installation to a pipe, via an 1” ball valve
- Pressure rates up to 600 PSI (40 Bar)
- Max. process temperature 110° C
- Optional use in hazardous area

Typical applications

- **Measurement of oil in condensate.** The measurement results are not affected by mineral or oil coatings, high sensitivity against free oil.
- **Measurement of oil in water.** The measurement results are not affected by algae growing or oil coatings, high sensitivity against free oil. Possible positive interference caused by particles.
- **Measurement of water in oil.** The measurement results are not affected by oil coatings, high sensitivity against free water. Possible positive interference caused by particles.
- **Measurement of particles in black ink or other extreme colored liquids**. The measurement results are not affected (influenced) by opacity of liquids.
- **Measurement of particles or bubbles in film development liquid**. The light sensitive product is not affected (influenced) by the ultrasonic pulses.
- **Selective measurement of yeast cells in beer with additional protein based turbidity.** The measurement results are not affected (influenced) by the proteins inside the beer.
- **Filtration control in industrial applications**

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