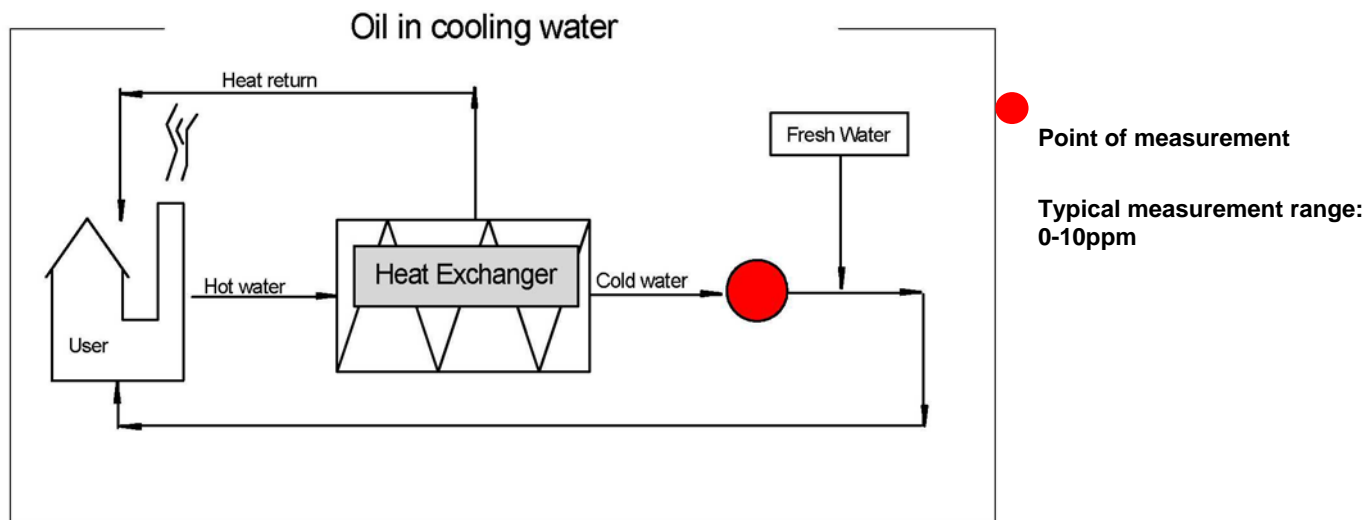


## Oil in Cooling Water



Cooling water is typically clean water with a low turbidity value. A lot of energy and fresh water can be saved by returning clean cooling water to the process. There is also no oil pollution allowed in case of water return to a river or into the sea. Oil leakages at turbines, pumps or within the heat exchanger can pollute the cooling water with oil. Even a low quantity of oil will interfere the chemical balance of the cooling water, accelerate the corrosion and take negative effect to the heat transfer. The efficiency of the system declines, energy and maintenance cost will rise. The release of oil into the environment is strictly prohibited by law and can cause extreme high penalties.

### Optical or Acoustic

Two different principles of measurement are typically used for oil and particle monitoring of condensate or feed water, the classic optical 12° forward scatter turbidity measurement as well as the ultrasonic reflection. Both methods detect even low oil and particle contaminations.

#### Optical: forward scatter turbidity (model MoniTurb-F / Messenger)

The optical measurement allows very high process temperatures. The sapphire windows of the sensor typically can become opaque after some weeks or month of operation, due to algae growing or oil coatings in case of leakage. This requires a consistent manual cleaning of the windows.

#### Acoustic: Ultrasonic reflection (model AS3 / AT3)

The ultrasonic pulses of the measurement probe are not affected by any coatings. The accruing of any coatings is prevented by the ultrasonic cleaning effect additionally. The probe does not have any wearing parts, shows extreme high long term stability and is usually free of maintenance. The design of the probe allows an easy and cost-effective installation. These advantages make the ultrasonic reflection to a perfect technology for this application.

# Turbidity by Ultrasound or by using the traditional optical Methods

## Ultrasonic reflection as an alternative for the optical turbidimetry

### Per definition is Turbidity an optical Impression.

Turbidity describes the characteristic of a transparent product, to scatter or absorb light. A focused light beam will be attenuated and scattered in hazy products, so that this product can become practically opaque in bigger layers. Turbidity is caused by particles in transparent products. A particle is defined as something with a different refractive index as the carrier liquid. Some examples of particles are minerals, yeast cells, metals, oil drops in water, milk in water, gas bubbles and aerosol's.

### Ultrasonic Refection

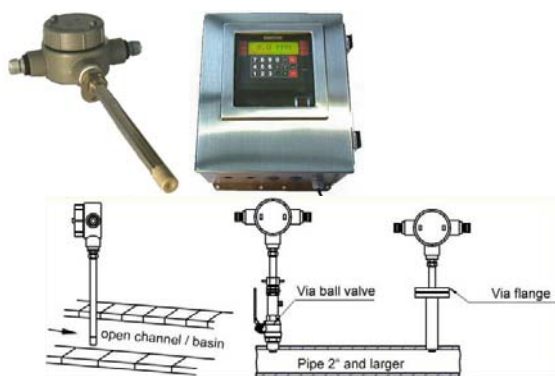
The ultrasonic particle measurement is used to detect non-dissolved (suspended) particles in a liquid, similar to a turbidimeter. Turbidity is an optical effect. Therefore the acoustical method is typically named as particle or concentration measurement. The acoustic probe transfers ultrasonic pulses into the measurement sample, equal to a sonar system. When the acoustic pulses hit particles inside the 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.

Possible measuring ranges are 0 - 1ppm up to 0 - 20000ppm.

### Scattered light turbidimetry the classics

An intense collimated beam of light is projected through a sample contained within the sensor. The intensity of this light beam is measured by the direct beam detector, located opposite to the light source. The light, scattered by particles inside the sample is measured by a scatter light detector. The more the scattering the higher the turbidity. Measuring ranges of 0 - 1ppm up to 0 - 4000ppm are possible (absorption sensors up to 50000ppm) depending by sensor.

### Model AS3/AT3



### Advantages Ultrasonic Reflection

- Extreme low maintenance
- No wearing parts
- Calibration interval: typical 24 month
- Wide span of measurement ranges
- Pressure rating: ANSI class 400 / PN40
- Line size not limited
- Easy installation due to probe technology
- Self cleaning due to the ultrasonic pulses
- Not affected by product colour
- Insensitive against coatings
- Programmable measuring range
- Programmable units (ppm, mg/l, etc.)

### Typical Applications

- Product concentration
- Filtration control
- Quality control
- Iron in Water
- Oil in Condensate
- Oil in cooling water

### Model Series MoniTurb / Messenger



### Advantages optical Turbidimetry

- 12° scattered light and / or 90° scattered light
- Low maintenance
- Calibration interval: typical 12 month
- Material measuring windows: Sapphire
- Pressure rating: ANSI class 150 / PN16
- Line size: 1/4" up to 5" (DN10 to DN125)
- Installation flanges: DIN, ANSI, NPT, APV, TH, ...
- Optional cleaning jets
- Programmable measuring range
- Programmable units (ppm, mg/l, etc.)

### Typical Applications:

- Product concentration
- Filtration control
- Quality control
- Wells water
- Water in Oil
- etc.

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