Information B 1.3

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Advantages of Turbidity Measurement

By means of turbidity measurement insoluble matter suspended in a liquid can be detected. In a light beam dispersed (insoluble) matter produces scattered light which is evaluated in the GESTRA turbidity detector TURBISCOPE.

Besides fixed factors inherent in the design of the equipment used (such as the angle at which the scattered light is measured and the intensity and wave length of the source of light) the intensity of the scattered light depends on the amount of dispersed particles. The self-absorption of the particles is compensated, the measurements are, however, influenced by the shape, the size and the refractive index of the particles with regard to the liquid.

A comparative turbidity measurement is therefore made difficult, yet it is gaining in importance since it represents a simple method to detect dispersed systems*). In addition turbidity measurement provides a quick means of determining the degree of purity of a liquid to be monitored so that in the event of contamination a process can be interrupted in time.

The application of turbidity measurement varies in the different industries. On the other hand, the same application may be found in various industries (e. g. water treatment, condensate and process water monitoring etc.).

In the following we shall give a few typical examples of application of the GESTRA TURBISCOPE.

In many cases it is quite useful to connect a recorder to the TURBISCOPE, so that in addition to the indication of the measured value and to the tripping of alarms, control valves etc. a recording of the process is obtained.

1. Monitoring of Raw Water

A TURBISCOPE installed downstream of the raw-water pump can be used to monitor the quality of the water. After heavy rainfalls sand and clay may penetrate into the raw water. The turbidity detector may be used to directly throttle the pump discharge capacity so that the water treatment units downstream of the pump are not unnecessarily overloaded.

2. Water Treatment

2.1 Sand Filters

Monitoring of the turbidity downstream of sand filters is a more objective and economic method than the well-known differential-pressure method, as the value obtained is measured directly. Filter saturation is easily recognized and an optimum use of the filter guaranteed. After backwashing the TURBISCOPE indicates whether the degree of purity required is reached. The filtered water can be used immediately without considering any safety losses.

During backwashing water may also be saved by monitoring the process with a GESTRA TURBISCOPE. Limiting the backwashing process to the actual time required has the additional advantage of accelerating the formation of a new filter bed.

2.2 Charcoal Filters

In principle the same applies as stated in subsection 2.1.

After regeneration of the filters by admitting steam turbidity measurement is the only means of detecting whether charcoal slurry is escaping, which should, for example, be considered in the case of charcoal filters downstream of ozone plants in swimming baths.

2.3 Demineralization Plants

Monitoring of the preliminary filter ensures that the filter is cleaned in time, so that excessive sludge deposits in the cation exchanger are avoided. With regard to filter backwashing which is normally effected at regular intervals and not as a function of the degree of contamination water savings (also of waste water) can be obtained by turbidity monitoring.

2.4 Reverse Osmosis Plants

A TURBISCOPE installed upstream of the reverse osmosis plant will protect the sensitive diaphragms from contamination by monitoring the transparency of the water from the preceding filter units. It is thus possible to check the correct maintenance of the filters and to ensure that the maximum acceptable turbidity level is not exceeded.

3. Steam Boiler Plants

The quality of boiler feedwater must be higher than that of drinking water. Neither dissolved substances (such as salts etc.) nor undissolved matter (such as oil, grease, sludge etc.) should be fed with the feedwater to the boiler. These impurities would deposit on the heating surfaces and impair heat transfer which may cause boiler damage.

Boiler feedwater is treated in water treatment plants to obtain the high quality required which is quite expensive. Considerable savings can be obtained by returning the condensate from the various heat exchangers to the boiler. The condensate may, however, be contaminated by corrosion particles from the heating surfaces and the steam and condensate lines or, as a result of product leakage, by the product itself. In such cases the return of the contaminated condensate to the boiler can be prevented if a TURBISCOPE is used.

In accordance with the German regulations for the operation of steam boilers without constant supervision (TRD 604) automatic monitoring of the condensate returned to the boiler is required.

4. Monitoring of Waste Water

Depending on the conditions prevailing in a process optical monitoring of the waste water may become necessary to detect disturbances or damage caused by foreign matter (oil) in time.

The settling tank is then not unnecessarily contaminated and environmental pollution prevented.

5. Special Applications

Besides the general applications of the TURBISCOPE which concern most industries, we shall give below a few special examples.

A) Breweries

During filtration the beer is monitored downstream of the diatomite filter. The main point is the monitoring of the filter. Recording of the measured values obtained with the GESTRA TURBISCOPE does not only supply correct data on the quality of the beer but gives also evidence of the different kinds of beer filtered.

Monitoring of wort downstream of the centrifuges is another application of the TURBISCOPE in breweries.

If the recoolers are cooled with process water and if the water is returned to the water circuit or discharged into the settling tank the engine cooling water should be monitored to detect any penetration of oil.

Monitoring the effluent acid when cleaning beer casks ensures that an alarm is given should oily casks be cleaned.

B) Chemical Industry

Turbidity measurement can for example be applied in a process to determine the beginning of crystallization in a solution.

*) A dispersed system is a substance consisting of at least two finely dispersed phases, such as emulsion (liquid/liquid), suspension (liquid/solid), foam (liquid/gaseous).

C) Beverage Industry

Monitoring the beverage with a turbidity detector is a far better method than a visual inspection that is affected by the lack of constant supervision. During the production of must, for example, spoilage is avoided. Turbidity detection is an important instrument for quality assurance.

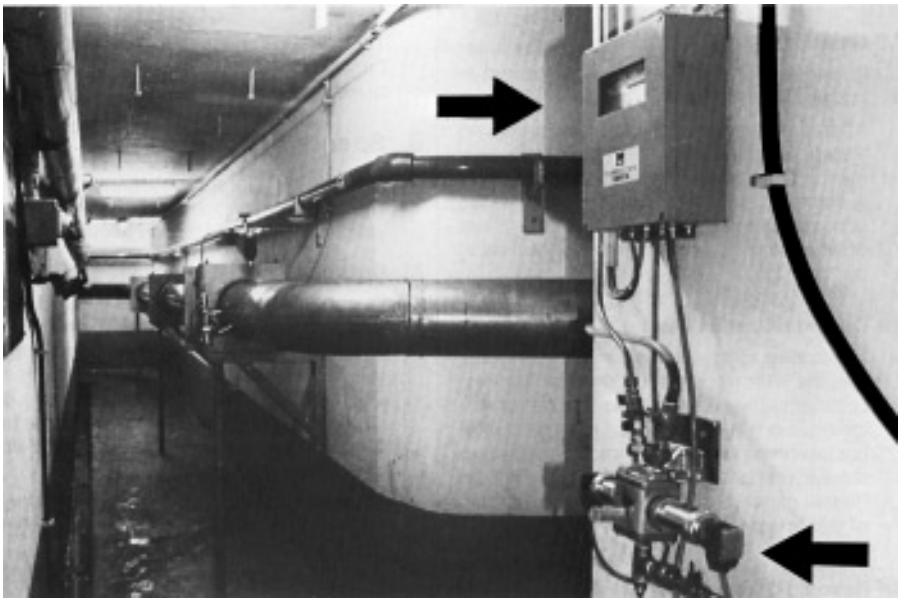
D) Waterworks

The high degree of automation in waterworks makes turbidity detection almost indispensable, e.g. downstream of raw-water pumps, flocculation units, sand filters, charcoal filters and pure water storage tanks, i.e. upstream of the discharge equipment.

E) Sugar Industry

The sugar liquor is monitored downstream of the filtering equipment to signal filter failure.

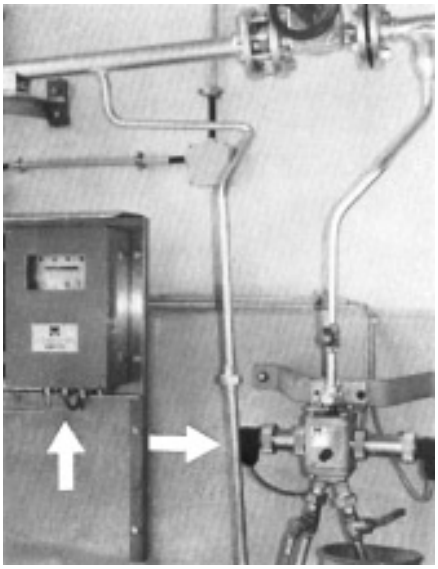
This article does not claim completeness on the subject turbidity detection. It should, however, convey some useful information on the application of the GESTRA TURBISCOPE.



Monitoring of a Well with a TURBISCOPE

A sample taken from the raw-water line is fed to the sensor type ORG 22 of the TURBISCOPE via a stainless-steel line. As the well water contains iron the formation of deposits in the glass cylinder of the sensor must by avoided. For this purpose the sensor incorporates a brush which is operated once a day. The sample is discharged below into the purification system. The flexible tube for the discharge is elevated to produce a slight overpressure in the sensor.

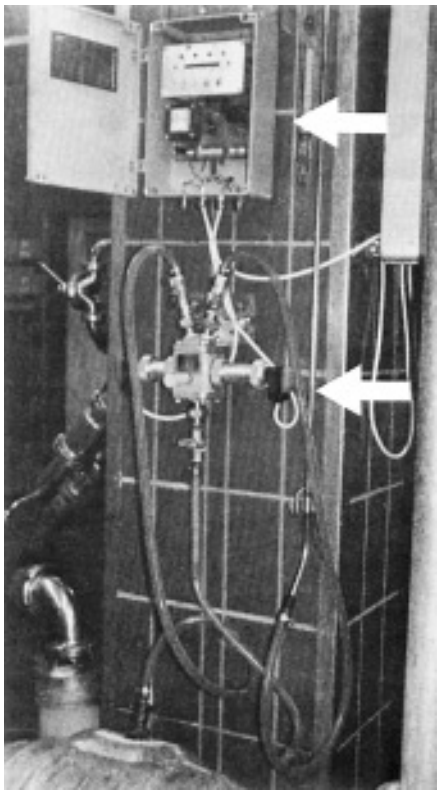
The turbidity values are recorded in the central control room. The daily inspection of the well can be supervised with the aid of the chart obtained. There are no iron deposits on the glass cylinder.



Condensate Monitoring

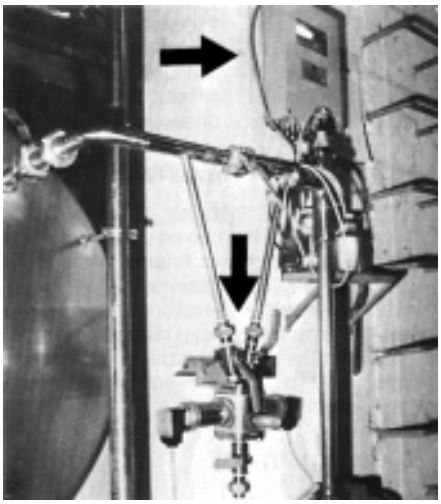
The condensate header conveying hot condensate and flash steam from oil preheaters is tapped at the bottom in the form of a tee (top right of illustration). The main amount of condensate and the flash steam pass on through the header via an isolating valve and a spring-loaded non-return valve type RK. The non-return valve produces the differential pressure necessary for the flow of the sample through the sensor.

The flow through the glass cylinder of the sensor is vertical to prevent contamination. The sample is returned into the header from below. Taking of samples or rinsing of the sensor at a higher flow velocity can be effected with the isolating valve fitted below on the right side.



Monitoring of Turbidity Downstream of Beer Filtering Equipment

The flow through the sensor is V-shaped. The beer sample flows into the sensor via a flexible tube from above on the right. The outlet on top of sensor (left side) is throttled to avoid the release of carbon dioxide. The sample is discharged into a tank.



Application of the TURBISCOPE Type OR 52/2 in the Foodstuff Industry

A non-return valve type RK installed in the main line (top of illustration) produces a differential pressure to ensure the V-shaped flow through the sensor type ORG 22.

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