Application Report
Turbidity after Filter Backwash

SIGRIST PROCESS-PHOTOMETER

In water treatment plants, sand filters are very often used and they all have to be cleaned periodically. For this cleaning process, treated water is used. This water often cannot directly be re-entered into the treatment process but, after a sedimentation stage, must be disposed of into the environment.
As a result a large amount of valuable water is lost at each filter backwash.
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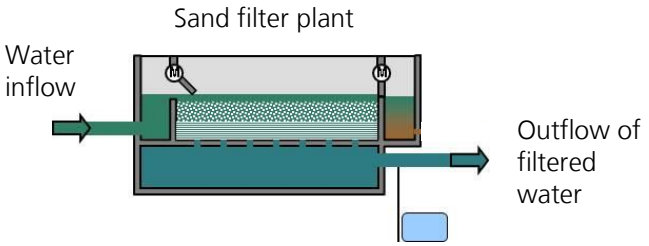
Pict.1: Sand filter plant

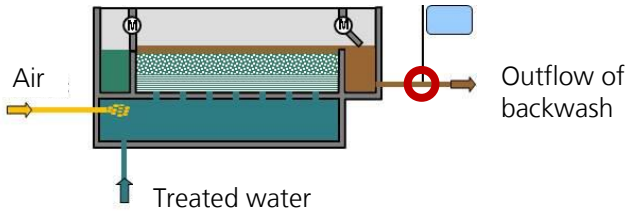

Pict. 2: Profile of a sand filter

Benefits
The backwash process can be controlled depending on turbidity. This allows water consumption to be optimized and costs to be lowered.

Typical application
The filters retain solid matter and get soiled as a consequence. Pressure measurement or the water level is often used for determining that a filter needs to be backwashed.
In the backwashing process, air and treated water is pumped into the filter plant from below. The overflow with large amounts of suspended solids is fed into a sedimentation basin. After a sufficient settling period, the water is fed into the environment and the remaining sludge is disposed of as waste or even as hazardous waste.
The duration of the filter backwash and thus the amount of water used is often determined by a time constant. Sometimes one can also see employees standing at the filtration tank and deciding "from experience" when the back-washing process can be stopped.

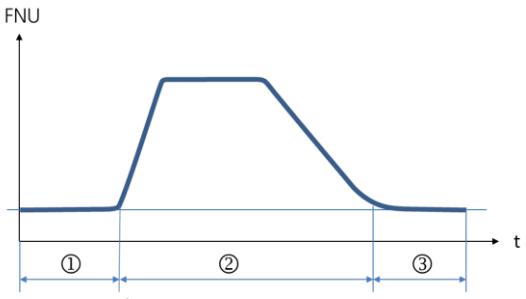


Pict.3: Filtration in operation



Pict.4: Backwash in operation

Installing turbidity measurement at the outflow of the backwash water (Pict. 4 ○) is a reliable method.
The course of turbidity measured in the outflow of the backwash is represented in Pict. 5. Phases 1&3 show the state before or after the backwash, respectively.
Phase 2 shows the actual backwash. At the beginning, turbidity rises rapidly to a level of several hundred FNU. For a considerable time of the backwash period, it remains high. Towards the end of the process, turbidity is reduced and decreases continuously. The backwash becomes increasingly clear.
The duration of the backwashing process is usually within a range of 12-20 minutes, depending on the power of the pumps. Water consumption can be optimized by stopping the backwash process depending on the turbidity.



Pict. 5: Course of turbidity during the backwash process

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At this point, an AquaScat HT should be used which guarantees the best possible cost / benefit calculation.

Pict. 6: AquaScat HT

Cost / benefit analysis

In order to calculate the benefits of this procedure, the following information is necessary:

- How often is the filter cleaned (once per day, every 48 hours ...)?
- How much water is used during a cleaning process in m^3?
- What are the production costs including filtration (possibly sales price) per m^3?
- If there is a manifold for the discharge of the backwash, the number of the connected filters should be known.
- Since the money saved will only be apparent after some time, a reduction of the current water consumption of about 10-20 % is assumed for the calculation.

Example calculation

A water supplier operates a sand filter plant and has to backwash every two days. For the existing sand filter, 150 m^3 of water are used for one backwash. The costs of water treatment amount to 0.5 Euro/m^3.
Water consumption per year: 150 m^3 x 180 backwashes = 27'000 m^3
Costs: 27'000 m^3 x 0.5 Euro = 13'500 Euro
Assumed degree of optimisation: 15 %
13'500 Euro x 15 % = 2'025 Euro/year
Additionally to the water savings, less energy is used to run the pumps and the waterworks has a better carbon footprint.
Investment volume: approx. 7'000 Euro
Amortization of the investment: after about 3½ years.

Products

SIGRIST products and configurations
- AquaScat 2 HT
- Checking unit for AquaScat 2 HT/WTM

Parameter settings
- Adjust water flow
- Determine threshold value for preliminary alarm and alarm together with the customer

Alternative methods
- Determination of the period of backwash via a time constant
- Determination of period of backwash „from experience"

Advantages of SIGRIST AquaScat HT
» customer benefits
- Free-fall concept without the water contacting the optics
  - » No falsifying of the measured values and no drift because of window soiling
  - » very long maintenance intervals
  - » very high turbidities can be measured

- Adjustment with secondary turbidity standard
  - » Allows recalibration without Formazin
  - » Buying, storing and managing Formazin is no longer necessary