Control Odor and Taste in Beverage Production

Challenge

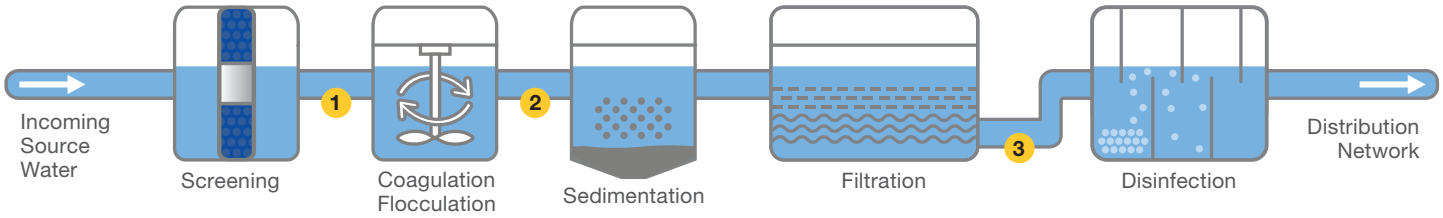
When beverage producers use surface water or groundwater for their production process, the organic load of such water sources can vary. Due to this, plant operators are interested in having a very efficient and well controlled coagulation and flocculation treatment to create stable and known conditions for the later disinfection treatment. This can be achieved with an optimized dosing of coagulants to the source water. One challenge of the later disinfection process is to minimize the formation of **d**isinfection **byp**roducts (DBPs), which can pose odor and taste in their final product.
In fact, the remaining organic compounds present in the water do react with disinfectants during the treatment and this leads to the formation of DBPs. DBPs include compounds such as **tri**halo**me**thanes (THMs), **h**alo **a**cetic **a**cids (HAAs), and chlorites.

Solution

Because the **d**issolved **o**rganic **c**arbon (DOC) value does correlate with the UV absorbance at 254nm (SAC254) both parameters can be used to determine the **n**atural **o**rganic **m**atter (NOM) in water. By measuring the DOC or SAC254 value, operators can control and optimize the chemical dosage during the coagulation and flocculation treatment. An optimal coagulant dosing is very important for the disinfection treatment later in the downstream process, because many organic compounds react with disinfectants and create DBPs. A good guideline for this delivers the **s**pecific **UV a**bsorbance (SUVA, see EPA 415.3) which gives a relation between the UV absorbing NOM and the regular NOM level in the water. The higher the SUVA is, the more THMs are formed during disinfection. Please find more details in graphic below. With this knowledge the plant operator can ensure the production of high quality, DBP-free water for their beverage production.

Here is a list of how cost savings for plant operators occur:

1. *Optimized Chemical Dosing: Accurate SAC254 monitoring allows precise adjustment of coagulant dosages, reducing chemical wastage and costs.*
2. *Prevention of Equipment Damage: Monitoring SAC254 levels helps prevent fouling of treatment equipment, reducing maintenance needs and operating costs.*
3. *Energy Savings: Optimized treatment processes based on controlled SAC254 levels can lead to energy savings, reducing operational expenses.*
4. *Regulatory Compliance: Proactive SAC254 management ensures adherence to water quality regulations, avoiding penalties and associated costs.*



1 Dosing
Chlorine dioxide
(for inactivation of bacteria, viruses, etc.)
Aluminium sulfate
Calcium hydroxide

Online Parameters
pH
Turbidity

2 Online Parameters
SAC254

3 Dosing
Chlorine dioxide

Online Parameters
pH
Turbidity

$$SUVA\ \left(\frac{L}{mg \cdot m}\right) = \frac{UV_{254}\ (cm^{-1})}{DOC\ \left(\frac{mg}{L}\right)} \cdot 100\ \left(\frac{cm}{m}\right)$$

SUVA Range	Characteristics
< 2	High hydrophilic/non-humic/non-aromatic matter, low UV absorbance, low chlorine demand, low THM potential
2-4	Mix of hydrophobic humic/aromatic/hydrophilic matter, medium UV absorbance, higher chlorine demand, higher THM potential
> 4	High humic/aromatic/hydrophobic matter, high UV absorbance, high chlorine demand, high THM potential

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Swan AMI SAC254

A Swan partner initiated a project to improve the water quality of a big beverage producer. The goal was to provide them with better control over their disinfectant process by avoiding the formation of DBPs which caused odor and taste issues in their final products. The main factor to achieve this, was to adjust the dosing of the coagulation reagents according to the incoming NOM concentration. In this case it was decided, because it was a very cost sensitive customer, to feedback control the coagulation dosing. This means the measurement of the SAC254 value was positioned only after the coagulation and flocculation treatment. But a more precise and efficient dosing control would be possible if another SAC254 measurement is positonend after the screening as well. But even with one AMI SAC254, the beer producer was able to prevent DBP formation during the disinfection treatment. This process setup brings the following benefits and drawbacks:

Benefits

- SAC254 online analysis much less expensive than DOC online analysis,
  - SAC254: no reagents are needed
  - SAC254: lower initial investment
- The raw water is often affected by high turbidity as well, after the coagulation and flocculation step this factor is eliminated
- Only one analyzer needed

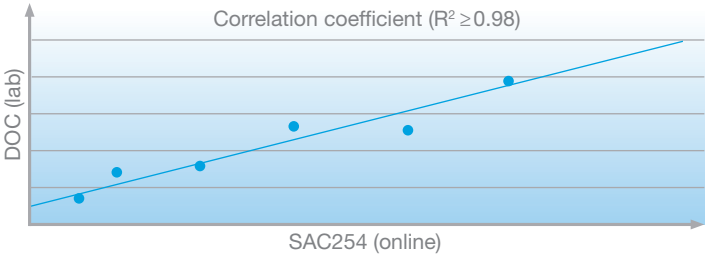
Drawback

- Coagulant dosing control based on already treated water, which relates to higher lag time if fluctuating NOM values occur in the raw water
- A more accurate coagulant dosing could be achieved by installing a second AMI SAC254 in the raw water

AMI SAC524

What you get

- Competitive price comparing to other online organic monitoring methods and competitors
- Easy operation and maintenance
- No reagents needed
- Grab sample functionality
- SAC254 is a sum parameter for the organic load of a sample
  - Good correlation with DOC or TOC lab measurements:



- High application range: The broad measuring range of 0 to 200 m[1]
- Dynamic measuring method which is robust to fouling issues and therefore enables a precise trend analysis
- The straightforward instrument design enables:
  - High reproducibility
  - Easy operation and low maintenance
  - Verification and calibration
  - Low cost of ownership
  - Low service intervals
  - Simple plant integration

Swan Analytical Instruments · CH-8340 Hinwil
swaninstruments.ch · sales@swan.ch

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Application Note