Detect the Lifetime of Charcoal Filter Materials and Save Energy Costs in UV Disinfection Treatment

Challenge

Pesticides and their toxic metabolites can impact our drinking water sources. When pesticides are used, they can break down into metabolites over time. These pesticides and their metabolites can enter drinking water through runoff or soil leaching. The timeframe for their presence in drinking water sources varies based on factors like pesticide type, soil properties, climate, application methods, and site specific conditions – this can range from months to years. Once they enter drinking water sources, they create challenges for drinking water suppliers all over the world. The following four points are summarizing those challenges in a nutshell:

Contamination: Pesticide metabolites contaminate drinking water sources through runoff or infiltration. Metabolites pose risks to human health and the environment.

Persistence: Metabolites can persist longer than original pesticides, accumulating in water sources and potentially bioaccumulating in organisms.

Ecological Effects: Metabolites harm non-target organisms, disrupting ecosystems and impacting the food chain.

Human Health Concerns: Metabolites in drinking water pose health risks, including endocrine disruption and reproductive or developmental issues.

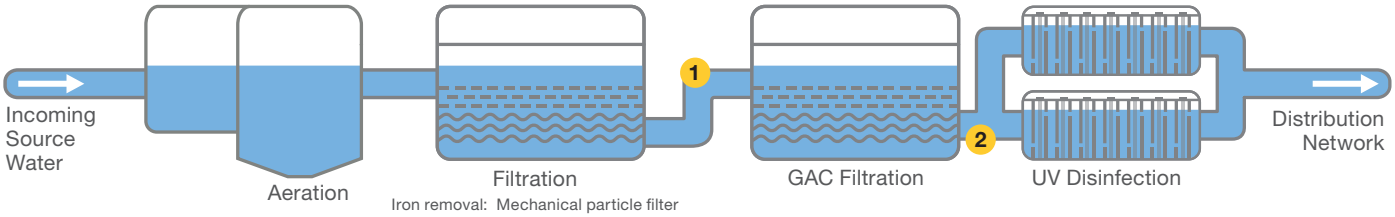
Therefore, many countries, including the United States, European Union and others, have established maximum contaminant levels (MCLs) for pesticides and their metabolites in drinking water. These MCLs set the maximum allowable concentrations of specific pesticides or their metabolites in drinking water to protect public health.

Solution

Potable water treatment plants (WTPs) employ multiple treatment processes to remove or reduce the organic load from the source water, ensuring the production of safe drinking water. Beside ozonation, a widely used treatment process for removing organics from water sources is granular activated carbon (GAC) adsorption. GAC is effective at adsorbing and removing all kind of organics, including pesticides and their toxic metabolites. A water treatment plant located in the north Germany does exactly this. Heavy agriculture industry and a historical accident with pesticides (Bromacil®, Ethidimuron®, etc.) affected the ground water quality in this region and because of this, they decided to add a GAC treatment with specifically designed charcoal to fully adsorb the occurring pesticides. This example shows, that the water quality in a region can change immediately even if the contamination lies years back – the named pesticides have been banned since 1990. This undelines that in the future many more water treatment plants will have similar problems where a GAC adsorption treatment could be a solution. Additionally, the described plant also controls the UV disinfection treatment which follows after the GAC treatment with the SAC245 value.

GAC treatment tanks

UV disinfection treatment



1 Online Parameters
pH
Conductivity
Turbidity

2 Online Parameters
SAC254
Turbidity

Swan AMI SAC254

To ensure the drinking water quality, this specific water treatment plant decided to **monitor the GAC filtration online and optimize the energy consumption of their UV treatment with the help of the AMI SAC254 analyzer**. Which makes this a really great thing because one analyzer can solve two problems. The Swan AMI SAC254 online analyzer is used to continuously monitor the organic load after the GAC treatment. Even though the UV254 absorption signal is not designed to specifically detect pesticides and their toxic metabolites, it can provide important insights into the presence of certain organic compounds, including pesticides. When the SAC value goes up, the possibility of present pesticide and their toxic metabolites is higher. But it is important to note, that the interpretation of a UV254 measurement requires caution – if the pesticides and their metabolites must be quantified it needs specific laboratory analysis techniques, such as chromatography coupled with mass spectrometry. While the **AMI SAC254 can provide information on** the overall absorbance of the organic matter in the water, it is not a direct method for detecting or quantifying pesticides or their toxic metabolites. Nevertheless, it is a very reliable and useful analysis to **detect the "end of life" of the granulated activated carbon** to initiate a replacement. Furthermore, this parameter is used **to control the UV treatment and to adjust the power of the UV radiation according to the existing organic load, which saves between 40-50% of energy compared to a not controlled operation.**

AMI SAC524

What you get

- Continuous measurement of UV absorption at a wavelength of 254 nm
- SAC254: Sum parameter which indicates organic load, typically dominated by organic contaminants
- Control the UV disinfection to reduce operational costs
- Correlation to DOC, TOC, etc. e.g. pesticides
- 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
  - Communication ability

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