

# Disinfection By-Product Management

## Disinfection By-Product Formation

The use of chlorine disinfection in potable water treatment has the potential to produce various disinfection by-products, which have been classified mainly as halogenated and non-halogenated by-products. These primary by-products are trihalomethanes (THMs) and haloacetic acids (HAAs). THMs and HAAs are the by-products of chlorination of water that contains natural organic matter (NOM).

THM's and HAA's are carcinogenic and are therefore tightly controlled in the water quality regulations of most countries.

The quantity of by-products formed is mainly determined by the amount and type of NOM present in the water at the time of chlorine addition. Secondary variables such as temperature, pH, chlorine dose and contact time also influence the quantity formed.

UV-Vis spectroscopy is a valuable tool that can be used to actively minimise the formation of THMs and HAAs in water treatment.

The s::can UV-Vis spectro::lyser available in the UK from **Process Measurement & Analysis** can measure the following parameters continuously on-line in any water type:

- NOM Surrogates (e.g. SAC UV254 Absorbance, TOCeq, DOCeq and True Colour)
- NOM Characterisation Parameters (e.g. SUVA, Absorbance Slope Index, Et Band Halfwidth)
- Total THM Formation Potential
- HAA5 Formation Potential
- Chlorine Demand

The s::can UV-Vis spectro::lyser can also run the predictive coagulation control software Com::pass (patent pending).

## Disinfection By-Product Management Options

Water treatment plant owners and operators can utilise s::can spectro::lyzers to provide a complete disinfection by-product management system from source to supply.

S::can spectro::lyzers can be used to measure the THM formation potential and HAA5

formation potential in source waters. If multiple sources are available this information can be used to select the source with the lowest formation potential. The information can also be used to identify when to switch between conventional coagulation and enhanced coagulation.

Automated coagulation control is an essential tool in optimising organics removal and therefore THM formation potential and HAA5 formation potential removal. Com::pass is an advanced coagulant control system, suitable for use with any metal based coagulant. It uses UV-VIS spectral and turbidity data to predict the coagulant dose required to achieve treatment aims. Com::pass can be set by the user to operate in either conventional coagulation or in enhanced coagulation mode. Com::pass has been shown to out perform other control methods such as streaming current meters, on multiple sites and water types.

With s::can spectro::lyzers sampling the plant inlet and filtered water (before chlorination) it is possible to monitor the removal of THM formation potential and HAA5 formation potential continuously. The plant can then be optimised to target the removal of these parameters rather than the more generic measurements such as true colour or UV254. Com::pass Plus does this automatically.

It is important to avoid overdosing chlorine in order to minimise formation of THMs and HAAs. The chlorine demand parameter can be used to automatically adjust the chlorine dose control setpoint. This ensures that the target chlorine residual will be met at the end of the distribution system under all conditions and avoids overdosing of chlorine.

