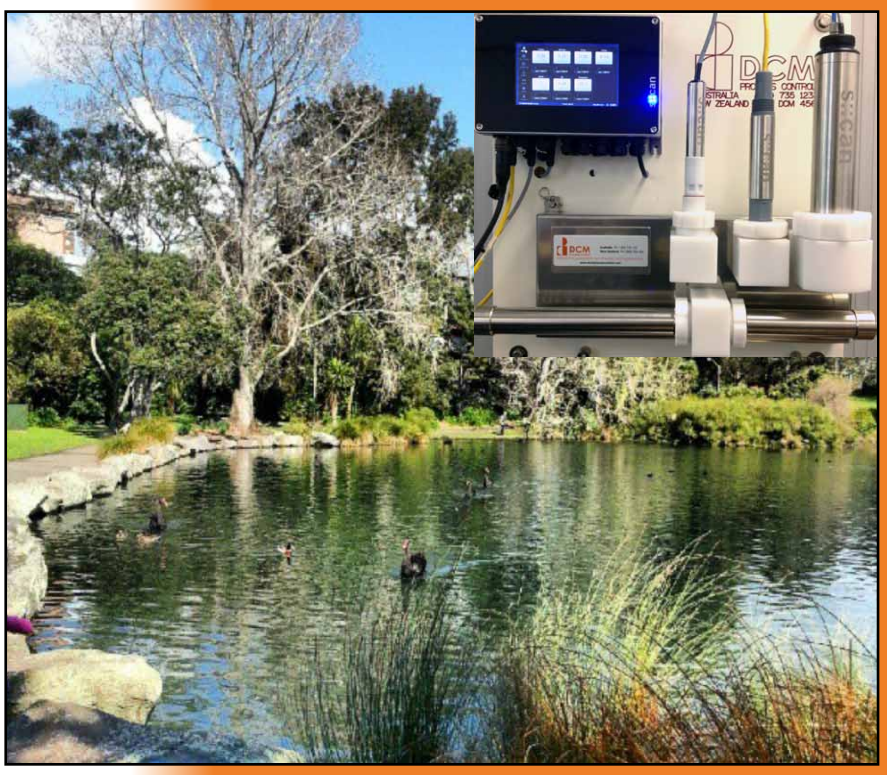
DCM Process Control

s::can Intelligent. Optical. Online.

Info Sheet

- Real-time Data
- DBP Measurement
- DBP Formation Potential
- Chlorine Demand
- NOM Characterisation
- On-line Data Validation
- Control Outputs
- Low Maintenance
- Real-time Remote Support



DBP

Disinfection By-Product Management

NOM characterisation, chlorine demand and prediction & measurement of DBP's is an important aspect of source water selection and treatment plant/ distribution management

Achieve real-time measurement and set point control with DCM/s::can

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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 the 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 of by-products formed.

The quantity of by-products formed has to be measured in the laboratory using gas chromatography-mass spectroscopy. The formation potential of THMs and HAAs in any water can also be determined in the laboratory by adding chlorine to a sample and measuring the amount of THMs and HAAs formed after 7 days. This is an expensive and time consuming test. Recent advances, however, now mean that it is possible to measure the formation potential of THMs and HAAs in water on-line using UV-Vis spectroscopy.

UV-Vis Spectroscopy

The s::can UV-Vis spectro::lyser 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 (i.e. the amount of TTHM that will form if chlorine is added to the water)
- HAA5 Formation Potential (i.e. the amount of HAA5 that will form if chlorine is added to the water)
- Chlorine Demand (i.e the amount of chlorine that will be consumed by the water in a given time)

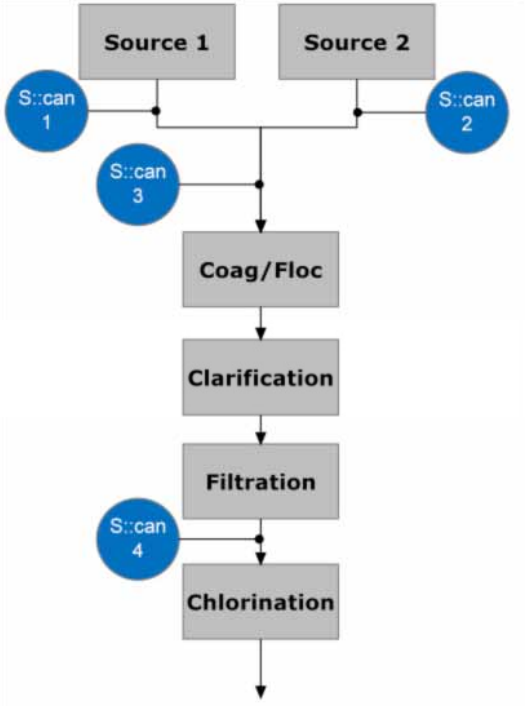
The s::can controller can also run the predictive coagulation control software Com::pass and Disinfection By-Product Management Options.

Disinfection By-Product Management Options

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

Source Water Selection

s::can spectro::lysers 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.



Coagulation Control

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 data 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 on multiple sites and water types to out-perform other on-line control methods such as streaming current meters.

Continuous Monitoring of THMFP and HAAFP Reduction

With s::can spectro::lysers sampling the plant inlet and filtered water (before chlorination) it is possible to continuously monitor the reduction of THM formation potential and HAA5 formation potential. The treatment regime can then be optimised to target the removal of these parameters. Com::pass Plus does this automatically.

Chlorine Dose Setpoint Control

In order to minimise formation of THMs and HAAs it is important to avoid overdosing chlorine. The s::can 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 water quality conditions and avoids overdosing of chlorine.

Greater Wellington Water are using s::can spectro::lysers at full-scale to successfully manage disinfection by-products. This technology is now available in the UK.

Case Study

Greater Wellington Water (New Zealand) operates two surface water treatment plants. These are the 140ML/d Te Marua WTP and the 60ML/d Wainuiomata WTP. Both of these sites treat water from heavily forested upland catchments. The source water is very low in turbidity and has highly variable NOM content. The NOM is predominantly humic and fulvic acids with a high THM and HAA formation potential.

The average normalised formation potentials for the plants are:

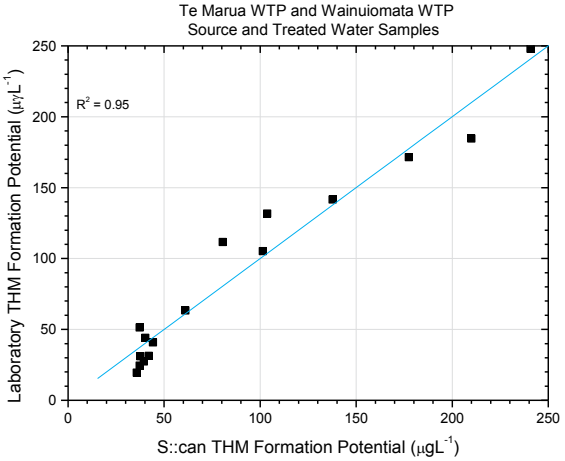
Total THM formation potential = 75.3 µg/mg C

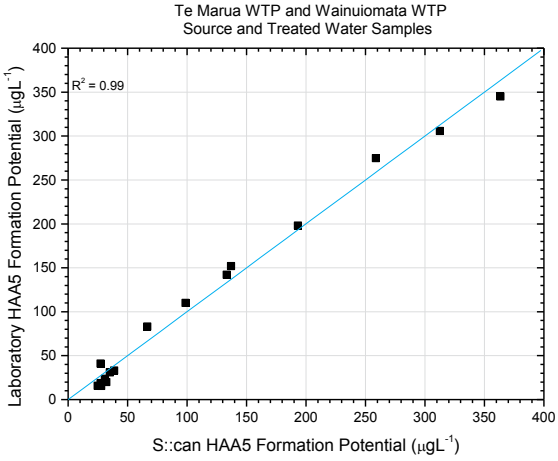
HAA5 formation potential = 100.9 µg/mg C

Each of the plants has 4 s::can spectro::lysers installed for source selection, coagulation control (Com::pass), plant performance monitoring and chlorine dose setpoint control.

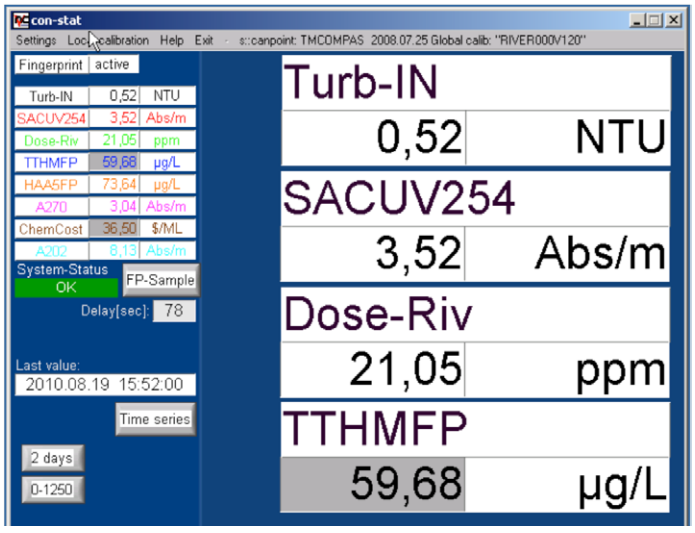
Despite the relatively high levels of both total THMS and HAA5s in the source waters the concentrations measured in the distribution system are always <20µg/L and <50µg/L for total THMs and HAA5s respectively.

The TTHM formation potential and HAA5 formation potential as measured in-situ by s::can spectro::lysers are compared to laboratory measurements in the following graphs.



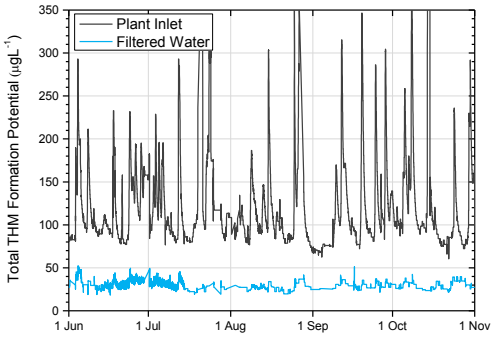


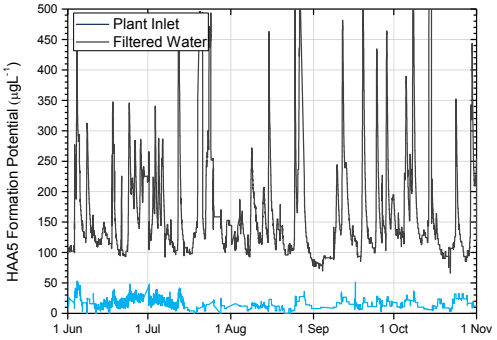
The s::can spectro::lyser installation and a screenshot of the Te Marua WTP s::can con::stat processor unit are shown in the following pictures.



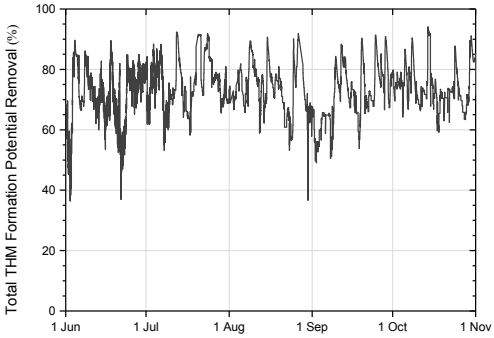
Disinfection By-Product Management

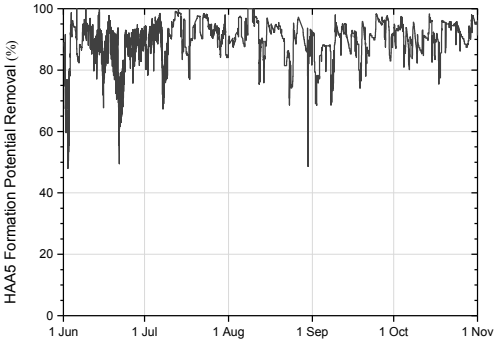
On-line measurements of TTHM formation potential and HAA5 formation potential are shown for the Te Marua WTP inlet and combined filtered water in the following graphs.



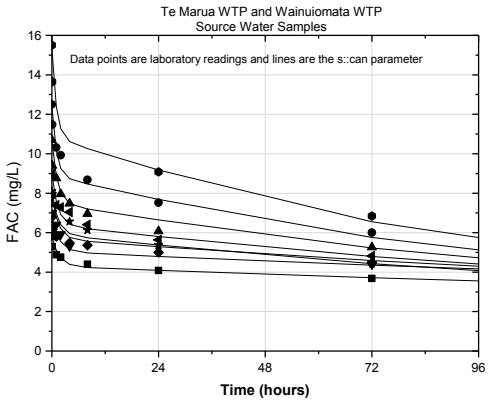


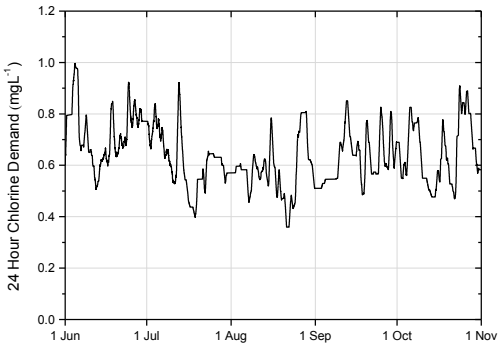
TTHM formation potential and HAA5 formation potential removals are shown in the following graphs.





The chlorine demand as measured by an s::can spectro::lyser is compared to laboratory measurements in the first graph below. The second graph shows the chlorine residual setpoint used at the Te Marua WTP. It is based on the 24 hour chlorine demand since this corresponds with the maximum water age in the distribution system.





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