Water
Research
Australia

Form: Project initiation template

The purpose of this document is to describe a research idea to WaterRA, initiating a possible project. The information will be used to communicate the idea with WaterRA members and the water industry to garner support, allowing the idea to progress to the next stage which is usually a workshop.
Once complete, submit to info@waterra.com.au.

Title
An assessment methodology for screening wastewater streams causing reduction of UV disinfection
Focus Area

1. *IWM & WSUD*
2. *Sustainable management of Environmental impacts*

3. *Managing Contamination in Water*

4. *Operational (Service) Risk Reduction and productivity*
5. *Resource recovery and re-use*

What is the problem?
The efficiency of UV disinfection of secondary effluent depends on the physicochemical characteristics of the wastewater and can be determined by the UV transmittance (UVT) of the water. It is negatively impacted by the presence of suspended solids, inorganic cations such as Fe and Mn, and organic compounds which absorb radiation at or near 254 nm. Preliminary results show that fluorescence can indicate the presence of non-biodegradable substances in the plant influent which then reduce UVT and thus disinfection efficacy of the secondary effluent.

Background
The efficiency of UV disinfection of secondary effluent depends on the physicochemical characteristics of the wastewater. The likely effectiveness of the UV disinfection process can be determined by the UV transmittance (UVT) of the water. The transmittance is negatively impacted by the presence of suspended solids, inorganic cations such as Fe and Mn, and organic compounds which absorb radiation at or near 254 nm. These compounds may originate from industrial, domestic and agricultural sources, and are not removed or, perhaps for some organics, are generated in the STP.

The preliminary investigation utilising samples from three selected Victorian STPs showed that many of the Trade Wastes (TWs) and domestic wastewaters contained high UV-absorbing organics (e.g., humic-like, aromatic protein-like). As the hydrophobic humic-like substances tend to be recalcitrant to biological treatment, they appeared in all the secondary effluents and so provide a major source of UVT-reducing compounds, and pose a greater challenge to the STP systems compared with other types of organic matter with respect to the effectiveness and efficiency of subsequent UV disinfection.

It was shown that the fluorescent intensity of the non-biodegradable humic or humic-like substances had a significant relationship with the UVT. Analysis of the fluorescence profiles suggested that fluorescence analysis of the humic-like organic matter could potentially be used as a tool to evaluate the UVT-decreasing potential of TW streams to STPs without the need for biodegradation testing.

What is the desired outcome?
[Briefly describe how you see the project will be conducted and what it will project produce – i.e. Fundamental research, Guidance Manual. If the problem or idea is addressed what will be the outcome Note that this is subject to the idea being discussed at the workshop and may change as the idea is developed.]

As this project was based on lab-scale trials and analysis using a limited number of samples, more extensive sampling, biodegradation tests and correlation with UVT for additional STPs which treat different TW streams and have different treatment processes, is required.

There is potential to use fluorescence (e.g., by use of a fluorometer) as a tool to evaluate the characteristics of TWs, and to monitor the level of humic-like substances in STP influent and thus their UVT-reducing potential. This could be done on-line prior to treatment, or after treatment, thus providing the ability to divert UVT non-compliant water prior to the UV disinfection process. Hence only treated water which has undergone appropriate disinfection would be released for recycling.

The overall research outcomes are expected to assist in the development of appropriate TW management options for the cost-effective control of the UVT to enable effective UV disinfection in wastewater recycling processes.

Why would this idea be of benefit to the water industry?
[Provide a brief description of what you see the benefit being, consider which part of the industry would benefit and how. Also consider if there would easily definable cost benefits; if not, how could success be measured?]

The goal of this work is to develop a tool with which wastewater streams, such as Trade Wastes, could be screened and so assessed for their impact on the UVT of treated effluent, and thus to determine their impact on the effectiveness and efficiency of the UV disinfection process.

The preliminary study developed a potentially powerful diagnostic tool for understanding the sources of UV-absorbing species without the need to undertake biodegradation tests on each source.

This would benefit water utilities which utilise UV disinfection of their secondary effluent as it would ensure efficient disinfection, and thus reduce the health and environmental risk associated with the treated water on recycling or release to the environment.

This tool may also provide a means to more accurately price some Trade Waste streams based on their impact on UV disinfection efficiency.

How would the work/project be delivered?
It is proposed that it be researcher led under the guidance of a Project Advisory Committee. Samples from participating utilities would undergo laboratory scale testing to further test the relationship between fluorescence intensity and UVT previously developed. A fluorometer would then be installed on-site at a participating plant to further test the system. A tool would then be developed to process the fluorometric data to an appropriate format for use by plant operators.

List any relevant references
Predicting the Impact of Trade Waste Streams on UV Transmittance
Water Research Australia Project 2033